



**Women's Inheritance Rights and Fertility Decisions:
Evidence from India**

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Women's Inheritance Rights and Fertility Decisions: Evidence from India

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Abstract

We analyze the impact of the Hindu Succession Amendment Act (HSAA) that mandated equal inheritance rights for women, on their fertility choices in the context of son-preference in rural India. We use the NFHS-3 data and exploit the variation in timing of the introduction of the HSAA across states to employ a difference-in-difference strategy. While both reform and non-reform women had similar son preference and desire for children, treated women, on average, had 0.8 additional children than their counterparts. We find evidence that the fertility increase was a result of women being able to use the stopping rule more effectively to achieve son-preference. Women impacted by the reform also had a higher proportion of sons for a given family size, indicating stronger son preference among treated women. Finally, we find the amendment lead to a decrease in domestic violence, improvements in maternal health, and women's decision-making power. This greater empowerment could be the potential mechanism that allowed women to increase fertility to realize their son preference.

JEL Codes: O12, J16, J13, P48

Keywords: Inheritance Rights, Bargaining Power, Fertility, Son-Preference, Stopping Rules, Gender, India

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1 Introduction

Despite growing gender progressive reforms, women's agency is often hindered by sticky social norms and lack of economic independence.¹ Two key measures of agency include women's control over resources and their ability to assert their voice over family formation (World Development Report, 2012). One way to address access to resources is to secure their rights to property through better land certification programs and inheritance reforms (Agarwal, 2001). With greater land and property ownership women can increase their income and economic contribution to the household, their intra-household bargaining power, and their outside labor force participation (Duflo and Udry, 2004; Field, 2004; Anderson and Eswaran, 2009; Quisumbing & Maluccio, 2003; Peterman, 2011; Melesse et al., 2018). Access to property also has long-term consequences for women's fertility choices and household formation. Property ownership (including legal titles to such property) can affect women's marriage market matches and in-household conflicts (Anderson & Genicot, 2015; Bose & Das, 2019; Harari, 2019), dowry payments (Roy, 2015), and provide protection against domestic and intimate partner violence (ICRW, 2006). This could increase their bargaining power within the household allowing them to take control over their reproductive decisions, including lowering fertility (Balk, 1994; Chakrabarti, 2018; Dyson and Moore, 1983; Hindin, 2000), improving maternal health by delaying childbearing (Harari, 2019) and longer birth intervals (Upadhyay and Hindin, 2005). Studies have found that women with greater property rights may decrease the number of children to allocate additional resources towards each child and improve overall welfare of her children (Allendorf, 2007; Menon et al., 2014; Mishra & Sam, 2016; Rangel 2006).

How does a change in inheritance laws that improved women's access to property affect their fertility decisions in the context of son preference in rural India? We answer this question in the backdrop of the reforms made to the 1956 Hindu Succession Act (HSA), the governing law for Hindus on matters of inheritance, that significantly discriminated against women.

¹ Agency is defined as a person's ability to make use of their endowments, exploiting economic opportunities and transforming them into desired outcomes (World Development Report, 2012).

Women under this law were denied the right to inherit ancestral property², usually land, which was reserved for male heirs. Between the late 70s and early 90s, five states in India amended the HSA to allow for equal coparcenary rights to ancestral property for unmarried women, a move that was nationally adopted in 2005. Studies have consistently found that these reforms increased investments in women's education (Roy 2015, Deininger et al. 2013, Bose and Das, 2019). The property rights reforms also increased women's bargaining power, labor force participation and decreased violence against women (Amaral, 2017; Heath and Tan, 2019; Calvi, 2020). However, Anderson & Genicot (2015) find an increase in marital discord that led to more male and female suicides. Bose and Das (2019) look at the intergenerational effect of the reform and find no evidence that the improvements in mother's education due to the HSAA transfer to her children. Our paper contributes to this growing body of literature by analyzing whether these state reforms to the Hindu Succession Act increased women's ability to make fertility choices and we explore various channels of household bargaining power to explain these results.

We investigate the impact of the gender progressive inheritance reforms by focusing on rural India where agriculture is the main occupation and 70% of the female labor force is engaged in this activity (FAO 2011, NSSO 2014). Yet, less than 10% of women have legal titles to land (property), increasing their vulnerability to financial shocks and poverty. In addition to relying on agriculture, rural India is also deeply entrenched in social norms that contribute towards strong son-preference among families. Sons are often considered the status-quo caretakers of their parents and old-age insurance, especially for widows (Anderson and Ray, 2010). These norms lead to sons being valued more and results in women desiring more sons relative to daughters.³ Thus, if rural women had greater agency, they could potentially use it to insure their future by making fertility decisions to achieve their preferred number of sons using the stopping rule. Under the stopping rule hypothesis, women continue to have children till they reach their desired number of sons or stop due to resource constraints. In this paper, we

² Ancestral property is any property that has been passed down generations, but only through the male bloodline. For example, ancestral homes or lands that have passed from the paternal grandfather to the father, to the son are part of ancestral property. We focus on land as our primary measure of property and provide detailed information in Section 2.

³ In Appendix A1, we show that son preference exists in rural India. We find that women desired a higher proportion of sons relative to daughters, and, on average, they had more children when the first born is a girl rather than a boy. The higher fertility stems from the pressure to have a son when the first-born is female.

specifically analyze if the HSA amendment increased women's ability to use the stopping rule to achieve their son preference goals.

We use the third round of the nationally representative National Family Health Survey (NFHS-3) that includes detailed information on women's marital and fertility history, maternal health, and indicators of women's empowerment between the reproductive ages of 15-49. This allows us to observe the gender composition of current children, women's desired number of children (of both sexes), as well as their participation in decision-making and incidences of domestic violence. States that reformed the HSA versus those that did not, provide us with a geographic variation in the amendment's impact. The timing of a woman's marriage forms our cohort variation: women who were married after the HSA reforms are part of the treated cohort and those who were already married at the time of the reform are part of the control group. We exploit these two sources of variation to conduct our estimation using a difference-in-differences (DID) strategy. We test the validity of the DID strategy by conducting a parallel trend analysis using cohort data of women who were unaffected by the reform. Our results indicate similar overall fertility trend between HSAA and non-HSAA states prior to the reform, lending credibility to our conclusions from the DID exercise.

