The Seen and the Unseen: Impact of a Conditional Cash Transfer Program on Prenatal Sex Selection

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Abstract. How is the prenatal sex selective behaviour influenced by the presence of cheap fetal gender identification technology and financial incentives? We study this question by analysing a conditional cash transfer program called Janani Suraksha Yojna (JSY) implemented in India. By providing access to prenatal sex detection technology like the ultrasound scans and simultaneously providing cash incentives to both households and community health workers for every live birth, this program altered existing trends in prenatal sex selection. Using difference-in-difference and triple difference estimators we find that JSY led to an increase in female births by 4.8 and 12.7 percentage points respectively. Additionally, the likelihood of under 5 mortality for girls born at a higher birth order increased by around 6 percentage points. Our calculations show that this resulted in nearly 300,000 more girls surviving in treatment households between 2006 and 2015. We find that the role played by community health workers in facilitating this program is a key driver of the decline in prenatal sex selection.

Keywords: Sex Selective Abortions · Janani Suraksha Yojna · Gender Gaps · Conditional Cash Transfer Program.
JEL: D0, I3, J1, O2

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1 Introduction

Son preference has persisted in many Asian countries despite their recent economic progress. This is the key driver of the male biased sex ratios in their population. In 2017, the sex ratios at birth in India and China were 111 and 116 boys per 100 girls respectively, compared to the natural sex ratio at birth of 104 to 106 boys per 100 girls [Ritchie and Roser, 2019].[3] This excess female deficit in recent times is linked to the practice of prenatal sex selection due to the increased availability of fetal gender identification technology like the beta ultrasound. Ultrasound scans discern the sex of the fetus in early stages of pregnancy and consequently allow parents with a strong desire for a son to selectively abort female fetuses [Junhong, 2001, Banister, 2004, Goodkind, 1999, Guilmoto, 2012]. In India, nearly 4.8 million girls have been selectively aborted since the dissemination of this technology in the nineties [Bhalotra and Cochrane, 2010, Bhaskar, 2007]. Although there have been various governmental schemes launched to improve the gender balance including providing pecuniary benefits to parents to have daughters, their effects on improving sex ratios at birth are ambiguous [Anukriti, 2018, Sekher, 2012, Sinha and Yoong, 2009].

This paper demonstrates how the availability of ultrasound technology and financial incentives interact with parental son preferences to influence the gender imbalance in India using a large scale conditional cash transfer program called the Janani Suraksha Yojana (JSY). Specifically we estimate causally JSY's unintended impact on the sex selective behaviour of Indian parents and investigate the underlying mechanism through which the effect disseminates. The JSY was launched by the Government of India in 2005 to reduce maternal and neonatal mortality by providing women with cash payments for a live birth in a health facility. The scheme mandated beneficiaries to undergo at least three antenatal checkups which include ultrasound scans. Moreover health workers called ASHAs were recruited by the scheme and were provided with financial benefits to register pregnant women into the program as well as promote institutional deliveries and the uptake of prenatal health services.

Why would JSY influence the sex selective behaviour of Indian parents? Since the scheme increased the supply of maternity health care like the ultrasound scans in rural India [Powell-Jackson et al., 2015, Lim et al., 2010, Joshi and Sivaram, 2014, Carvalho and Rokicki, 2015, Nandi and Laxminarayan, 2016], households now had greater access to technology that per-

[3] Sex ratio at birth is defined as the number of males born per 100 females.

mitted fetal gender identification. Parents with a strong son preference may use it to perform sex selection through induced abortion of female fetuses. Alternatively, JSY reduced the cost of bearing children through a sizable cash transfer upon a live birth in a health facility, lowering incentives for parents who value the monetary transfer to selectively abort their female children. Similarly the health worker's remittance depended on the number of beneficiaries she registers for JSY and motivates to deliver at health centers. This may incentivise health workers to dissuade parents from performing sex selective abortions and give birth to their female children. Thus, JSY influences the propensity of parents to bear daughters by creating an unintentional trade-off between different dimensions of the program.

To estimate the program effect on prenatal sex selection we use difference-in-difference (DiD) and triple difference (DDD) estimators that exploit the variation in the timing of program implementation, the geographical location of beneficiary households and the natural experiment created by sex of the first born child to the beneficiary woman. Prior to implementation, JSY categorized states in India into low performing states (LPS) and high performing states (HPS) based on the prevailing state specific institutional delivery rates. The eligibility criteria to receive program benefits varied by the household's socioeconomic characteristics across this classification. Based on this, the treatment group consists of women above poverty line and not belonging to schedule castes or schedule tribes (SC/ST) from the LPS and the control group consists of similar counterparts from the HPS.[4] Sex selective behaviour is indicated by the likelihood of female birth at every birth order and we compare this likelihood across the women from the LPS and HPS groups. We perform a number of robustness and falsification checks to validate our empirical strategy and provide evidence that differences in the propensity of female births can be attributed to JSY.

This paper contributes to the extensive literature on 'missing women' in India and is one of the first, to the best of our knowledge, to show that JSY led to a decrease in the sex selective abortions. We find that, overall the likelihood of female births increases by 4.8 percentage points in a highly son-preferring environment. The triple difference estimates show that first girl families

[4] In other words, comparison groups consists of non-BPL (below poverty line), non-SC/ST women from the LPS and HPS.
Caste groups in India are classified in 'hierarchy' as - upper castes, other backward castes, schedule castes and schedule tribes. Non-SC/ST includes upper castes and other backward castes. Forward caste and non-SC/ST is used interchangeably

see an increase in the likelihood of female births at birth order 2 and above by 12.7 percentage points. This is a novel result considering the existing evidence on the prevalence of prenatal sex selection amongst the forward caste, non-poor families and families with first born daughters [Borker et al., 2017, Anukriti, 2018, Almond et al., 2013, Rosenblum, 2013].

The second contribution of this paper is that it is the first to document a reversal in discriminatory practice followed by son-preferring households from prenatal to postnatal discrimination as an unintended consequence of JSY. Prior to advent of ultrasound technology in India, households followed a fertility behaviour called the 'stopping rule'. This entailed parents adjusting their family's gender composition by bearing children until they had a desired number of boys. This generated poor health outcomes for girls leading to mortality as they were either purposely neglected or discriminated against on account of being born in larger families [Jayachandran and Pande, 2017]. The advent of technology and the desire for smaller families led to parents prenatally eliminating unwanted girls. So the girls who were born were the desired children and hence acquired parental investments. Since the JSY increases the propensity of parents to bear girls, we analyse their under 5 survival probability. Our results show that though more girls were being born in treatment households, the program also increased under 5 mortality for girls especially for those born at higher birth orders. We also provide some suggestive evidence on the well being outcomes for the surviving girls and show that their nutritional outcomes are lower than those of boys. To put these results in context; our estimates show that the net combined effect of the program on prenatal sex selection and girl child mortality translates to an overall increase of 300,000 girls in the LPS households from 2006 to 2015 due to the program.

The last contribution of this paper is to the small but growing literature which points to the role of financial incentives to the community health workers in achieving desirable maternal and child well being objectives [Celhay et al., 2019, Brenner et al., 2011, Björkman Nyqvist et al., 2019]. By studying the channels through which JSY influences prenatal sex selective behaviour, we find the positive role of ASHAs in reducing this practice undertaken by Indian households. To study this we employ a new administrative dataset on health workers. This carries an important policy implication that government schemes can effectively improve gender ratios in son-preferring societies by targeting households through the community health workers.

Rest of the paper flows as follows: Section two sets the context for missing women. Section three describes the JSY program and the data used for the analysis. Section four describes the estimation strategy and section five reports the results. Section six provides the robustness checks and falsification tests for the results. Section seven provides a discussion with additional evidence on impact of the program on child mortality and suggestive evidence on well-being of surviving children. Section eight discusses various mechanisms through which the program could have impacted these results and section nine concludes the paper.

2 Missing Women and Overview of Literature

2.1 Missing Women

Discrimination against young girls in India is well documented with formal records available as far back as the First Census of British India in 1871-72 and is today reflected in the the skewed sex ratios at birth and child sex ratios [Waterfield, 1875]. The natural sex ratio at birth should be between 104 - 106 boys per 100 girls [Bhaskar, 2007, Anderson and Ray, 2010] however in India, the sex ratio at birth has increased from 108 boys per 100 girls in 1991 to 111 boys per 100 girls in 2011.[5] The child sex ratio (CSR) for India according to 2011 census was 108.8 boys per 100 girls whereas the average child sex ratio in the developing world was between 103 and 106 boys per 100 girls for the same period [Shiva and Bose, 2003].[6] Figure 2 shows that over the period of ten years, CSR has become exceedingly male dominated, particularly in the Northern states of the country. This shortfall of women in the population was termed as 'missing women' by Sen[1990] where he estimated nearly 37 million women missing from the country's population. According to The Economic Survey of India 2017-18, this number has risen to nearly 63 million women.

The male skewed sex ratios at birth and child sex ratios are primarily due to the son preference existing in many Asian societies [Clark, 2000, Almond et al., 2013]. Son preference in India originates from certain religious and cultural norms where sons are viewed as assets and daughters as liabilities. For instance, in Hinduism, sons are expected to perform funeral rites for the deceased parent. In the absence of social security, older parents typically live with the sons since daughters live with their husbands family. While daughters have a legal authority to an equal share of

[5] The natural sex ratio at birth among many species including humans is biased towards males. This is natures way of compensating for excess male mortality later in life due to natural causes.
[6] Child sex ratio is measured for of 0-5 year children as the number of boys per 100 girls.

inheritance of the family wealth, due to sticky social norms around marriage, households prefer to keep it within their family by bearing a son instead of giving it away to the daughter who will eventually move to another household [Bhalotra et al., 2018a]. Having to pay large sums of dowry for the daughters marriage and concerns about safety also make it costly for parents to have a daughter as compared to a son. Further, there is some evidence on the economic advantages sons are able on acquire on the labor market compared to daughters [Rosenblum, 2013].

These norms shape household's fertility preferences and are in turn reflected in the discriminatory behaviour of households towards daughters before and after their birth. Parents adjust gender composition of their family by resorting to two forms of discrimination, postnatal discrimination and prenatal discrimination. A few decades back, parents followed a fertility rule called the *stopping rule* wherein parents continued to have children until they had a desired number of boys. As a result, girls were born in larger families with limited resources and therefore acquired lower investments [Jensen, 2012, Arnold et al., 1998, Das Gupta and Mari Bhat, 1997]. This postnatal discrimination resulted in lower health outcomes and excess mortality amongst younger girl. With the availability of prenatal sex determination technology, parents could determine the sex of the fetus within seven weeks of pregnancy.[7] This allowed parents desiring a son to get an abortion of the unwanted female fetus [Chen et al., 2013, Bhalotra and Cochrane, 2010]. Easy access to ultrasounds since the mid-1980s and an increasing preference for smaller families has led to households changing their behaviour from postnatal discrimination to prenatal discrimination [Goodkind, 1996, Kashyap, 2019].