Although there is no statistically significant difference in women's desire for children of both sexes, HSAA women had significantly more children than their counterparts. Since many women in our dataset are in their childbearing years, we account for continuing fertility and find no change in our initial results. We test the stopping-rule hypothesis and find that the increase in fertility stems from son preference. Within the sample of women who had not achieved their desired number of sons, significantly more HSAA women expressed a desire for future children than control women. Among women who had realized their desired number of sons, we find that HSAA women had higher incidences of excess births (that is, when total births exceed desired fertility) to achieve their aim. In fact, our results indicate that the reform resulted in women exhibiting stronger son preference.

Overall, women with greater access to property due to the amended inheritance laws were better able to use the stopping rule by bearing and raising the number of children needed to satisfy their son preference. This suggests that the Amendment increased women's control over the household budget since she would need to be able to ensure that adequate resources would be available to support her children's welfare. We find that the amendment improved

women's say in household decision-making and significantly reduced domestic violence, mainly abuse arising from control issues and emotional violence. Thus, improved property rights strengthened women's power and control over her household and her circumstances, and this greater empowerment was the underlying mechanism that allowed her to make the fertility decisions needed to satisfy son preference.

Our paper contributes to the literature that explores the intersection of women's economic and reproductive empowerment by focusing on women's property rights and their ability to exercise control over their fertility decisions. To our knowledge, our study is the first to empirically document an *increase* in fertility when women's agency is improved through greater property rights. We attribute this finding to the setting of our study, rural India, where women often view their sons as investments in their financial future.

Results from our study complement those in Rosenblum (2013) and Bhalotra et al. (2018). Rosenblum (2013) documents an increase in the mortality of girls post the reform, attributing it to the increased costs of having a daughter. Bhalotra et al. (2018) examine the effect of HSAA on son preference by looking at births after the reform was introduced, irrespective of whether mothers were impacted by the amendment or not. They focus on sex-ratio at first and second birth and explore whether families increased sex-selective abortion post-reform by accessing ultrasound technologies. Our paper differs in a few specific ways. First, we look at the fertility decisions of women directly impacted by the HSAA and whether they were able to use their bargaining power to achieve their son preference goals. Second, since we focus exclusively on rural India, we examine son preference through the lens of the stopping rule hypothesis. Our study provides a comprehensive picture of the fertility decisions of rural women who were directly impacted by the property reforms.

One potential concern with our analysis is the growing dependence on sex-selective abortion to achieve son-preference. While there has been an uptick in the use of these services since 2002 due to the expansion of various policy changes related to the Medical Termination of Pregnancy (MTP) Act, these services continued to be scarce and of poor quality in rural India in the 2000s (Stillman et al., 2014). Additionally, women in rural India are relatively poor and less educated compared to those in urban regions; this, in turn, has limited their access to ultrasound technology and subsequent abortion services (Sebastian, Khan and Sebastian,

2014).⁴ Since our paper focuses on women's fertility prior to 2004-05 (using NFHS-3 data), the possibility of women in rural India using sex-selective abortion to achieve son-preference is trivial in our analysis. We also corroborate this with our dataset and find no evidence of women in our sample using abortions to achieve son preference.

The rest of the paper is organized as follows. In Section 2, we introduce the Hindu Succession Act and its amendments, in Section 3 we explain our conceptual framework and our empirical strategy. We describe our data in Section 4 and discuss our results in Section 5. We conclude in Section 6.

2 Hindu Inheritance Laws in India

Inheritance laws in India are governed by religion, and both state and federal governments share authority to amend these laws. Initially, Hindu inheritance rules followed two doctrines, Dayabhaga and Mitakshara, that differed in the way they classified ancestral (joint) and separate property. Ancestral family property is one that has been inherited via the male bloodline, for example, ancestral homes and land that have passed down from grandfather to father to son and so on. Separate property, on the other hand, is any property that is self-acquired or purchased outside of the generational transferred property.⁵ While the Dayabhaga system treated both separate and ancestral property equally, Mitakshara differentiated between the two types of property. The Mitakshara system reserved the rights to ancestral (joint property) exclusively to sons. Even in case of separate property, fathers had absolute control over the decision to divide the property among his children. This was also the case under the Dayabhaga system, where preference was given to sons even though daughters could inherit this property. Both systems heavily discriminated against women inheriting ancestral property, and in rural areas, that mainly applied to land.

In 1956, the Hindu Succession Act (HSA) was enacted to unite the two existing systems and made inheritance laws consistent among Hindus (this includes Sikhs, Jains and Buddhists). The HSA is the principal inheritance law that guides division of property, especially when a

⁴ Studies show that till the early 2000s rural women were mainly using late term abortions due to poverty, lack of information, and limited access to facilities (Zavier et al., 2011).

⁵ Any assets inherited from sources other than one's father or ancestors are also part of separate property (Agarwal, 1994).

male dies intestate (without a will). The Act has some notable exemptions: it does not apply to the state of Jammu and Kashmir and does not apply to the members of any Scheduled Tribes. The Act prescribed that sons and daughters are entitled to equal share of separate property, however, only sons could claim right to ancestral (joint) property. Thus, gender inequality in inheritance was deeply rooted in the prescriptions in the HSA and inheritance of ancestral property continued to be on the basis of patrilineality.⁶

Beginning in the 1970s, individual states started to amend the HSA to make it more gender equal. Specifically, Kerala (in 1976), Andhra Pradesh (in 1986), Tamil Nadu (in 1989), Maharashtra and Karnataka (in 1994) amended the Act to allow daughters to inherit an equal share of ancestral property as their brothers, with rights by survivorship. An important stipulation of the reform was that only an unmarried daughter at the time of the reform would be eligible to inherit under new law.⁷ The amendment passed by Kerala abolished the system of joint property under the Hindu Family System (Abolition) Act, hence making it slightly different than the amendments passed by the four other states. In 2005, these state amendments were extended to the rest of the country through the Hindu Succession (Amendment) Act (HSAA).

Despite the amendment's intent to make inheritance laws more gender equal, rigid cultural and social norms and legal barriers have rendered the reform largely unsuccessful (Agarwal et al., 2020). Studies show that land inheritance for women post the reform has not improved significantly (Deininger et al, 2013; Roy, 2015; Sircar 2016). Evidence also suggests that women voluntarily gave up their rightful claims to property to maintain access to their parents' home in the event of any unexpected economic, social, or physical vulnerability brought on by marital problems, domestic abuse, or widowhood (Agarwal, 1994). Thus, there is divergence in the de facto and de jure nature of the inheritance laws.

3 Methodology

3.1 Women's Property Rights, Fertility and Son-Preference

⁶ See Agarwal (1994) for more detailed information on the Hindu Succession Act of 1956.

⁷ See Bose and Das (2019) for information on how the concept of *Hindu Undivided Family* helped unmarried daughters benefit from the Amendments to the HSA.

Greater property rights for women enhances female empowerment and improves their economic status via greater bargaining power and reduction in poverty (Agarwal, 1994; Deere & Doss, 2006; Mishra & Sam, 2016). Kabeer (1999) defines women's empowerment as "the expansion of people's ability to make strategic life choices in a context where this ability was previously denied to them". The ability to make these strategic choices depends, among many other things, on women's access to resources. We use this definition to explore how women's access to property rights (resources) can influence her fertility decisions (empowerment).

A well-established phenomenon is that women's property rights improves her decision-making power within the household (Wiig, 2013; Wang, 2014). Most studies find a decrease in women's fertility when their property rights increase due to the improvements in bargaining power (Ali et al., 2015; Chakrabarti, 2018; Harari, 2019). If mothers with greater access to resources view children as normal goods (or luxury goods), they may engage in a quality-quantity trade off by reducing the number of children and increasing resource allocation towards them to improve their overall wellbeing (Becker, 1960; Becker and Lewis, 1973). Instead, if mothers view children as investment goods, then she would prefer more children who could provide her with greater security during old age and widowhood. This is especially true for women in developing countries, who often depend on male members of their families (Cain, 1984; Jensen, 2010; Lambert and Rossi, 2016). However, in patriarchal societies women could suffer from increased backlash in their families while exercising their bargaining power, thus decreasing her ability to assert her fertility choices (Behrman, 2017).

With evidence of widespread son preference in India (Sen, 1990), it is important to analyze whether women, with improved property rights through HSAA, were using their bargaining power to make fertility decision to achieve their *son preference* (that is, their desired number of sons). Son preference stems from economic, religious, and social reasons. Typically, sons remain in the family home and are responsible for looking after their parents in old age. In rural agricultural households, sons are also expected to contribute to household income by working on the family land. For rural widowed women, Anderson and Ray (2010) find that survival in old age increases if women live with their sons. Thus, sons are both a source of

wealth creation and old-age insurance, especially for women. This creates a greater desire for sons and is reflected in son targeting fertility behavior.⁸

Given the incentives for rural women to prefer sons, we study whether the HSAA reform increased treated mothers' ability to use the stopping rule to reach their objective. Under son preferring stopping rules, the current sex composition of children determines the subsequent fertility decision (Arnold et al., 1998), therefore, families continue to have children till they have their desired number of sons (Yamaguchi, 1989) or till they reach the maximum number of children permitted by their resources (Basu and de Jong, 2010). Thus, families who have not realized their son preference would express a desire to have more children, budget permitting. In addition, for any given family size, families with *stronger* son preference will have more sons, resulting in a greater proportion of sons, than those with weaker son preference (Clark, 2000).

We test the stopping rule hypotheses by first focusing on mothers with unrealized son preference to assess if women who were treated by the property rights reform expressed a greater desire to have future children to realize their fertility objective. This would reveal if treated women are better able to envision achieving their son preference than control women. Next, we analyze if HSAA treated women have stronger son preference than their control counterparts. Being able to exercise strong son preference implies that treated women can ensure greater security for themselves. However, strong son preference is only possible if treated women have enough control over household budget decisions to bear and raise the number of children needed to satisfy her fertility goals. Thus, the underlying assumption here is that HSAA mothers have more agency and greater decision-making power over her household resources. We examine this assumption by focusing on women's say in household decisions as well as domestic violence, which typically signifies control over one's life and circumstances.

3.2 Empirical Strategy

We exploit the staggered introduction of the HSAA across four southern states in India to analyze the impact of the property rights reform on fertility decisions. Since the HSAA applied

⁸ Afridi (2010) and Bhalotra et al. (2016) find that households tend to use targeting fertility behavior to achieve son preference. There is greater pressure to have a son when the first-born child is female. This results in girls having a greater number of siblings than boys.

to unmarried women at the time the reform was introduced in her state, we have two sources of variation to set up a difference-in-differences (DID) strategy. The four reform states (*HSAA state*) provide the first source of variation. Women's year of marriage identifies those who were married from those who were unmarried (at the time of the state reform), provides the second source of variation. We estimate the following equation:

$$Y_{ist} = \alpha + \beta_1(HSAA_{st}) + \Pi X_{ist} + \lambda_s + \delta_t + \varepsilon_{ist} \quad (1)$$

where Y_{ist} measures fertility related outcomes of a woman i from state s married in year t . $HSAA_{st}$ is a dummy variable that equals 1 if a woman belongs to reform state s and was unmarried in the reform year t , and equals 0 if she was not exposed to the reform. X_{ist} is a vector of individual and household characteristics, including caste, presence of older men and women, women's age and educational attainment, husband's age and educational attainment, and total agricultural land holding.⁹ We account for older adults in the household since they may need caregiving, thus, increasing the cost of having children for women of reproductive age. A potential concern in our difference-in-differences analysis could arise from the fact that women in reform and non-reform states (Table 1) are different - women in our treated group marry and have their first child at a later age than women in the control group. These differences could affect their overall fertility. To explain these cross-place and cross-time differences, we use state and time fixed effects which helps account for the baseline differences between the treated and control group. λ_s are state fixed effects and δ_t are year of marriage fixed effects.¹⁰ Finally, ε_{ist} is the error term and all standard errors are clustered at the state-level.

Since a large percentage of women in our dataset were in their childbearing years, we also conduct a separate DID analysis where we account for continuing fertility to provide a more consistent assessment of women's fertility choice relative to her age cohort. This is done by using an age-adjusted z-score measure of women's fertility which calculates the number of standard deviations from the mean number of children borne by women in her age cohort. We estimate the impact of HSAA on normalized fertility by using Equation (1), where Y_{ist} captures

⁹ We include control for education levels since educated individuals on average have fewer children (Kim, 2016).