A salient feature observed since the nineties in India is that the sex ratio at birth skews exceedingly towards males for higher births orders [Gellatly and Petrie, 2017, Visaria, 2005, Das, 1987]. It is observed that parents seldom sex select at the first birth order since they prefer to have a child of either gender over the possibility of having no children. However, in the presence of son preference, parents whose first born is a daughter have more incentives to adopt fetal gender elimination techniques from the second birth onwards compared to parents whose first born is a son. Figure 3 plots sex ratio at birth from 2000 to 2016 at various birth orders. The horizontal line at 106 is the reference line for the natural sex ratio at birth. The dotted line plots sex ratio at birth for children born at birth order 1 i.e. the first born children. This line closely follows

[7] PNSDT or fetal gender identification technology

the reference line indicating a balanced sex ratio for first born children. The dashed line and the solid line plots plots the sex ratio at birth for children born at birth order 2 and birth order 3 or above respectively. Both these lines are progressively far off from the reference line indicating that the sex ratio at birth for children born at higher birth orders is substantially distorted towards males. This distortion at higher parity suggests that sex selection is more prominent for pregnancies at a higher order. While skewed sex ratios at birth for higher parity has been linked to prenatal sex determination technology like ultrasounds, other channels leading to an increase in the sex selective behaviour among Indian households are the price of gold, dowry and marriage institution and the religious identity of the political leader [Bhalotra et al., 2018b,a].

3 Background and Data

3.1 Janani Suraksha Yojna (JSY)

In 2005, the Government of India launched Janani Suraksha Yojna (JSY), a conditional cash transfer program sponsored 100% by the Central Government with a dual objective of reducing the number of maternal and neonatal deaths nationwide.[8] This scheme promoted safe motherhood by providing cash incentives to women if they delivered their children either in government hospitals or in an accredited private health institutions.[9] A further condition to receive the full cash incentive was that the mother should undertake at least 3 prenatal check ups that include ultrasound and amniocentesis.

Eligibility for receiving the conditional cash transfer (CCT) was dependent on the place of residence, income level and the caste of the household. The scheme implemented throughout the country in April 2005 classified states as low and high performing based on the rates of institutional deliveries i.e the proportion of women undertaking deliveries at health centers as opposed to home deliveries. Low performing states were states where the institutional delivery rate was less than 25%; these included - Uttar Pradesh, Uttranchal, Bihar, Jharkhand, Madhya Pradesh, Chhattisgarh, Assam, Rajasthan, Orissa and Jammu & Kashmir and rest of the states were

[8] JSY is a modified graded version of the National Maternity Benefit Scheme which provided all BPL women throughout the country uniformly with Rs 500 per live birth up to 2 live births. This Scheme was suspended after JSY was launched. Since our comparison groups do not comprise of BPL women, our estimates are not affected by the earlier scheme.

[9] Also include government health centres such as Sub Centers (SCs)/Primary Health Centers (PHCs)/Community Health Centers (CHCs)/First Referral Units (FRUs)/general wards of district or state hospitals

classified as high performing states (HPS). The objective of this program was to reduce maternal and child mortality rates by increasing the number of women undertaking safe deliveries at health institutions [Joshi and Sivaram, 2014].

In LPS, all pregnant women were eligible program beneficiaries and the benefits were paid regardless of whether the women delivered in a government hospital or in a private accredited health center and regardless of the birth order of their children. In HPS, only women who are classified as living below the poverty line (BPL) or belonging to scheduled caste or scheduled tribe (SC/ST) were eligible for program benefits. The eligibility in HPS was restricted to women who were 19 years of age or older and were giving birth to their first or second child. This structure gives us our comparison groups. The treatment and control groups thus are non-BPL and non-SC/ST women from the LPS and the HPS respectively. Women's eligibility for the program as well as the remuneration they received was different across the LPS and the HPS. Women in LPS were eligible to receive Rs. 1400 (20$) in rural areas and Rs. 1000(14$) in urban areas, per live birth. Women in HPS were eligible to receive Rs. 700(10$) in rural areas and Rs. 600 (9$) in urban areas, per live birth. The payment is made to the woman as a one time cash installment upon discharge from hospital or health center.[10]

A novel feature of the program was the introduction of the community health worker or the accredited social health activist (ASHA) who acted as a link between the government and the beneficiaries. Adult women who have a 12th grade certificate and are from the same village as the beneficiaries were chosen as ASHAs. This ensured that the beneficiaries develop trust in the health workers and follow their advise regarding pregnancy. The role of the ASHA is to facilitate the program in the village by identifying pregnant women and registering them into the scheme by providing them with a personalized JSY card wherein each of their pregnancies is recorded. Her duties include assisting the beneficiary to access prenatal health services like getting at least three antenatal checkups (ANC) including TT injection and IFA tablets.[11] The ASHA is also supposed to counsel pregnant women to undertake safe deliveries and escort them to the health centers. She is supposed to provide information to the new mother on the benefits of breastfeeding and immunization of the infant. The role of the ASHA in essence is to

[10] Average monthly per capita consumer expenditure (average MPCE) in 2005-06 was Rs.625 in rural India and Rs.1171 in urban India at 2005-06 prices.

[11] TT Injections : Tetanus Toxoid Injection, IFA tablets: iron and folic acid tablets

ensure that the pregnant women in her village have a safe motherhood experience by encouraging institutional deliveries and administering access to prenatal and post natal health services.

To keep the ASHA sustained in the system, she received performance based incentives depending on how many mothers she could motivate to undertake institutional deliveries. ASHA package was Rs 600 for rural areas and Rs 200 for urban areas and was similar across the low and high performing states. ASHAs were paid in two installments with the first half of the payment disbursed after the beneficiary's ANC and the second half paid on the discharge of the beneficiary. Table 1 shows the eligibility criteria by state, cash incentives available to pregnant women and ASHA workers for every live birth under this program.

Category	Rural area		Total	Urban area		Total	Eligible Women
	Mother's package	ASHA's package	(Amount in Rs.)	Mother's package	ASHA's package	(Amount in Rs.)	
LPS	1400	600	2000	1000	400	1400	All
HPS	700	600	1300	600	400	1000	SC/ST and BPL

Table 1: Source: http://www.nhm.gov.in/nrhmcomponnets/reproductive-child-health/jsy.html

In June 2011, a few additional features were added to the program to eliminate all out of pocket expenditures related to related to deliveries and treatment of the sick newborn. This included unpaid normal and cesarean operations, free supplements and drugs to the newborn and the mother, free transport from home to health center and free stay at all government health institutions in both rural and urban areas. While no provisions under the original program were changed, new features were added to further extend additional health facilities to the newborn and the mother. This late diffusion program, now called the Janani Shishu Suraksha Karyakram (Mother Child Safety Program) further ensured better facilities for women and child health services. Because of this revision to the program, we are able to compare early and later diffusion of the JSY with pre program years. The early diffusion period is from 2006 until 2010 and the later diffusion is from 2011 until 2015 both of which are compared with pre program period 2000 - 2005.

3.2 Data and Descriptive Statistics

We use the Demographic and Health Survey-IV (DHS) data of the year 2015-2016. The DHS collects detailed information on every birth of women who were ever married and are in the age range of 15 to 49 years. This includes information on the sex of her ever born child, the birth year, if this child is dead or alive at the time of the survey and if he/she is a twin or not. Using this information we are able to create a mother and her ever born children panel for each state of India where a mother is observed over all her delivered babies. While the data has information on all children born between 1980 to 2016 we restrict our analysis to mothers who conceive their first child on or after the year 2000. The reason for this is that the ultrasound machines were imported by India in 1985. This technology became widespread from 1995 onward when India started locally producing these machines [Bhalotra and Cochrane, 2010]. While our results are robust for the entire sample, we suspect that a full sample analysis could possibly conflate the effects of an earlier ultrasound shock of 1995. We restrict the analysis to rural parts since the areas to first get access to the technology were likely to be urban and including them in the analysis will bias our estimates. Thus our sample is a mother-child panel of non-SC/ST, non-BPL women in rural LPS and HPS who started their fertility on or after 2000.

Table 2 records the descriptive statistics for the LPS and HPS group. The proportion of girls in both the comparison groups are similar however there are substantial differences in socioeconomic characteristics across the two groups. We take these differences into account in our empirical strategy.

To study the mechanisms we use two additional data sources that are merged with DHS. First, rainfall data is obtained from the Climate Hazards Center of the University of California, Santa Barbara. CHIRPS dataset records of monthly precipitation for each district of India from 1981 to 2015.[12] Next, to explore the health worker channel we use the MIS data from the Health Management Information System of the Ministry of Health and Family Welfare, Government of India.[13] The number of health workers in each district is recorded from 2008 to 2015. One drawback is that as the number of ASHAs is recorded for the district, we are unable to distinguish between their number in the rural and urban.

4 Estimation Strategy

The goal of this paper is to estimate the causal effect of the JSY program on sex-selective behaviour of the households and its consequences on child well being. We exploit variation in

[12] Climate Hazards Group InfraRed Precipitation with Station data, Funk, C.C., Peterson, P.J., Landsfeld, M.F.,Pedreros, D.H., Verdin, J.P., Rowland, J.D., Romero, B.E., Husak, G.J., Michaelsen, J.C., and Verdin, A.P.,2014, A quasi-global precipitation time series for drought monitoring: U.S. Geological Survey Data Series 832,4 p. http://pubs.usgs.gov/ds/832/

[13] https://nrhm-mis.nic.in

the timing of program implementation, program eligibility based on state of residence of the women and the random variation in the sex of the first born child of the woman. We run a number of robustness checks to validate the exogeneity of these three sources of variation in the later section. As mentioned before we compare the female births to mothers in the rural LPS and HPS who belong to the non-SC/ST and non-BPL families and who began their fertility on or after the year 2000. To estimate the impact we employ a difference-in-difference and a triple difference strategy.