¹⁰ Since the reform is at the state level, we include state fixed effects. Additionally, NFHS – III does not collect district information, restricting us from using district fixed effects.

age adjusted fertility outcomes of a woman i from state s married in year t , and all other variables remain same.

4 Data

We use the 2005-06 round of the National Family Health Survey (NFHS-3), a nationally representative survey of 109,041 households from 29 states that provides information on demographic and household characteristics, marital and fertility history, family planning and health, with an emphasis on women and children. The *Women's Questionnaire* section has information on a woman's year of marriage which allows us to identify treated and control women based on their exposure to reform.^{11,12} Since we analyze the impact of HSAA on fertility outcomes for rural women, we restrict the sample to rural Hindu households and focus on married women aged 15-49 with at least one child.¹³ This reduces our main sample to 22,007 households.

Table 1 presents the descriptive statistics; Column 1 focuses on the full sample, Column 2 on non-reform states, Column 3 on reform states, and Columns 4 and 5 look at treated and control groups in reform states. While women in reform and non-reform states marry around age 16, treated women tend to marry later, at age 17.14, relative to control women who marry at age 15.80. Within reform states, treated women with 4.91 years of schooling are more educated than their control counterparts who have 2.58 years of schooling. This pattern also holds for their husbands.

In terms of fertility, reform women desired slightly fewer children, of both sexes, than non-reform women, and similarly, treated women desired less children than control women.

¹¹ The states in our treatment group are Andhra Pradesh, Karnataka, Maharashtra, and Tamil Nadu. With Kerala's reform different than the other early reform states, we omit Kerala to ensure that households in our treatment group experience a similar change in property rights reform.

¹² The states in our control group are Bihar, Chhattisgarh, Gujarat, Haryana, Himachal Pradesh, Jharkhand, Madhya Pradesh, Orissa, Punjab, Rajasthan, Uttaranchal, and Uttar Pradesh. Jammu and Kashmir is not in the sample since it was excluded from the HSA of 1956. West Bengal and Assam followed the *Dayabhaga* system of property rights, which allowed daughters to inherit all types of property, thus making them unsuitable as control groups. In the late 1970s, West Bengal successfully passed a redistributive land reform measure, which likely affected women's land inheritance in the 1970s and 1980s. This measure coincided with the property rights amendment in the Southern states making West Bengal a biased control. Union Territories are also not considered in our sample since they differ politically and administratively from the rest of the states. Finally, we exclude Delhi since we focus on rural India.

¹³ We omit Scheduled Tribe women from our dataset since this group was not subject to the HSA.

Our data indicates that at the time of the survey treated women had fewer children than control women. However, this could be a result of treated women, on average, being younger (26.62 years) than their counterparts (38.84 years) and thus being in their childbearing years. It is important to note that women in reform states were subject to less domestic violence, especially violence stemming from control issues and emotional abuse. This pattern also holds true for treated women who faced less trauma than control women. Finally, reform women tend to have more control over decision-making, but treated women appear to have less say relative to control women.

5 Results

5.1 Impact of HSAA on Women's Fertility

To assess the impact of the HSA reform on women's fertility, in Table 2A, we focus on the total number of children, and the number of sons and daughters born to women. In Column 1, we use the basic set of controls, which include age at marriage, year of marriage fixed effects, and state fixed effects, and find that women exposed to the reform had on average 0.8 more children than control women. This is significant at the 1% level. Column 2 increases the set of controls to include caste, women's educational attainment, and the presence of older men and women. In Column 3, we add further controls for her husband's age and education, as well as the household's agricultural land holding and continue to find a statistically significant impact on the total number of children. Focusing on the sex of children, our results show that treated women had 0.3 more sons and 0.2 more daughters than control women. To establish the validity of these results we conduct a parallel trend analysis in Appendix A3, which confirms that these observed differences in women's outcome can be attributed to the HSAA.

In rural India, where land accounts for approximately 73% of total value of assets (NSSO, 2014), the property rights reform predominantly affected women born in households with agricultural property. Since we do not have information on women's natal landholding, we try to account for it using data from her marital household. In Panel B, we focus on women in households with agricultural property and find that women who were potentially impacted by the reform chose to have more children, both sons and daughters, than their counterparts. This increase in fertility may be explained by mothers in landed households valuing greater number

of sons since household income would increase with more individuals participating in farming related activities. This would, in turn, ensure greater financial security and chance of survival in old age for women.

Since women in our sample are between the ages of 15 and 49, many women in the younger cohort may still be in their childbearing years. To account for continuing fertility, we standardize women's fertility, and Column 4 presents the results of this analysis. We find that even accounting for a woman's age, the above trend continues to hold. Treated women had 0.3 standard deviation more children; specifically, the number of sons increased by 0.24 standard deviations and the number of daughters increased by approximately 0.13 standard deviations. Finally, to accurately analyze the impact of HSAA without the effects being contaminated by continuing fertility, we focus on individuals who are nearing the end of their childbearing years by restricting our sample to women above the age of 25 in Column 5.¹⁴ Our results continue to show that treated women had more children, of both sexes, than control women.¹⁵

Given the above trend, it is important to examine whether this increase in fertility stems from a greater desire for children by treated women. To assess this, we use the section of the questionnaire that asks women about their desired number of children (of both sexes) at the time of the interview.¹⁶ Table 2B indicates that there is no significant difference between treated and control women; however, in landed households, treated women desired 0.1 more children than control women. In addition, reform mothers desired 0.06 more sons than her counterparts, but there is no significant difference in desired number of daughters. Focusing on women's ideal son proportion, which is the ratio of desired number of sons to her desired number of children, we find no significant difference between treated and control women.

¹⁴ The Woman's Individual section of the NFHS questionnaire asks women the age at which they elected to get sterilized. Using this information, we see that most women choosing this option were below 25 years old and 80% of women who had undergone sterilization were below 30 years. While sterilization may not be a perfect measure, it provides us with a general understanding of the age at which women typically choose to stop their fertility.

¹⁵ A similar exercise is conducted for women above 30 and the above pattern continues to hold. Since this age restriction reduces our sample size, the standard deviation increases and overall significance decreases.

¹⁶ Clark (2000) states that a woman's response to survey questions on desired fertility could be impacted by her current number of children. Thus, the data on desired fertility may not reflect the number of children a woman wanted prior to starting her fertility journey.

5.2 Son Preference and Fertility

Our results in Section 5.1 show that while treated and control women have a similar son preference and desire for children, HSAA treated women have significantly more children of both sexes. We examine the role of son-preference via son-preferring stopping rule to explain these results. We define *son preference* as a woman's desired number of sons and her *preferred fertility level* as her desired number of total children.

In Table 3, we conduct probit analyses to examine whether treated women were exhibiting greater son preference relative to control women. Based on the son-preferring stopping rule, mothers with unrealized son-preference will wish to have future children, resources permitting, even if they have achieved their desired number of children. In Columns 1 and 2, we broadly assess whether the HSAA differentially impacted women's ability to use the stopping rule by focusing on women who had at least two children. Since mothers in our sample desired approximately two children (Table 1), ideally this group of mothers should not desire more children. For this sub-sample, we conduct a probit analysis to examine mother's desire for subsequent children based on the current sex composition of children.^{17, 18} In Column 1, we look at women who had at least one son¹⁹, and find that there is no significant difference in their desire to have another child due to the reform. However, for women with no living sons (Column 2), we find the reform increased the odds of treated women wanting future children. Thus, when women had no sons, significantly more treated women expressed a desire to have future children than control women. Given that there is no difference between treated and control women in terms of their ideal son proportion (Table 2B), and that women in this sub-sample had likely achieved their desired fertility (Table 1), our results suggest that treated women were better able to conceive using the stopping rule to achieve her *son-preference* objective, even if that required her to exceed her *preferred fertility*.

In Columns 3 to 6, we further analyze how HSAA impacted childbearing decisions in the context of son preference. In Columns 3 and 4, we focus on women with unrealized son-

¹⁷ The Women's Questionnaire section of the NFHS-3 asks women if they have a "desire for more children." We use this information to conduct a probit analysis where the outcome variable is a dummy variable that equals 1 if women desired more children and equals 0 if women did not want more children or were sterilized. We include the treatment variables, $HSAA_{st}$, and include the same individual and household level characteristics as in Equation (1). State and time fixed effects are used.

¹⁸ 95% women in our sample wanted approximately 2 children.

¹⁹ Women in our sample, on average, desired one son (Table 1)

preference (desired number of sons $>$ actual number of sons) and in Columns 5 and 6, we focus on women who had realized their son-preference (desired number of sons \leq actual number of sons). In line with our findings in Columns 1 and 2, we find that when women had not reached their son preference (Column 3), the odds of treated women who desired more children was 42% higher than for control women. However, when women had realized their son preference, we find no change in the odds ratio of desiring more children (Column 5). This leads us to ask if reform women were more willing to exceed her *preferred fertility* level (resulting in *excess births*) to achieve their son preference objective. In Column 4, we find that when women had not met their son target, there was no significant difference among treated and control women in terms of *excess births*.²⁰ However, in Column 6, we find that when women had realized their goal, the odds of treated women having *excess births* was 14.9% greater than women not affected by the reform. Thus, the reform increased women's ability to use the son-preferring stopping rule by continuing to have children in order to reach her desired number of sons, and they were more likely to exceed their preferred fertility level to achieve son-preference, an indication that the HSAA gave women more control over household resources to ensure her children's wellbeing.

Finally, the literature on son preferring stopping rules hypothesizes that since families continue to have children until they reach their desired number of sons, the proportion of sons in the family declines as the total family size increases (Clark, 2000). Therefore, there exists a negative relationship between son proportion and family size.²¹ The second hypothesis is that families with stronger son preference will be associated with a higher proportion of sons for any given family size relative to a family with weaker son preference. This implies that the curve depicting the relationship between son proportion and family size for households with strong son-preference will be above that of households with weaker son-preference. Thus, women with stronger son preference will have more children at every given level of son proportion.

²⁰ Since current sex composition of children could influence a woman's current desired fertility (Clark, 2000), treated and control women might inflate their desired number of children when they experience unrealized son-preference. If this occurs, then we would not see any difference in terms of excess births among these groups of women. However, once women realize their son-preference, they may be more willing to reveal their true desired fertility.

²¹ There exists a negative correlation of -0.3 between son proportion and total number of children in our dataset; this is in line with the son preference hypothesis.

To assess if treated women were exhibiting stronger son preference than control women based on the second hypothesis, we divide women into three groups based on their proportion of sons – low (*son proportion* < 0.33), medium ($0.33 \leq \text{son proportion} \leq 0.67$), and high (*son proportion* > 0.67).²² Table 4, Column 1, looks at the full sample, and Column 2 looks at women above age 25 to focus on women who are expected to have completed their fertility. Our findings reveal that treated women exhibit stronger son preference than control women under the stopping rule framework and this holds for the full sample and for women over age 25.²³ Column 1 indicates that treated women were having significantly more children for every bracket of son proportion, and this also holds for landed households. For women above 25, Column 2 indicates the same trend. However, for women in landed households with high son proportion, the results are no longer significant due to the smaller sample size.

Overall, our results show that women treated by the reform were better able to use their bargaining power to realize their son preference via stopping rule. Since our paper focuses on rural women who are poorer, less educated, and have limited access to abortion and ultrasound facilities than urbanized women (Johnston, 2002), they are less likely to use sex-selective abortions to achieve son preference while maintaining smaller families.²⁴ However, if rural mothers had access to ultrasound technology and abortion services, they would be able to make decisions over births based on the sex of the child; thus, sex at the first birth would not be random. In fact, sex-selective abortions would skew the sex-ratio at birth towards sons. To check if treated women in our sample were using sex-selective abortions at a different rate from control women, we focus on sex at first birth. Table 1 shows that for all groups, the sex ratio at first and second birth are not skewed towards boys, and that the ratios are statistically similar for treated and control women. In fact, the sex-ratio at birth for the first child is within the biological range of 1.03-1.07 (Ritchie, 2019). If we assume that the first birth is random but rural women pursue sex selective abortion for later births, then there should be relatively more sons at second birth. However, this is not true for sex at second birth. Thus, the data suggests

²² We define son proportion as the total number of living sons to the total number of living children. The classification of low, medium, and high son-proportion is based on the fact that the lowest quartile for son proportion is 0.3 and the highest quartile is 0.67.