4.1 Difference-in-Difference

Our first estimation is a standard DiD specification. For a child born at birth order b to mother i in year t and state s, we estimate the following:

$$Girl_{bist} = \beta_0 + \beta_1 LPS_{is} \times Post_{2006\_15,t} + \delta_i + \lambda_t + \theta_b + e_{bist} \tag{1}$$

$$\begin{aligned} Girl_{bist} = \beta_0 + \beta_1 LPS_{is} \times Post_{2006\_10,t} + \beta_2 LPS_{is} \times Post_{2011\_15,t} + \\ \delta_i + \lambda_t + \theta_b + e_{bist} \end{aligned} \tag{2}$$

The dependent variable $Girl_{bist}$ is a dummy variable that is 1 if the child born at birth order b is a girl and 0 if its a boy. LPS_{is} specifies if the mother i in the state s belongs to LPS or HPS. $Post_{2006\_15,t}$ is 1 if the child was born after 2005 and is 0 if the child was born between 2000 - 2005. $Post_{2006\_10,t}$ captures the early diffusion period of the program. It is 1 if the child at birth order b was born between 2006 to 2010 and is 0 if the child was born prior to 2005. Similarly, $Post_{2011\_15,t}$ captures the late diffusion period and is equal to 1 if the child at birth order b was born between 2011 to 2015 and is 0 if they were born between 2000 to 2005. We classify the post JSY years into the early and late diffusion periods for two reasons. First as additional features were added to JSY in 2011, we can see how the impact changed over the two diffusion periods. Second, we have information on the anthropometric outcomes for children born in late diffusion period. By classifying the effects into diffusion periods we can tie the effect of the program on the sex ratio at birth for this cohort to their average anthropomentic welfare outcomes.

Mothers from the LPS and HPS are different across many observables. We add mother fixed effect in our specification to eliminate heterogeneity across mothers that could possibly confound the treatment effect. By adding mother fixed effects we are comparing children of the 'transitional' mothers i.e mothers who have at least one child born before and after 2005 in LPS and HPS. λ_t, θ_b are year of birth fixed effects and birth order fixed effects respectively, to control for any year and parity invariant factors.[14] As the program was implemented at state level, we cluster by state to account for the serial correlation that could exist within state. In equation 1, the DiD estimate is β_1 and in equation 2 it is given by β_1, β_2.

4.2 Triple difference

Sex of the first child has been shown to be random in literature as parents do not sex select at the first birth order. There is also evidence that families randomly assigned with girls as first born are more likely to sex select at consequent birth orders than first boy families in presence of son preference.We compare the first girl families with the first boy families across LPS and HPS before and after 2005. This helps us identify the effect of the program across groups that have different incentives for using the features of JSY.

We run the following triple difference specification where $LPS \times Post$ is interacted with an indicator for first girl families. We include mother fixed effects, birth order fixed effects, year of birth fixed effects and state-year fixed effects. The triple difference specification estimated is:

$$Girl_{bist} = \beta_0 + \beta_1 LPS_{is} \times Post_{2006\_15,t} \times First\_Girl + \beta_2 Post_{2006\_15,t} \times First\_Girl + StateTime_{st} + \delta_i + \lambda_t + \theta_b + e_{bits} \quad (3)$$

$$Girl_{bist} = \beta_0 + \beta_1 LPS_{is} \times Post_{2006\_10,t} \times First\_Girl + \beta_2 LPS_{is} \times Post_{2011\_15,t} \times First\_Girl + \beta_3 Post_{2006-10,t} \times First\_Girl + \beta_4 Post_{2011\_10,t} \times First\_Girl + StateTime_{st} + \delta_i + \lambda_t + \theta_b + e_{bits} \quad (4)$$

[14] All regressions were also run with including state fixed effects and results are similar.

While most terms in the above specification are similar to the DiD, the addition is $First\_Girl$ which is equal to 1 if the family has first born girl and 0 if it has first born boy. Like our previous estimation, our sample continues to be comprised of all families in rural India that started their fertility on or after the year 2000 and belong to non-SC/ST and non-BPL groups. The triple difference estimator is β_1 and β_2 in equation 4 and β_1 in equation 3.

5 Results

5.1 DiD Estimates

Table 3 presents the results for DiD estimation. In the first column the post program years 2006 to 2015 are compared with pre program years 2000 to 2005. In the second column the post program years are divided into a late diffusion periods (2011-2015) and an early diffusion period (2006-2010) and compared to the reference pre program years. The key variables of our interest are (i) $LPS_{is}\times\text{Post}_{2006\_15}$, (ii) $LPS_{is}\times\text{Post}_{2006\_10}$ and (iii) $LPS_{is}\times\text{Post}_{2011\_15}$.

We see that the likelihood of a female birth increased by 4.8 percentage points in the LPS. When we look at the early and late diffusion periods of the JSY, we see that in the early diffusion period this likelihood increases by 4 percentage points while in the later period it increases by 8.6 percentage points. This result is interesting as it shows reduction in sex selective behaviour among the groups that have been known in literature to sex select i.e. non-SC/ST and non-BPL groups.

5.2 DDD Estimates

The key coefficients of our interest are the triple difference estimators. Similar to DiD specification, we first look at the entire post period of the policy from 2006-2015 and then we differentiate between the early and late diffusion period in Table 4. We see that the program led to an increase in the likelihood of female births from birth order 2 onward for first girl families in LPS by 12.7 percentage points with almost 18.4 percentage points increase in the later diffusion period and 11.7 percentage points increase in the early diffusion period. We add in our specification state-year fixed effects as well as state year trends. After including state-year fixed effects this estimate reduces to 10.5 percentage points with a 9.7 and 15.2 percentage points increase in the likelihood of female births in the earlier and later diffusion periods. This is a more conservative specification than before as it controls for additional heterogeneity. These results suggest that one of the unintentional impact of the JSY program is the reduction in sex selective abortions and an increase in probability of girls being born in families eligible for treatment. We also see that most of the positive result is driven by the larger impacts in the later diffusion periods.

6 Robustness and Falsification tests

To make a case of the effect of JSY on sex selective abortions as a causal effect, we argue for the exogeneity of the year of implementation of JSY, the classification of states as LPS or HPS and the sex of the first born child. In other words we need to confirm that the no other unobserved variables could be confounding the treatment and common trend assumption holds.

6.1 Exogeneity of the sex of the first born child

The randomness of the sex of the first born child has been used extensively in the literature [Bhalotra and Cochrane, 2010, Das Gupta and Mari Bhat, 1997, Rosenblum et al., 2013]. In the absence of sex selection the sex ratio at birth is 104 - 106 boys per 100 girls [Ritchie and Roser, 2019]. From figure 3 we see that the sex ratio at birth for parity 1 given by the dotted line closely follows the natural sex ratio at birth line. The sex ratio at birth for parity 2 and 3 or above are diverging away from the natural sex ratio at birth line. This indicates sex selection from parity 2 onward and no sex selection at parity 1. Next we check if the first girl and first boy families are different across observable. We plot the coefficients of the regression of an indicator of first girl on socioeconomic variables in figure 6. The red line is to indicate that the estimated coefficient is 0. Each coefficient has a 95% confidence interval. All of the estimated coefficients are 0 i.e the first girl families and the first boy families are not different across observables. Both these arguments support the case for the natural experiments created by the sex of the first born.

6.2 Exogeneity of JSY

We will not be able to identify causal effects of JSY if the classification of states into LPS and HPS categories is not exogenous and is a response to pre existing values of the outcome variable here the female births in the state. We argue that this is not the case. JSY was launched with an objective to increase institutional deliveries and reduce maternal mortality. Beneficiary states were those where the institutional delivery rates were lower than 25% of the national average. Second the proportion of girls in the LPS and HPS states prior to the implementation of JSY was not significantly different.

It could be argued that the states with lower institutional delivery rates are the states where the gender attitudes are different than states with higher institutional deliveries. Or states with lower institutional delivery rates are dissimilar than the remaining states on general developmental dimensions. These unobserved factors could influence the sex selective behaviour in the respective states. This would mean that the estimated coefficient is picking up the effect of JSY plus gender attitudes or development. If we are able to eliminate these differences, then the JSY classification could be considered exogenous. We do this by including mother fixed effects in our specification. This removes all observed and unobserved differences between mothers in LPS and HPS that could be correlated simultaneously with being qualified for JSY and the outcome variable of female births. We compare essentially within mother differences in the likelihood of female births across LPS and HPS. Conditional on mother fixed effects, we could consider that the LPS and HPS classification is random.

Another factor that could bias our results is if households anticipated the implementation of JSY before 2005. We will then be conflating our estimate with the households expectations. If this was the case then households in LPS should have changed their fertility behaviour prior to 2005 and we should see a decrease in the female births. However if households did not change behaviour prior to 2005 in LPS differently than HPS i.e the probabaility of female births was similar in LPS and HPS prior to 2005, we can fairly say that households did not anticipate the program from before and year of implementation is exogeneous. This is evident from Figure 4 and 5 where prior to 2005, the likelihood of female births is not different.

6.3 Identification Assumptions

A key assumption of a DiD estimation is that in the absence of the program the outcome variable in the treatment and control groups have parallel trends i.e. the outcome variable would have evolved in the same way for both the groups. For our analysis, this implies that the probability of having a girl at next birth should not be significantly different across mothers in LPS and HPS in the pre-program years. To test this we run a specification where the effect of the program is allowed to vary by year like in an event study analysis. For us to be confident that program estimated a causal impact on sex selective behaviour of a mother, we should not observe any significant differences in the probability of having a girl in the LPS and HPS prior to the program. Significant differences, if any, should only occur after the program if our identification strategy is identifying the program effect. To check this, we estimate the following specification for a DiD and a DDD:

$$Girl_{bist} = \beta_0 + \sum_{j=2000}^{2015} \beta_j LPS_{is} \times Year_j + \delta_i + \lambda_t + \theta_b + e_{bist} \tag{3}$$

$$Girl_{bist} = \beta_0 + \sum_{j=2000}^{2015} \beta_j LPS_{is} \times Year_j \times First_Girl + StateTime_{st} + \delta_i + \lambda_t + \theta_b + e_{bist} \tag{4}$$

Figure 4 shows that the likelihood of a girl born to mothers in LPS versus HSP groups are not significantly different for years prior to 2005. Similarly Figure 5 shows that the likelihood of a girl birth is not significantly different for first girl families across LPS and HPS. The differences in both the figures only become significant after year 2009. The joint test of significance of the leads of the program renders a pvalue of 0.3 and 0.163, implying that prior to the program the girl births evolved in a similar way and our empirical strategy identifies the differences between sex of children caused due to the program.

6.4 Falsification tests

The key idea behind this exercise is that if our empirical strategy identifies the causal impact of the program on the fertility decisions of mothers then we should not be able to see any effect on mothers who never received the program. The first exercise we do is to individually assume each year from 1990 to 2004, i.e. years prior to 2005 to be the program year. Assuming each of the years as the year when JSY was implemented, we check the impact of the program on the likelihood of a girl birth across LPS and HPS mothers. Figure 7 plots the coefficient for each year and we can see that the probability of girl birth across LPS and the HPS groups is not significantly different for any of the years except 1996 and 1997. The reason we may see some significant difference in these two years could be due to the structural break in 1995 when the ultrasound technology became widely available in India [Bhalotra and Cochrane, 2010]. However, the effect of this structural break does not last long and dissipates after 1997. The coefficients for the remaining years are insignificant and we the differences in the outcome only after 2005 i.e after JSY was implemented implying that what we are capturing is the causal effect of JSY.