²³ These results continue to hold for women above age 30. However, the results are not significant for landed households with high son proportion.

²⁴ Rural women tend to have second trimester abortions. Despite the impression that second and third trimester abortions are used for sex selection, rural women tend to get late abortions due to lack of resources (Zavier et al., 2012).

that women in our sample were most likely not using abortions to achieve son preference. This aligns with the reality of rural India in the early 2000s when women had limited access to abortion services.²⁵

5.3 Women's Health and Empowerment

Health

In Table 5, we assess whether the reform had an impact on maternal health outcomes. Focusing on age at first birth, we study if treated women were able to delay childbearing to protect herself and her child against risks associated with early pregnancy.²⁶ In Column 1, we find that age at first birth significantly increases for the full sample by 0.24 years and by 0.37 years for women in landed households. Given India's high incidence of women with anemia compared to the rest of the world (2018 Global Nutrition Report), and 50% of reproductive age women experiencing anemia, our second measure looks at women's anemia status to investigate if women's nutritional status improved post reform. In Column 2, we present results from an ordered probit estimation and find an increase in the odds of women having better anemia indicators, and for the sub-sample of women belonging to the landed households the odds increased significantly by 12%.²⁷ These results suggest that HSAA improved women's reproductive and nutritional health, potentially providing her with other long-term benefits through higher work productivity and healthier pregnancies (Horton and Ross, 2003).

Lastly, we look at spacing between births to study if mothers were using their bargaining power to increase the timing between births to have more time to care for her newborn and to allow her body to recover from the birth process. Birth spacing allows us to further explore son preference among treated women. A clear indication of son-preference is if

²⁵ India legalized abortions through the Medical Termination of Pregnancy (MTP) Act which specified that abortion services must be carried out by trained and certified doctors in approved public or private facilities. Given the inability of Primary Health Centers to offer such resources in rural areas, legal abortion was expanded by policy changes in 2002 and 2003 to provide access to safe and timely abortions. However, these services continued to be inadequate and of poor quality (Stillman et al., 2014).

²⁶ The WHO (2020) states that there are higher risks of "eclampsia, puerperal endometritis, and systemic infections" with adolescent pregnancy (10-19 years) than women aged 20 to 24 years, and that babies of adolescent mothers "face higher risks of low birth weight, preterm delivery and severe neonatal conditions." <https://www.who.int/news-room/fact-sheets/detail/adolescent-pregnancy>. Accessed on 06/23/2020.

²⁷ We conduct an ordered probit on anemia levels (severe, moderate, mild, and not anemic). To analyze if the reform had an effect on women's health, we include the interaction term $HSAA_{st}$ which equals one for a woman in state s married in year t . We also use the same individual and household level characteristics as in Equation (1) and employ state and time fixed effects.

birth-spacing decreases when the first child is a girl and increases when that child is a boy. Since one can assume that the sex of the first child is random (Bhalotra and Cochrane, 2010) we concentrate on mothers who have at least two children and focus on timing between births of the first and second child.²⁸ Column 3 looks at mothers whose first child is a girl and we find that the timing between births is not significantly different relative to the control group. In Column 4, we look at mothers whose first child is a boy and again, we find no difference from the control group. Thus, HSAA mothers were not using this channel to exercise son-preference or improve her health post-birth.

Empowerment

In the previous sections we argued that the HSAA reform potentially increased women's empowerment and decision-making ability which allowed her to have a greater say in fertility outcomes, especially their ability to use the *stopping rule* to achieve their son preference. To verify if the property rights reform created these potential empowerment channels, we use a probit analysis to examine the impact of HSAA on decision-making and domestic violence, which typically stem power imbalance among sexes and control issues (Anderson and Umberson, 2001). To conduct this analysis, we develop a decision-making index which equals 1 if women have a final say in any of the following decisions – healthcare, major and minor household purchases, visiting family, and spending of husband's earnings; and equals zero otherwise. Similarly, we create three indices for domestic violence to capture violence stemming from controlling behavior, emotional violence, and physical violence.²⁹ In Table 6, Column 1 we find that the odds are 18% higher for a treated woman having greater decision-making power relative to control women. Columns 2 to 5 find that the reform reduces the probability of women being subject to domestic violence. Treated women have a 7% lower probability of suffering controlling behavior and a 7% lower probability of emotional violence. Column 4 shows they also have a lower likelihood of being victims of physical violence, however, this is not statistically significant. Finally, Column 5 shows that treated and control women have similar views on whether beating by the husband is justified. Thus, while both

²⁸ Studies find that the sex-ratio at first birth lies within the biological range of 1.03-1.07 and that parents do not use sex-selective abortions for first-borns but only for subsequent births (Bhalotra and Cochrane, 2010; Jha et al., 2011; Rosenblum, 2013)

²⁹ Appendix 2 details these indices.

cohorts of women seem to have a similar attitude towards domestic violence, the reform increased women's level of autonomy and gave her greater control over her circumstances.

6 Conclusion

Property rights reforms are a long-standing policy to empower women. In this paper we analyze how an Amendment that improved women's access to property empowered them to make the necessary fertility decisions to realize their son preference goals. Using the NFHS-3 dataset, we exploit the state-cohort variation in women's access to the reform to conduct a difference-in-differences analysis. Although all women in our sample had a similar desire for children, including sons, women who benefitted from the reform had more children of both sexes than those who were excluded from the amendment. To evaluate this phenomenon in the context of rural India, we specifically test whether the reform increased women's ability to use the *stopping rule* to achieve their son-preference objective. Among women with unmet son preference, treated women expressed a greater desire for future children, and among women with realized son preference, reform women had more *excess births*. Thus, HSAA women had relatively more children in order to use the son-preferring stopping rule to reach their goal. We also find evidence of reform women exhibiting *stronger son preference* relative to control women. Finally, we find that the HSAA increased women's autonomy in household decision-making. This indicates that the property rights reform gave women enough control over resource allocation decisions to bear and raise the number of children necessary to realize her desired son preference.