The second exercise of our falsification test relies on running our triple DiD specification on DHS-III sample that was collected in 2005-06. Since this survey was completed by 2005-06, women interviewed in this sample never received the program. The idea is similar to the test run above. We should not find any effect of the program on women who never received the program. Here we assume 1995 as the year JSY was implemented and compare children born upto 10 years after 1995 with children born upto 5 years prior to 1995. Our sample consists of mothers who start their fertility decisions from 1990 onwards. Since we assume 1995 to be the year that the program was rolled out we compare children born between 1996 to 2000 (our assumed early diffusion period) and 2001 to 2005 (our late diffusion period) with those born between 1990 to 1995. One reason for doing this is that if there are any reporting biases in fertility for children born more than 10 years prior to survey year, then these biases should be the same in the any DHS sample. Hence, if our main results are driven by reporting bias then we will also see significant differences in the outcome in our DHS-III estimation results.

We estimate the following specification for DHS-III:

$$Girl_{bits} = \beta_0 + \beta_1 LPS_{is} \times Post_{1996\_00,t} \times First\_Girl + \beta_2 LPS_{is} \times Post_{2001\_05,t} \times First\_Girl \\ + StateTime_{st} + \delta_i + \lambda_t + \theta_b + e_{bits}$$

Table 6 shows the results of our falsification test on mothers who started fertility decisions in 1990.[15] In both columns we see that the likelihood of girl births is not significantly different across first girl LPS families and the controls. Lack of significance will indicate that our empirical strategy is capturing only the program effect.

Both the falsification tests support our claim of causal identification of the program effect on the likelihood of girl births with the empirical strategy we employ.

[15] Additional falsification test assuming year 2000 to be the treatment year for the DHS III sample is shown in appendix.

6.5 Threats to identification

Our strategy will fail to identify causal effects of the program if there are other unobserved factors say some other pro-female laws or schemes that vary by state-year and are correlated with the JSY comparison groups as well as the likelihood of having a girl. This could include state specific child and maternal welfare schemes launched or discontinued after 2005. For e.g Maternity Benefit Scheme implemented in Tamil Nadu in 2006 that aims to provide optimal nutrition for pregnant women and compensates the wage loss during pregnancy by providing a cash transfer to poor mothers, or the MAMATA Maternity Scheme implemented in Orissa from 2011 until 2012. Such factors varying across different states over years would be eliminated by the triple difference strategy as the sex of the first born child gives us an additional source of variation within state.

Now there could be a concern that the influence of the confounders varying by state-year influence first girl and first boy families differently and are not eliminated in the triple difference. For example the inheritance law. The Hindu Succession Act 1956 was amended in 2005 and applied across all states whereby women could inherit an equal share of the family wealth. If parents with a first girl now decide to not sex select because they want their daughters to claim family wealth, then it would be the change in the inheritance law and not the implementation of JSY that would drive our results. To overcome this concern, we include a covariate to indicate the change of inheritance law in our specification. Table 5 shows the result for this regression. The coefficient on inheritance law is statistically insignificant which means that the change in this law is not a possible confounder. As a matter of fact, the inclusion of state-year fixed effects will eliminate all the heterogeneity due to unobservables varying across states and over years, however inclusion of the dummy for inheritance law only makes our case for causality stronger.

Another threat to validity could come from the fact that women who have a first born daughter are biologically more likely to have more daughters. It would be biology driving our results and not the program. However the likelihood of first girl mothers having more daughters would be similar across LPS and HPS which would be differenced out in our triple difference estimation.

Looking at the results of the various placebo tests we implement, we can positively say that the likelihood of an increase in girl births are associated to JSY implementation.

7 Discussion and Additional Evidence

7.1 Impact on infant mortality

The previous section showed the causal impact of JSY on sex selective abortions in India. The program caused an increase in number of girls being born in families eligible to receive JSY benefits, indicating that the mechanisim of access to prenatal sex determination technologies was not dominant. Previous work has shown that in societies with preference for male children, girls suffer from lower welfare in families that follow stopping rule and have more girls than they desire. This discrimination is starker for girls at a higher birth orders. In this section we therefore test this hypothesis. We look at the mortality of children born to women in our sample who died after being born at various intervals before age 5. Biologically, mortality among boys is higher than among girls between the age of 0 to 1 [Kraemer, 2000] so if we observe higher mortality for girls than boys it would indicate that girls born are being neglected.

Using our difference in difference estimator, we test if the the program increased child mortality for girls. Model estimated is:

$$Dead_{ibt} = \beta_0 + \beta_1 LPS_i \times Post_t \times Girl_i + \beta_2 LPS_i + \beta_3 Post_t + StateTime_{st} + \delta_i + \lambda_t + \theta_b + e_{ibt}$$

Table 7 shows the result of above estimation which shows if there are disproportionately more girls amongst infants who died before 7 days, before completing 1 year and before completing 5 years of birth. For each of these samples, the first two column show results for all infants in rural India irrespective of their birth order. Columns 3 and 4 show results for all infants who were born at birth order greater than 1, i.e. who were not the first born children. The last two columns show results for all infants born at birth order greater than 2. We do this distinction by birth order because girls at a higher birth order tend to die more than boys due to neglect and discrimination.

We find that for all age groups, the probability that the dead infant is a girl is positive at all birth orders. We see that the likelihood of a girl born at birth order more than 2 dying before 7 days from birth is 4.2 percentage points higher in the LPS groups. Under the age of 1 year, girls have a larger probability of dying in the LPS. The statistical significance holds for infant girls that were born at birth order greater than 1 and birth order greater than 2. These differences in mortality are seen in the early diffusion phase of the program. This can also be seen amongst girls born at higher birth orders who die before reaching the age of 5 years. Overall girls born at birth order higher than 2 in LPS who die before 5 years of age increases by nearly 6 percentage points after the program. An interesting observation is that the significant difference in mortality between girls and boys disappears when we look at late diffusion period. This could be due to the additional feature of providing nutritional supplements to infants that was added to the program in 2011.

7.2 Well-being in surviving children

This paper has shown that JSY program unintentionally caused more girls to be born in treatment families but at the same time increased their probability of death before reaching the age of 5 years. This indicates that the program substituted pre-natal gender discrimination to post natal discrimination among families eligible for the program. While more girls are being born in treatment groups, infant mortality is also high for girls in these families suggesting neglect towards unwanted girls. Work by Anukriti et al. [2018] shows that access to PNSD technologies leads families to not give birth to unwanted girls as a result post natal gender gaps between wanted girls and boys in a family disappear. However, in our case, the program induced families to deffer the discrimination between girls and boys to after they were born. In the previous section we show some evidence that the additional girls being born were unwanted and not cared for which led to a significantly higher probability of these girls dying before the age of 5 years.

Given the existing discrimination against girls, it becomes important to assess the well being of the surviving girls. Widely used measures of child nutrition in literature are the child anthropometrics. Child anthopometric indicators are are derived from physical body measurements, such as height or weight (in relation to age and sex). While weight and height based on age and sex of the child do not indicate malnutrition directly as they are affected by many intervening factors other than nutrient intake, in particular genetic variation. However, even in the presence of such natural variation, it is possible to use physical measurements to assess the adequacy of diet and growth, in particular in infants and children. This is done by comparing indicators with the distribution of the same indicator for a "healthy" reference group and identifying "extreme" or "abnormal" departures from this distribution [O'donnell et al., 2008]. The new reference population recommended by WHO is based on random samples form US population reflecting ethnic diversity among mothers following prescribed health behaviour eg. breastfeeding, no smoking etc.

The most common way of using these measures is to convert them in to z-scores. The two most commonly used indicators for assessing child level nutrition are (i) Height-for-age z-score (HAZ); and (ii) Weight-for-age z-score (WAZ). WAZ is used to monitor growth and change in malnutrition over time, HAZ on the other hand reflects cumulative linear growth and indicates past inadequate nutrition or chronic illness. To compute these z-scores, we follow the latest process prescribed by WHO and also used by Jayachandran and Pande [2017]. The results in this section further explore the heterogeneity in child anthropometric outcomes for all surviving children in our sample that are born on or after 2010.In other words, this section answers the question: "for the families eligible for the program, are the child level outcomes different for children on the lower end of the distribution than those with average outcomes?".

DHS IV collects information on these child level anthropometric indicators for all children between the age of 0 to 5 years who agree to be measured and are present at the time of the survey. Our sample consists of 237,508 children who were measured in the survey and are from rural population. This enables us to create all the above three measures to test the well-being of the surviving children in our sample. There are however, some drawbacks of this analysis. First, in our sample many mothers have no more than one child below the age of 5 years, as a result we can no longer use mother fixed effects in our regression. And second, since the children between the age of 0 to 5 are all those born in the late diffusion phase we do not have a counter factual sample to compare their outcomes to. As a result we are only able to compare the outcomes between our treatment and control groups and hence these results should not be interpreted as the causal effect of the JSY program. This analysis is only meant to provide suggestive evidence to what are the possible child level outcomes as a result of changes in fertility decisions caused by the program. The specification estimated is:

$$Ybits = \beta_0 + \beta_1 Girl_{bi} \times LPS_{is} + \beta_2 Girl_{bit} + X_{its} + \delta_i + \lambda_t + \theta_b + e_{bits}$$

Where the dependent variable is either of the three z-scores for child at birth order b born to mother i at time t in state s. $Girl_{bit}$ is the dummy variable which equals one if child is a girl. LPS_{is} is the same variable as before that captures if the child is from a family eligible for treatment or if he/she is from the control group family. Lastly, X_{its} is a vector of mother and household level controls. Estimation is done with standard errors clustered at the mother level since we are unable to control for mother level heterogeneity. The key variable of interest is Girl $\times$ LPS that measures the difference in height for age outcomes for girls born in treatment group with those born in the control group. We find that while the height for age for girls in treatment group is lower than those in control group at all quantiles, the difference is statistically significant for girls in second and third quantiles. So girls at second quantiles from treatment group have height for age 0.085 standard deviation points lower than those in the control group. Similarly, for girls at median from the treatment group have height for age 0.06 standard deviation points lower than those in the control group.

Similar to Table **??**, Table 9 shows the results of fixed effects quantile regressions for weight for age for all surviving children aged between 0 to 5 years in our sample. Again, the key variable of interest is Girl $\times$ LPS that measures the difference in weight for age outcomes for girls born in treatment group with those born in the control group. We can see that for most of the quantiles, weight for age for girls in treatment group is lower than those in control group versus boys in these groups except for in the fifth quantile. These differences are statistically significant and increase in magnitude with each quantile.

These results, indicate that gender gaps in well-being continue to exist among the surviving children with girls having poorer health outcomes than boys their age in the sample with effect being more detrimental for girls in the lower end of the distribution.

8 Mechanisms

In this section we explore the possible mechanism through which the program could have altered sex selective behaviour of Indian households.

First, JSY offered households with incentives to undergo at least three prenatal check-ups like ultrasound scans etc, thereby providing access to health services. This could have plausibly increased the usage of PNSD (Pre-Natal Sex Determination) technology by those households who might previously have been excluded from public health care. Literature has shown that parents with a strong son preference are likely to use this access to choose the preferred sex of the child by aborting the fetus if it's a girl [Bhalotra and Cochrane, 2010, Anukriti, 2018, Almond et al., 2013]. If this channel is dominant we're are likely to see an increase in sex selective behaviour and a decrease in the likelihood of a girl birth. The underlying assumption for this mechanism to hold is that there are illegal ways that parents with high son preference could avail and perform the sex-selective abortions.

Second, the program provided a substantial cash transfer for every delivery at a health center, consequently reducing the costs involved with childbearing. Average rural daily wage for a women according to the 2005 prices was Rs 85 so the cash transfer per birth was nearly 60% of her monthly wage if she was employed for all of the days.The program could possibly reduce the opportunity cost of childbearing for women who would forgo a wage by temporarily leaving the labor market. For rural families the transfer entailed an amount of nearly three times their monthly per capital consumption expenditure and could act as means to smooth consumption.[16] If this channel dominates, then we expect there to be increase in the probability of girl births in our LPS group.

Third, besides incentivizing households, JSY also offered performance based benefits to the health workers or ASHAs for every institutional delivery of JSY beneficiary in their village. As the ASHA received her benefit along with the mothers after the delivery of the child, she could dissuade the mother from undergoing sex selective abortions thus increasing the likelihood of the successive girl births. One of the duties of the ASHA is to identify the pregnant women eligible for the scheme in her village and register her into the scheme as well as record her pregnancies. This formal registration into the program entails the preparation of a JSY card for the pregnant woman. Revealing the sex of the fetus and conducting sex selective abortions is illegal in India according to the PCPNDT ACT 1994.[17] A formal registration into the system would entail the knowledge of the pregnancy to not only the ASHA but also perhaps to the doctors and nurses at the health centers. This could possibly deter parents from undertaking sex selective abortions

[16] Average monthly per capita consumer expenditure (average MPCE) in 2005-06 was Rs.625 in rural India and Rs.1171 in urban India at 2005-06 prices

[17] Pre-Conception and Pre-Natal Diagnostic Techniques (PCPNDT) Act, 1994 (Amended 2003) is an Act of the Parliament of India enacted to stop female feticides.The Act provides for the prohibition of sex selection, before or after conception. It regulates the use of pre-natal diagnostic techniques, like ultrasound and amniocentesis by allowing them their use only to detect abnormalities.

and thereby increase the probability of observing more girls at every birth order. We now test each of the above channels to identify the key driver of our result.

8.1 Ultrasound Access Channel

One of the main channels, as shown in the literature that impacts household's sex selective fertility decisions is access to pre-natal sex determination technologies like ultrasounds. All program beneficiaries were expected to undergo 3 ante-natal checkups that require the use of ultrasound machines. Having access to this technology could create incentives for households to use it to determine the sex of the fetus and consequently abort if it is a girl. While we cannot observe who uses the technology to determine sex of the fetus and who uses it to satisfy the program condition, we can hypothesize that if more people were using this aspect of the program to sex select, on average we should see this channel to lead to significantly lower probability of girls being born on average in the treatment group. Using the DHS IV data, we have information on which mothers report the use of ultrasound technology. Column 3 in the table 10 shows the results using this information. $Ultrasound_{bit}$ is a dummy variable that takes the value 1 if for child born at birth order b to mother 1 at time t, the mother had used ultrasound and 0 otherwise. One thing to note here is that the reported use of ultrasound technology was only asked for the last five years, so we only have information for use of ultrasounds for births on or after 2010. Therefore, we cannot compare ultrasound usage before and after the program. Results in column 3 show that there was no significant difference in likelihood of a girl birth as a result of using ultrasound between the treatment and control groups for first girl families. This result is mostly descriptive as reported values are are prone to measurement errors and create a bias.

We therefore compute an indicator of likelihood of ultrasound use by a mother based on use by her neighbours (excluding her own use).[18] One motivation to do this is that there could be severe reporting errors particularly for mothers who use the technology to sex select, who may choose not to report. With assumption that not all mothers in the neighbourhood will be sex selecting (since some will conceive boys), using their reported usage of this technology we can provide a likelihood of use to all eligible mothers in the neighbourhood. Though, using this indicator instead of reported values, does not completely absolves us of bias but provides better understanding of how ultrasound mechanism might be impacting decisions. Looking at

[18] We consider all eligible women surveyed within a primary sampling unit (PSU) as neighbours.

the sample of mothers who gave births in the last five years, so 2010 onward, this indicator is constructed as:

$$Likelihood_{cip}^{Ultrasound} = 1 - \left(\frac{(\sum_{c=1}^{C} B_{cip}^{U}) - B_{cip}^{U}}{\sum_{c=1}^{C} B_{cip}} \right)$$

Term B_{cip}^{U} indicates if for birth of child c to mother i in PSU p ultrasound (U) had ever been used. The numerator captures use of ultrasound in the neighbourhood, excluding own mother's use and $\sum_{c=1}^{C} B_{cp}$ captures all the births that happen in a PSU with or without ultrasound Using this indicator, we are able to generate a likelihood estimate for all eligible women in the sample irrespective of their reported use of ultrasound or not. Column 1 of Table 10 shows the results of likelihood of use between treatment and control populations. We can see that there is no significant differences in sex of the children born in these two groups as a result of ultrasound use. Since we are no longer able to difference out time trends in this estimate, in column 2 we run the regressions including another interaction of first girl. Since the time trends that we cannot control for should impact both mothers with first girls and first boys (except those that come due to ultrasound), this regression gives a much more precise estimate of the likelihood of use of ultrasound on sex of the child born. The result shows no differences in probability of having a girl as a result of access to this technology between or treatment and control groups. In the third column, the direct measure of ultrasound access is interacted with LPS and an indicator for first girl families. Here too we see insignificance on the lieklihood of female births. These results show that the use of ultrasound does not explain the differential probabilities of having a girl at every birth order between treatment and control groups and therefore we can conclude that by providing access to the ultrasound technology, the program did not induce eligible households to sex select.

8.2 Cash Transfer Channel

Wealth Effect

The program provided women with cash benefits for every live birth delivered at a public or private health center. This one time payment consequently reduced the cost of child bearing for the parents. The cash transfer was a substantial amount which was almost three times the monthly consumption expenditure of rural families in 2005 and almost 60% of a woman's average monthly rural wage. This cash transfer would be more valuable to parents are on the lower end of the wealth distribution among the non-BPL group. Using the information on wealth index for each household available in DHS IV, we examine if parents belonging to different wealth categories have differential probabilities of having a girl. A significant difference here would indicate that the financial benefit of cash transfer induced LPS households to have more girls and therefore, not sex select.

In Table 11, we see the results of an interaction of wealth quintiles with the indicator of LPS and post. The results show us that likelihood of a girl birth at subsequent birth orders does not differ by wealth across the LPS and HPS groups post 2005. We can therefore conclude that program did not lead to parents bearing girls for the cash incentive.

Income Effect

The JSY cash incentive could also have acted as a means to smooth consumption if the parents faced an income shock especially when abortion is still an option. In the literature we see that when hit by weather shocks, households smooth consumption through various ways like reduced health and human capital investments in children, increased dowry deaths among women, marrying daughters to distant households and so on [Sekhri and Storeygard, 2014]. Here we want to see if in response to a weather shock and in light of a cash transfer made available by the program, are parents more likely to have a girl in order to smooth consumption. To test this channel we use rainfall shocks that vary across districts and years. The data is use is Climate Hazards Group InfraRed Precipitation with Station data (CHIRPS) monthly rainfall data for the period 2000 upto 2015.[19] As the main agricultural season in India is the monsoons (July - September) and majority of Indian agriculture depends on rainfall during these months, we construct rainfall shocks for each year as one (two or three) standard deviations from the long run mean. For children born after the month of July in a given year, we lag the rainfall shock faced by parents by one year and for children born before the month of June we lag the rainfall shock by two years.

In Table 12, we record the results of shock interacted with LPS and post indicator. In Column 1 (2 and 3), we say parents faced a rainfall shock if they were residents in district where recorded rainfall in for the given year was 1 (2 and 3) standard deviation below and above the long run

[19] Climate Hazards Group InfraRed Precipitation with Station data, Funk, C.C., Peterson, P.J., Landsfeld, M.F., Pedreros, D.H., Verdin, J.P., Rowland, J.D., Romero, B.E., Husak, G.J., Michaelsen, J.C., and Verdin, A.P., 2014, A quasi-global precipitation time series for drought monitoring: U.S. Geological Survey Data Series 832, 4 p. http://pubs.usgs.gov/ds/832/

mean. The regressions control for mother, year and birth order fixed effects and we see that the rain shock has no effect on the likelihood of girl births. Parents most likely did not avail the program to smooth consumption in case of a shock.

8.3 Health Workers Channel

The last channel we test is that of the recruited community health workers (ASHA) through which the program could have impacted the probability to have a girl child. The effect coming through this channel could be attributed to two factors. First, the health workers were provided financial incentives in exchange of their services of assisting beneficiary women throughout their pregnancies. Their typical duties involved maintaining a record of all pregnancies for each beneficiary, preparing the JSY beneficiary card, assisting women with the ante-natal checkups and deliveries at health institutions and providing certain postnatal care. For these services ASHA workers were paid financial incentives half of which was disbursed after assisting beneficiaries with antenatal checkups and the other half after a beneficiary's delivery in hospitals. This provided them with the incentive to discourage abortions in their neighbourhood. Second, maintaining a record of pregnancies by ASHA workers further acts as a deterrent for sex selective abortions as these are prohibited by law. Given how close these two factors are we are unable to say if the health worker effect is due to the financial incentives provided to them or it is due to the record of pregnancies maintained by them. Hence we club effects coming through both these factors into the health worker channel.

To test for this channel we use data on deployment of ASHA workers per district over time since 2008 which is available on the Government of India's National Rural Health Mission (NRHM) website. This gives us variation in exposure to ASHA workers overtime and by districts which helps us in estimating their effect on births of additional girls in LPS groups. In the table 13, we have the regression output of the effect going through the health workers. In the first column we run a simple linear regression of the number of health workers scaled by the total female population in the district for the LPS group. We see that if the numbers of health workers per woman increases by 1, the likelihood of a girl birth increases by 8.12 pp. In column 2 we interact the the number of health workers divided by the total female beneficiaries in the district ($Health\_workers^{pop\_f}$) with LPS.[20] As the result shows, ASHA workers have a positive and

[20] Population data comes from 2011 India Census.

significant impact of probability of having a girl in next birth among LPS families. With every increase of ASHA worker per woman in a district, probability of having a girl is 8.42 percentage points higher for mothers in LPS group versus those in HPS group. This result clearly shows that the unintended effect of the program on improving sex ratios at birth is mostly driven through the role that ASHA workers played.