Our findings diverge from the bargaining power and fertility literature which mainly find that women's empowerment is associated with fertility declines. Despite an increase in household decision-making due to the HSAA reform, women tend to have more children to secure their future even though this may negatively affect their health and their children's overall wellbeing. We provide evidence that women were using stopping rules to achieve their son-preference goals which stems from dependence on male members for financial and emotional support. In India, successful implementation of gender progressive inheritance laws is often hindered by social and patriarchal traditions. Thus, while women may have more

bargaining power due to property rights, they could be constrained by social structures, leading to less than optimal outcomes.

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Table 1A
Descriptive Statistics – Independent Variables

	Full Sample	Non-Reform States	Reform States		
			All	Treated	Control
Age at Marriage	16.35 (2.78)	16.30 (2.64)	16.48 (3.08)	17.14 (3.14)	15.80 (2.85)
Household size	5.91 (2.50)	6.30 (2.57)	5.03 (2.07)	5.28 (2.17)	4.77 (1.93)
Number of Older Men	0.38 (0.52)	0.39 (0.53)	0.37 (0.51)	0.30 (0.48)	0.43 (0.53)
Number of Older Women	0.32 (0.50)	0.33 (0.50)	0.30 (0.49)	0.38 (0.53)	0.21 (0.42)
Women's Age	32.40 (8.25)	32.28 (8.31)	32.68 (8.10)	26.62 (4.91)	38.84 (5.72)
Women's Education	2.96 (4.07)	2.61 (3.95)	3.76 (4.21)	4.91 (4.51)	2.58 (3.50)
Husband's education	5.94 (4.92)	6.07 (4.97)	5.62 (4.79)	6.49 (4.94)	4.74 (4.48)
Husband Age	37.89 (9.23)	37.19 (9.15)	39.50 (9.21)	33.10 (6.06)	46.02 (7.04)
Size of Landholding (in hectares)	0.76 (2.68)	0.75 (2.81)	0.78 (2.35)	0.76 (2.65)	0.80 (1.99)
% Female Headed Households	0.09	0.10	0.06	0.07	0.04
<i>Caste (%)</i>					
Scheduled Caste	24.09	25.18	21.6	21.57	21.64
Other Backward Castes	52.95	51.87	55.43	57.42	53.4
Higher Castes	22.96	22.95	22.97	21.02	24.96
N	22007	16116	5891	2906	2985

Source: National Family Health Survey (NFHS-3), India 2005-06. The data is for the 16 major states. NFHS recommended weights are used for calculations.

Table 1B
Descriptive Statistics - Dependent Variables

	Full Sample	Non-Reform States	All	Reform States Treated	Control
	(1)	(2)	(3)	(4)	(5)
Age at Birth of First Child	18.75 (3.12)	18.80 (3.05)	18.64 (3.29)	19.06 (3.20)	18.22 (3.32)
Desired Number of Children	2.49 (0.88)	2.63 (0.90)	2.16 (0.74)	2.04 (0.55)	2.28 (0.88)
Desired Number of Sons	1.28 (0.77)	1.42 (0.77)	0.94 (0.66)	0.82 (0.58)	1.06 (0.72)
Desired Number of Daughters	0.92 (0.56)	0.98 (0.56)	0.80 (0.55)	0.74 (0.50)	0.87 (0.58)
Number of Sons	1.54 (1.06)	1.65 (1.12)	1.29 (0.87)	1.04 (0.76)	1.55 (0.90)
Number of Daughters	1.41 (1.21)	1.50 (1.26)	1.22 (1.07)	0.98 (0.86)	1.46 (1.20)
Number of Children	3.40 (1.91)	3.68 (2.05)	2.76 (1.32)	2.17 (0.92)	3.36 (1.39)
Spacing between 1 st and 2 nd Birth	32.00 (18.39)	31.73 (18.01)	32.61 (19.23)	30.71 (16.03)	34.14 (21.35)
Male First Birth (%)	50.97	51.41	49.95	49.55	50.35
Male Second Birth (%)	45.48	45.27	45.96	41.59	50.42
Women Decision-Making (%)	85.20	84.82	86.06	83.31	88.87
Women Think Beating Justified (%)	54.93	49.30	67.81	67.63	67.99
<i>Domestic Violence (%)</i>					
Control	26.77	31.40	17.16	14.67	20.02
Emotional	17.14	18.50	14.33	12.45	16.49
Physical	42.37	46.14	34.53	34.32	34.77
<i>Anemia (%)</i>					
Severe	1.8	1.58	2.31	2.2	2.42
Moderate	14.95	14.5	15.98	16.66	15.29
Mild	39.21	40.07	37.22	38.12	36.3
Not Anemic	44.04	43.85	44.48	43.02	45.99
Observations	22007	16116	5891	2906	2985

Source: National Family Health Survey (NFHS-3), India 2005-06. The data is for the 16 major states. NFHS recommended weights are used for calculations. Standard deviations are in parentheses.

Table 2A
Difference-in-Differences Estimates of Hindu Succession Amendment Act on Fertility

		<u>Full Sample</u>		<u>Age Adjusted Fertility</u>	<u>≥ 25</u>
	(1)	(2)	(3)	(4)	(5)
<u>Panel A: Full Sample</u>					
Total Number of Children	0.806*** (0.200)	0.824*** (0.204)	0.829*** (0.202)	0.328*** (0.079)	0.579*** (0.169)
Number of boys alive	0.291*** (0.074)	0.299*** (0.075)	0.299*** (0.075)	0.241*** (0.057)	0.182*** (0.067)
Number of girls alive	0.207*** (0.078)	0.211*** (0.077)	0.212*** (0.076)	0.126*** (0.048)	0.130* (0.069)
Observations	22007	22007	22007	22007	17889
<u>Panel B: Land Owning Households</u>					
Total Number of Children	0.579*** (0.161)	0.591*** (0.165)	0.613*** (0.163)	0.279*** (0.071)	0.434*** (0.135)
Number of boys alive	0.195*** (0.072)	0.198*** (0.074)	0.201*** (0.072)	0.162*** (0.058)	0.119*** (0.072)
Number of girls alive	0.188*** (0.056)	0.192*** (0.058)	0.202*** (0.057)	0.170*** (0.052)	0.126*** (0.037)
Observations	5888	5888	5888	5888	4788

Notes: ***, **, * denote significance at 1%, 5% and 10% respectively. Standard errors are clustered at the state level and reported in parentheses. In Panel A, we provide estimation results for the full sample, and Panel B for land owning households. Column (1) uses a basic set of controls including state and year of marriage fixed effects and women's age, Column (2) adds information on caste, women's education, the number of older men and women in the household and whether the household is headed by a female, and in Column (3) we add further controls for age and education of the spouse, and household landholding. Column (4) accounts for continuing fertility and uses the z-scores for age-adjusted fertility. Column (5) reports the results for women who are age 25 and above.