8.4 Net Effect on Missing Women

This paper has so far shown that the JSY led to an increase in number of girls being born but at the same time increased mortality for girls under the age of 5. To assess the implication of this result on demographics we use our estimates from DiD and mortality results combined with methodology similar to that used by Anderson and Ray [2010] and Anukriti et al. [2018]. We first compute an estimate of change in likelihood of birth and death for girls between 0-4 years for each year in our analysis. We then compare our observed estimates with reference estimates and multiply it with the starting population of girls in this age group from LPS (excluding population of SC and ST) as shown below:[21]

$$\text{Excess Births } = (Births_{Estimate} - Births_{Reference})$$

$$\text{Excess Deaths } = (Deaths_{Estimate} - Deaths_{Reference})$$

$$\text{Missing Women} = [\text{Excess Births } - \text{Excess Deaths }] \times Population_{0-4years} \tag{5}$$

Our estimates show that in the LPS after 2005, the program resulted in on average 621,470 additional births of girls while at the same time average excess mortality in girls ages 0-4 years in the same period was 1,046,295. This results in the net effect of 424,825 missing women in the age group of 0-4 years. When we compare this estimate of missing women to that in LPS in pre-program years, we find that prior to the program there were 724,997 missing women in age group of 0-4 years. This shows that while there are 424,825 missing women in our LPS sample,

[21] We use the natural sex ratio of 106 boys per 100 girls as a reference for calculating excess births in our sample. To calculate excess deaths in girls we use the ratio of death rates for girls and boys (0-4 years) in all countries of Europe and North America in 2015.

the program contributed to an improvement of nearly 300,000 women.

This calculation of net effect of the program on missing women in particularly important for policy as it highlights the magnitude of improvement in gender balance that can be achieved in a high son-preference society when right incentives are provided to community health workers. As can be seen from figure 1, most of the improvement in missing women comes additional births of girls due to the program.

9 Conclusion and policy recommendation

This paper examined the impact JSY conditional cash transfer program had on fertility decisions of mothers in rural India. More specifically, it provides causal evidence of the impact of the JSY on sex selective behaviour among Indian households. Results show that, contrary to previous work on sex selection, this program led to an increase in the probability of having a girl at each birth order for mothers eligible for program. The magnitude is especially larger in families who according to the literature have a greater incentive to sex select i.e those whose first child is a daughter. While overall in the country there is an increase in the prevalence of sex selective abortions, JSY managed to reduce this practice amongst families who qualified for the program.

Results also show that while there were more girls being born to families in LPS, these girls are also more likely to die before reaching the age of 5 years. Among the surviving children we find that girls on average have lower nutritional status than boys their age and this gender gap is highest for children on the lower end of the distribution. These findings indicate that though there are improvements in birth outcomes for girls as a result of the program, discrimination against them continues and shifts from prenatal to postnatal discrimination.

Our results show that in the age group 0-4, 424,825 women were missing from the population. However this is an improvement of nearly 300,000 women compared to 724,997 missing women in the same age group a decade prior to the program. While there still is a very large number of missing girls in the country, the policy contributed to reducing this number. The channel that leads to this result is the one driven by community health workers (ASHA) that were appointed as part of the program to assist pregnancies in their neighbourhood. Since these workers record each pregnancy for beneficiaries of the program and get financial incentives for every live birth of beneficiaries at health institution, they act as deterrents for couples to selectively aborting their fetuses. This result supports the emerging evidence on the role that health workers play in efficient public good distribution and in supporting health programs [Ashraf et al., 2016, Dizon-Ross et al., 2017,]

The effectiveness of community health workers in reducing the practice of prenatal sex selective abortions either due to parental fear of being reported if they undergo a sex selective abortion or ASHA's pressure on parents to not abort the child as her payment is conditional on a beneficiary's delivery in a hospital. This is an important piece of evidence in a country that has been unsuccessfully trying to reduce female foeticide through laws against sex selective abortions or financial incentives to bear girls. However our results should be taken with a pinch of salt as we do not claim that the health workers reduced the son preference in India. It merely was substituted by postnatal excess girl mortality.

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10 Tables

Table 2: Balance Test

	LPS	HPS	Diff.	Std. Error
Ferility	2.876	2.274	-.602***	.011
Proportion of girls	0.473	0.469	-.004	.003
Ultrasound Access	.286	.457	.170***	.012
Mother's education	4.955	7.224	2.268***	.028
Mother's age	33.347	34.505	1.159***	.047
Mother's age at first birth	20.373	20.959	.586***	.0214
Sex of hh head	.879	.880	.002	.002
Age of hh head	46.121	48.857	2.735***	.0802
Hindu	.813	.761	-.053***	.002
Muslim	.175	.104	-.071***	.002
Christian	.003	.033	.030***	.001
Sikh	.006	.078	.072***	.001
Buddhist	.001	.009	.009***	.000
Jain	.001	.001	-.000	.000
Other religion	.001	.013	.0132***	.000
OBC	.648	.525	-.124***	.003
Forward Caste	.351	.475	.124***	.003
First girl families	.474	.469	-.004	.003
Richest	.333	.296	-.036 ***	.003
Richer	.230	.240	.009 ***	.002
Middle	.179	.196	.017***	.002
Poorer	.145	.148	.003	.002
Poorest	.112	.117	.006***	.002
Electricity	.788	.944	.156***	.002
Radio	.105	.105	-0.000	.002
TV	.515	.827	.312***	.003
Fridge	.201	.476	.275***	.003
Bicycle	.591	.496	-.095***	.003
Motorcycle	.383	.531	.147***	.003
Car	.053	.121	.068***	.002
No of health workers[22]	13011.94	10864.38	-2147.561***	36.406
N	82919	44639		

[22] MIS data. This statistic is available only for the years 2008 to 2015.

Table 3: Difference in Difference

Dependent variable	Girl	
	(1)	(2)
LPS×$Post_{2006\_10}$		0.0407**
		(0.0199)
LPS×$Post_{2011\_15}$		0.0864**
		(0.0357)
LPS×$Post_{2006\_15}$	0.0484**	
	(0.0220)	
Mother FE	Yes	Yes
Time FE	Yes	Yes
Birth Order FE	Yes	Yes
N	150757	150757
R^2	0.3480	0.348

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The table reports the DiD coefficient of the impact of JSY on the likelihood of observing the child born to be a girl. LPS is the indicator for a non-SC/ST and non-BPL woman belonging to LPS vs HPS. $Post_{2006-15}$ compares post program years to the pre program years. $Post_{2006-10}$ and $Post_{2011-15}$ are the early and late diffusion periods of the program. The first column records the overall impact of the program and the second column records the impact of the program in the early and late diffusion period. Robust standard errors clustered by state.

Table 4: Triple Difference Results

Dependent variable	Girl					
	(1)	(2)	(3)	(4)	(5)	(6)
LPS×$Post_{2006\_15}$×First_Girl	**0.1270****		**0.1050***		**0.1149****	
	(0.0559)		(0.0590)		(0.0561)	
LPS×$Post_{2006\_10}$×First_Girl		**0.1168****		**0.0975***		**0.1076***
		(0.0544)		(0.0567)		(0.0544)
LPS×$Post_{2010\_15}$×First_Girl		**0.1845****		**0.1527****		**0.1642****
		(0.0679)		(0.0691)		(0.0650)
LPS×$Post_{2006\_15}$	-0.0112				-0.0813	
	(0.0487)				(0.0524)	
$Post_{2006\_15}$×First_Girl	-0.1813***		-0.1467**		-0.1572** *	
	(0.0544)		(0.0577)		(0.0548)	
LPS×$Post_{2006\_10}$		-0.0170				-0.0636
		(0.0462)				(0.0483)
LPSt×$Post_{2010\_15}$		0.0133				-0.0812
		(0.0595)				(0.0590)
$Post_{2006\_10}$×First_Girl		-0.1476***		-0.1171**		-0.1288**
		(0.0522)		(0.0548)		(0.0524)
$Post_{2010\_15}$×First_Girl		-0.3361***		-0.2857***		-0.2964***
		(0.0659)		(0.0681)		(0.0641)
Mother FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Birth Order FE	Yes	Yes	Yes	Yes	Yes	Yes
State Time FE	No	No	Yes	Yes	No	No
State Time Trend	No	No	No	No	Yes	Yes
N	63226	63226	63188	63188	63226	63226
R^2	0.3784	0.3807	0.3891	0.3906	0.6937	0.6944

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes : The table reports the triple difference coefficient of the impact of JSY on the likelihood of observing the child born to be a girl for first girl families.$First\_Girl$ is an indicator for if the woman's first born child was a girl. $Post_{2006-15}$ compares post program years to the pre program years. $Post_{2006-10}$ and $Post_{2011-15}$ are the early and late diffusion periods of the program. Robust standard errors clustered by state.

Table 5: Triple Difference

Dependent variable	Girl
	(1)
Treat×Post$_{2006_10}$×First_Girl	0.1066*
	(0.058)
Treat×Post$_{2011_15}$×First_Girl	0.1624**
	(0.018)
Post$_{2006_10}$×First_Girl	-0.1281**
	(0.020)
Post$_{2011-15}$×First_Girl	-0.2949***
	(0.0681)
Treat×Post$_{2006_10}$	-0.0643
	(0.182)
Treat×Post$_{2011_15}$	-0.8
	(0.181)
Inheritance_law	0.0183
	(0.763)
N	63250
R^2	0.3840
Mother FE	Yes
Year FE	Yes
Birth Order FE	Yes
State Year FE	No
State Specific Year Trend	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes : The table reports the triple difference coefficient of the impact of JSY on the likelihood of observing the child born to be a girl for first girl families controlling for a covariate indicating change in inheritance law. $First\_Girl$ is an indicator for if the woman's first born child was a girl. $Post_{2006-15}$ compares post program years to the pre program years. $Post_{2006-10}$ and $Post_{2011-15}$ are the early and late diffusion periods of the program. Robust standard errors clustered by state.

Table 6: Falsification Test

Dependent variable	Girl	
	(1)	(2)
LPS×Post$_{1996_00}$×First_Girl	-0.0370	
	(0.0847)	
LPS×Post$_{2001_05}$×First_Girl	-0.0956	
	(0.0952)	
LPS×Post$_{1996_05}$×First_Girl		-0.0491
		(0.0828)
LPS×Post$_{1996_00}$	0.0718	
	(0.0635)	
LPS×Post$_{2001_05}$	0.0981	
	(0.0719)	
Post$_{1996_00}$×First_Girl	-0.0450	
	(0.0326)	
Post$_{2001_05}$×First_Girl	-0.0845**	
	(0.0369)	
LPS×Post$_{1996_05}$		0.0789
		(0.0619)
Post$_{1996_05}$×First_Girl		-0.0547*
		(0.0318)
StateTime	0.0002	0.0002
	(0.0002)	(0.0002)
Mother FE	Yes	Yes
Year FE	Yes	Yes
Birth Order FE	Yes	Yes
State Year FE	Yes	Yes
N	15524	15524
R^2	0.3518	0.3515

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The table reports the results for the falsification test using DHS-3. The year 1995 is considered as the year the program is assumed to be implemented. Pre-program years are 1990-1995 and the years from 1996-2005 are the post-program years. Standard errors clustered by state.

Table 7: Impact on Infant Mortality

	Dependent Variable= Dead					
	(1)	(2)	(3)	(4)	(5)	(6)
	All births		Parity>1		Parity>2	
	Infant Mortality under 7 days					
LPS×Post$_{2006_10}$×Girl	0.0066		0.0093		0.0418*	
	(0.0061)		(0.0070)		(0.0228)	
LPS×Post$_{2011_15}$×Girl	0.0070		0.0162		0.0138	
	(0.0063)		(0.0130)		(0.0299)	
LPS×Post$_{2006_15}$×Girl		0.0067		0.0121		0.0294
		(0.0058)		(0.0081)		(0.0245)
N	150757	152634	63250	64258	23275	23748
R^2	0.3645	0.3636	0.4049	0.4041	0.4422	0.4432
Mean	0.026	0.026	0.024	0.024	0.029	0.029
	Infant Mortality under 1 year					
LPS×Post$_{2006-10}$×Girl	0.0090		0.0254**		0.0708**	
	(0.0062)		(0.0114)		(0.0274)	
LPS×Post$_{2011_15}$×Girl	0.0054		0.0174		0.0083	
	(0.0079)		(0.0161)		(0.0317)	
LPS×Post$_{2006_15}$×Girl		0.0070		0.0199*		0.0422
		(0.0065)		(0.0115)		(0.0262)
N	150757	152634	63250	64258	23275	23748
R^2	0.3675	0.3666	0.4054	0.4044	0.4438	0.4428
Mean	0.042	0.042	0.044	0.044	0.054	0.0254
	Infant Mortality under 5 years					
LPSt×Post$_{2006_10}$×Girl	0.0201		0.0201		0.0910***	
	(0.0129)		(0.0129)		(0.0301)	
LPS×Post$_{2011_15}$×Girl	0.0085		0.0085		0.0180	
	(0.0154)		(0.0154)		(0.0327)	
LPS×Post$_{2006_15}$×Girl		0.0131		0.0131		0.0578**
		(0.0123)		(0.0123)		(0.0284)
N	63250	64258	63250	64258	23275	23748
R^2	0.4022	0.4012	0.4022	0.4012	0.4414	0.4401
Mean	0.047	0.047	0.048	0.048	0.06	0.06

Standard errors in parentheses clustered at state

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The table reports the results for the child mortality for children born at all birth orders (columns 1 and 2), birth orders greater than 1 (columns 2 and 3) and birth orders greater than 2 (columns 5 and 6). All regressions include mother, year and birth order fixed effects as well as state specific year trends. Standard errors clustered by state.

Table 8: Child anthropometric outcomes

	HAZ	WAZ	WHZ
Girl	0.0857***	0.0719***	0.0473***
	(0.0266)	(0.0224)	(0.0169)
Girl×Treat	-0.0584*	-0.0598**	0.0004
	(0.0309)	(0.0274)	(0.0230)
Mom Age	0.0862***	0.0635***	-0.0081
	(0.0158)	(0.0094)	(0.0152)
Mom Age Sq	-0.0009***	-0.0006***	0.0001
	(0.0003)	(0.0002)	(0.0003)
Mom Education	0.0294***	0.0247***	0.0092***
	(0.0039)	(0.0019)	(0.0026)
Age at First Birth	-0.0216***	-0.0191***	-0.0004
	(0.0049)	(0.0040)	(0.0043)
Total Eligible Women	0.0142*	0.0186***	0.0121**
	(0.0082)	(0.0054)	(0.0050)
Wealth	0.1442***	0.1331***	0.0625***
	(0.0108)	(0.0106)	(0.0124)
StateTime	-0.0017	-0.0021***	-0.0011
	(0.0010)	(0.0006)	(0.0015)
State FE	Yes	Yes	Yes
Time FE	Yes	Yes	Yes
Birth Order FE	Yes	Yes	Yes
N	64209	65240	63476
R^2	0.1035	0.1049	0.0340

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The table reports the results for the height, weight for age and weight for height z-scores. Robust standard errors clustered by state.

Table 9: Child WAZ quantile outcomes

	Quantiles				
	0.1	0.25	0.5	0.75	0.9
Child_sex	0.1278***	0.0822***	0.0658***	0.0534**	-0.0280
	(0.0328)	(0.0229)	(0.0209)	(0.0225)	(0.0304)
Treat	0.1928	0.2156**	0.2320**	0.2766***	-0.0074
	(0.1448)	(0.1013)	(0.0923)	(0.0995)	(0.1342)
Child_sex × Treat	-0.0691*	-0.0617**	-0.0630**	-0.0760***	0.0087
	(0.0385)	(0.0269)	(0.0245)	(0.0264)	(0.0357)
Mom Age	0.0794***	0.0639***	0.0506***	0.0480***	0.0546***
	(0.0175)	(0.0122)	(0.0111)	(0.0120)	(0.0162)
Mom Age Sq	-0.0009***	-0.0007***	-0.0005***	-0.0004**	-0.0004*
	(0.0003)	(0.0002)	(0.0002)	(0.0002)	(0.0003)
Mom Education	0.0268***	0.0277***	0.0248***	0.0228***	0.0220***
	(0.0022)	(0.0015)	(0.0014)	(0.0015)	(0.0020)
Age at First Birth	-0.0251***	-0.0217***	-0.0160***	-0.0132***	-0.0167***
	(0.0053)	(0.0037)	(0.0034)	(0.0036)	(0.0049)
Total Eligible Women	0.0175*	0.0191***	0.0152**	0.0145**	0.0312***
	(0.0100)	(0.0070)	(0.0064)	(0.0069)	(0.0093)
Wealth	0.1486***	0.1389***	0.1380***	0.1326***	0.1193***
	(0.0089)	(0.0062)	(0.0057)	(0.0061)	(0.0083)
Intercept	-4.6985***	-3.7499***	-2.8986***	-2.1997***	-1.3947***
	(0.2711)	(0.1895)	(0.1728)	(0.1861)	(0.2512)
State Controls	Yes	Yes	Yes	Yes	Yes
Year Controls	Yes	Yes	Yes	Yes	Yes
Birth Order Controls	Yes	Yes	Yes	Yes	Yes
N	65240	65240	65240	65240	65240

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 10: Ultrasound access channel

Dependent variable	Girl		
	(1)	(2)	(3)
$\text{Liklihood}^{Ultrasound}$	-4.7239	-0.6321	
	(9.3845)	(40.7325)	
LPS $\times Liklihood^{Ultrasound}$	3.6967	0.7529	
	(9.4070)	(40.7965)	
First_Girl $\times Liklihood^{Ultrasound}$		-11.2462	
		(44.7901)	
LPS $\times First\_Girl \times Liklihood^{Ultrasound}$		9.8550	
		(44.8157)	
Ultrasound			-0.0012
			(0.2241)
Ultrasound $\times LPS$			-0.0334
			(0.2335)
Ultrasound $\times First\_Girl$			-0.1064
			(0.2378)
Ultrasound $\times LPS \times First\_Girl$			0.0455
			(0.2470)
Mother FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Birth Order FE	Yes	Yes	Yes
N	73944	44907	44907
R^2	0.7033	0.7754	0.7757

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The table reports the results impact of ultrasound usage on likelihood of a female birth. $Likelihood^{Ultrasound}$ is a variable that indicates the likelihood of ultrasound usage in a neighbourhood. Robust standard errors clustered by state.

Table 11: Wealth indices channel

Dependent variable	Girl
	(1)
Poorer×LPS×Post	-0.0295
	(0.0768)
Middle×LPS×Post	-0.0226
	(0.0610)
Richer×LPS×Post	0.0062
	(0.0634)
Richest×LPS×Post	-0.0137
	(0.0691)
State FE	Yes
Year FE	Yes
N	174298
R^2	0.4311

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The table reports the results for the impact of wealth quintiles on likelihood of a female birth. Wealth indices are classified in DHS as poorest, poorer, middle, richer, richest. The reference here is the category poorest. Robust standard errors clustered by state.

Table 12: Rainfall shock channel

Dependent variable		Girl	
	(1)	(2)	(3)
LPS×Post×Rain_shock	0.0150	0.0100	-0.033
	(0.0164)	(0.0296)	(0.0374)
LPS×Post	0.0437*	0.0473**	0.0495**
	(0.0228)	(0.0225)	(0.0217)
Rain_shock	0.0014	-0.0244	-0.0487
	(0.0139)	(0.0277)	(0.0377)
LPS×Rain_shock	-0.0183	-0.0170	0.0006
	(0.0149)	(0.0299)	(0.0459)
Post×Rain_shock	0.0058	0.0272	0.0758**
	(0.0154)	(0.0268)	(0.0323)
Mother Fixed Effect	Yes	Yes	Yes
Birth Order Fixed Effect	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes
N	151732	151732	151732
R^2	0.3468	0.3469	0.3469

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The table reports the results for impact of rainfall shock likelihood of a female birth. Rain_shock is the lagged rainfall shock by 1 year for children born after June in a given year and it is lagged by 2 years for children born before June in a given year. Columns 1 to 3 define rainfall shock as 1, 2 or 3 std. deviation below and above the long run mean. Robust standard errors clustered by state.

Table 13: Health worker channel

Dependent variable	$Girl_{LPS}$	Girl
	(1)	(2)
$Health\_workers^{pop\_f}$	0.0812**	
	(0.0272)	
$LPS \times Health\_workers^{pop\_b}$		0.0842***
		(0.0272)
$Health\_workers^{pop\_b}$		-0.0003
		(0.0011)
Mother FE	Yes	Yes
Year FE	Yes	Yes
Birth Order FE	Yes	Yes
State Specific Linear Time Trend	Yes	Yes
N	64982	86115
R^2	0.6081	0.6304

Standard errors in parentheses. Clustered at state level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The table reports the results impact of the number of health workers on likelihood of a female birth. In the first column, we restrict sample to only the children born in LPS; column 2 consists of LPS and HPS children. $Health\_workers^{pop_f}$ and $Health\_workers^{pop_b}$ are the number of health workers per woman and and per beneficiary in the district of residence. Robust standard errors clustered by state.

11 Figures

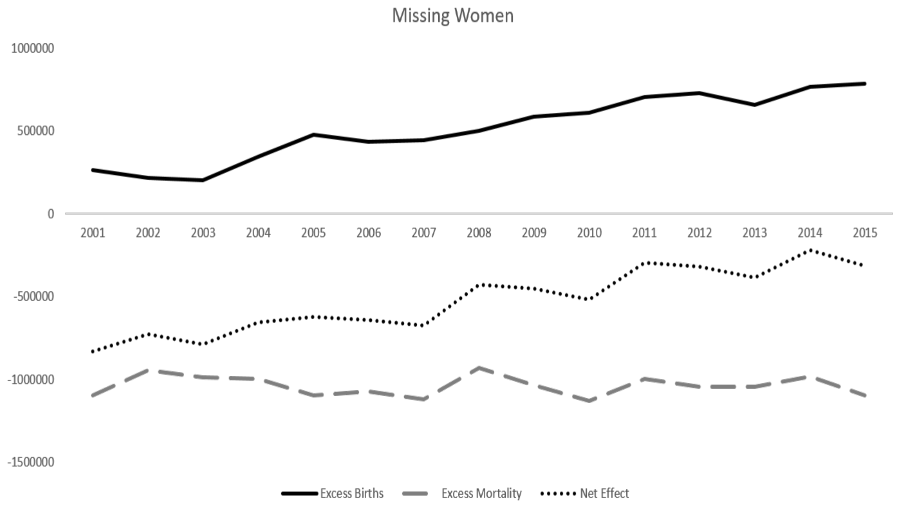

Fig. 1: Changes in Missing Women over time based on author's estimates.
Population data for India from Census 2011 and mortality data for reference group from UM World Population Prospects 2019.

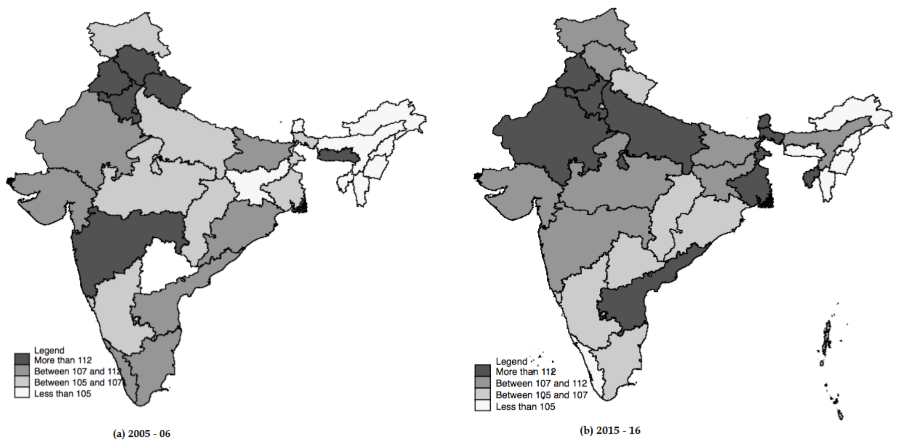

Fig. 2: Child sex ratio for 0-5 year old children, plotted using DHS-2005/06 and DHS-2015/16.

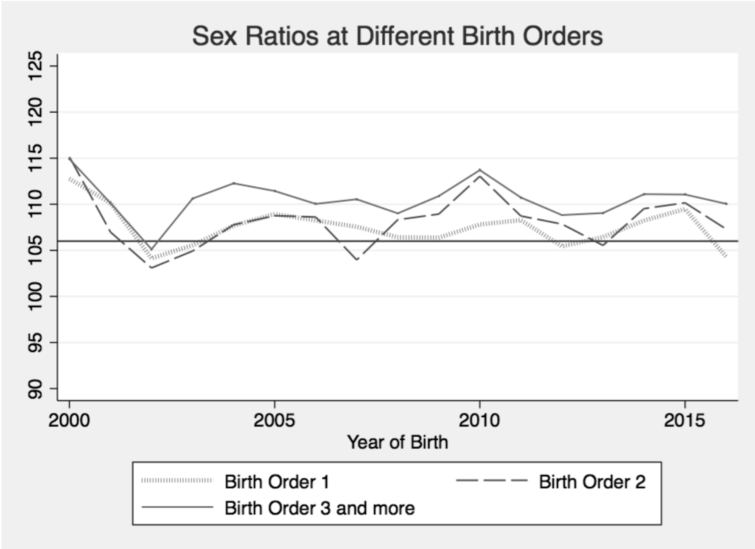

Fig. 3: Sex Ratio at birth by year plotted using DHS-2015/16. Sex ratio is computed as number of boys born per 100 girls.

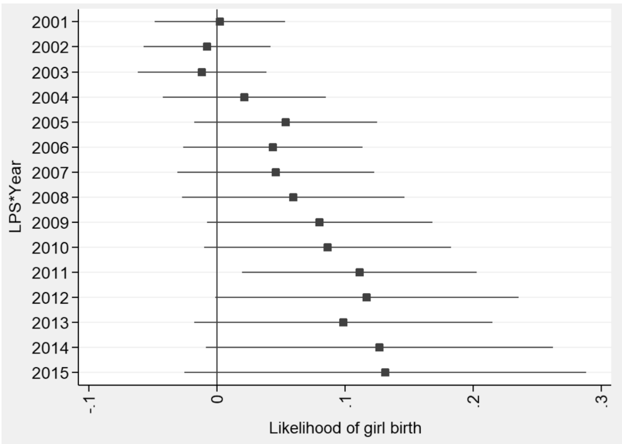

Fig. 4: Test of non differential pre-trends

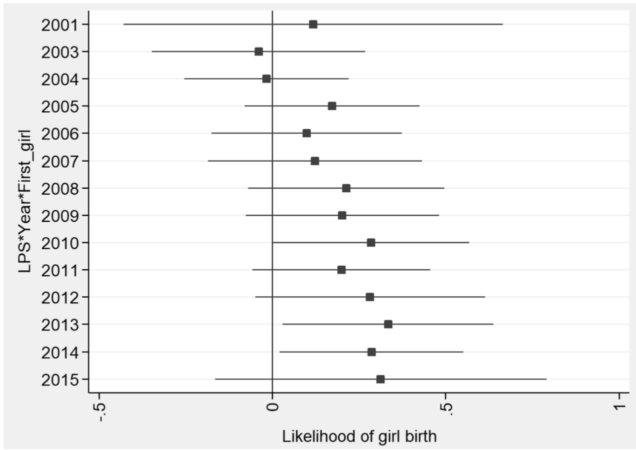

Fig. 5: Test of non differential pre-trends

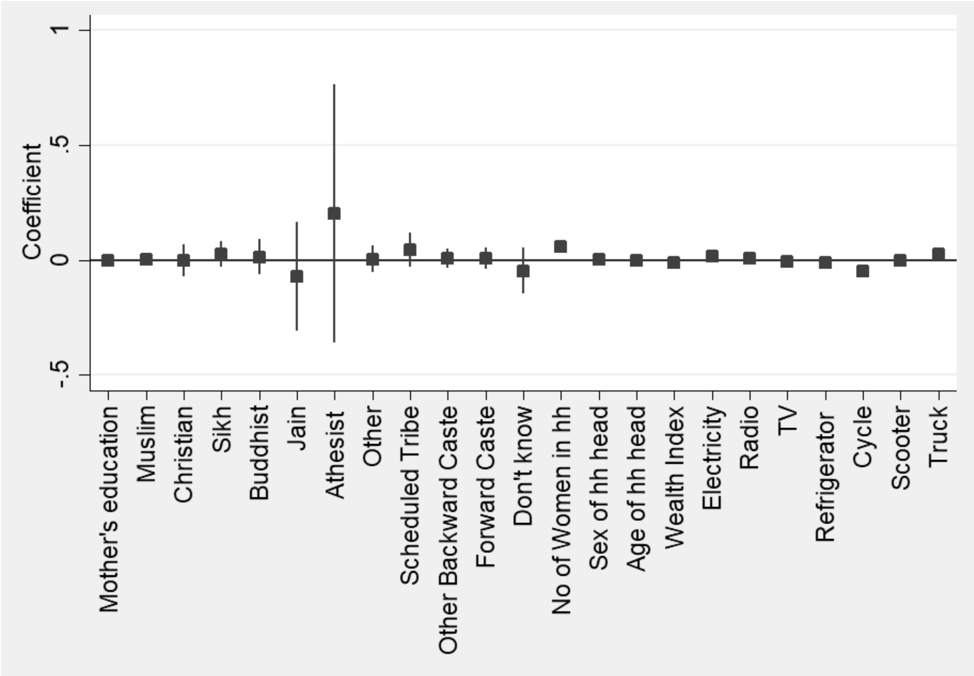

Fig. 6: Balance test for first girl and first boy families
Note that the sample is restricted for families who had their first child between years 2000 - 2005.

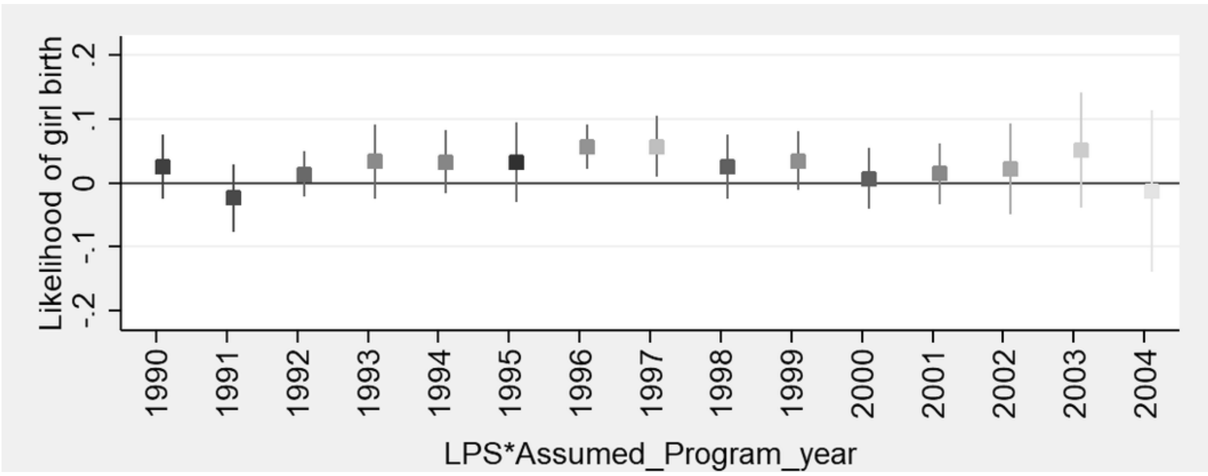

Fig. 7: Falsification test assuming program years from 1990 to 2004