Table 2B
Difference-in-Differences Estimates of Hindu Succession Amendment Act on
Women's Desired Fertility

	Number of Children	Number of Sons	Number of Girls	Son Proportion
	(1)	(2)	(3)	(4)
<u>Panel A: Full Sample</u>				
HSAA reform	0.104 (0.068)	0.064* (0.038)	0.043 (0.030)	-0.005 (0.005)
Observations	22007	22007	22007	21774
<u>Panel B: Land Owning Households</u>				
HSAA Reform	0.133* (0.075)	0.087 (0.048)	0.072* (0.044)	0.002 (0.008)
Observations	5888	5888	5888	5836

Notes: ***, **, * denote significance at 1%, 5% and 10% respectively. Standard errors are clustered at the state level and reported in parentheses. In Panel A, we provide estimation results for the full sample, and Panel B for land owning households. Column 1 reports results for women's desired number of children, Column 2 for desired number of sons and Column 3 for desired number of daughters. Column 4 focuses on women's ideal son proportion, which is calculated as the ratio of their desired number of sons to their desired number of children. Regressions include state and year of marriage fixed effects, the full set of controls described in the empirical strategy, and the weights provided by NFHS.

Table 3
Probit Estimates of Hindu Succession Amendment Act on Son-Preference

	<u>Desire for More Children</u>		<u>Unrealized Son Preference</u>		<u>Realized Son Preference</u>	
	At least 1 son	No living sons	Desire for more children	Excess Births	Desire for more children	Excess Births
	(1)	(2)	(3)	(4)	(5)	(6)
<u>Panel A: Full Sample</u>						
HSAA reform	0.041 (0.071)	0.917*** (0.126)	0.424*** (0.131)	0.085 (0.171)	0.038 (0.068)	0.149* (0.083)
Observations	15532	1623	4406	4275	14666	16572
<u>Panel B: Land Owning Households</u>						
HSAA reform	0.115 (0.356)	1.195** (0.481)	0.415* (0.251)	0.094 (0.162)	0.075 (0.179)	0.108 (0.113)
Observations	3179	316	1087	919	3083	4412

Notes: ***, **, * denote significance at 1%, 5% and 10% respectively. Standard errors are clustered at the state level and reported in parentheses. In Panel A, we provide estimation results for the full sample, and Panel B for land owning households. Regressions include state and year of marriage fixed effects, the full set of controls as described in our empirical strategy, and the weights provided by NFHS.

Table 4
Difference-in-Differences Estimates of Hindu Succession Amendment Act on Family Size: Son Proportion and Stopping Rule

	<u>Full Sample</u>	<u>Age >= 25</u>
	(1)	(2)
<u>Panel A: Full Sample</u>		
Low Son Proportion (≤ 0.33)	0.882*** (0.216)	0.520*** (0.189)
Observations	5290	3867
Medium Son Proportion (0.33-0.67)	0.759*** (0.217)	0.609*** (0.191)
Observations	11365	10073
High Son Proportion (> 0.67)	0.563*** (0.159)	0.309*** (0.129)
Observations	4646	3338
<u>Panel B: Land Owning Households</u>		
Low Son Proportion (≤ 0.33)	0.635*** (0.191)	0.354 (0.221)
Observations	1295	943
Medium Son Proportion (0.33-0.67)	0.576*** (0.172)	0.459*** (0.179)
Observations	3053	2714
High Son Proportion (> 0.67)	0.356* (0.196)	0.156 (0.197)
Observations	1366	985

Notes: ***, **, * denote significance at 1%, 5% and 10% respectively. Standard errors are clustered at the state level and reported in parentheses. In Panel A, we provide estimation results for the full sample, and Panel B for land owning households. The dependent variable is the total number of births. Column (1) presents results for the full sample, and Column (2) for women who are 25 and older. Son proportion is calculated as number of boys alive/total number of births. Low proportion is calculated using the 25th percentile for son-proportion which equals 0.33, medium proportion is between the 25th and 75th percentile for son-proportion and lies between 0.33 and 0.67, and high proportion is above the 75th percentile for son-proportion.

Table 5
Estimates of Hindu Succession Amendment Act on Women's Health

	<u>Age at First Birth</u>	<u>Anemia</u>	<u>Birth Spacing</u>	
			First-Born Son	First-Born Daughter
	(1)	(2)	(3)	(4)
<u>Panel A: Full Sample</u>				
HSAA Reform	0.245*** (0.110)	0.034 (0.026)	-2.061 (1.249)	0.144 (0.864)
Observations	22007	21291	9587	9440
<u>Panel B: Landed Households</u>				
HSAA Reform	0.374*** (0.057)	0.129* (0.069)	-1.375 (1.996)	0.051 (0.794)
Observations	5888	5740	2540	2459

Notes: ***, **, * denote significance at 1%, 5% and 10% respectively. Standard errors are clustered at the state level and reported in parentheses. In Panel A, we provide estimation results for the full sample, and Panel B for land owning households. Regressions include state and year of marriage fixed effects, a full set of controls as listed in our empirical strategy, and the weights provided by the NFHS. Column (1) focuses on women's age at first birth, Column (2) presents results of an ordered probit analysis for anemia levels. Columns (3) and (4) on spacing between births when the first child is a boy and when the first child a girl, respectively.

Table 6
Estimates of Hindu Succession Amendment Act on Women's Empowerment

	Decision Making	Domestic Violence: Control Issues	Emotional Violence	Physical Violence	Beating Justified
	(1)	(2)	(3)	(4)	(5)
<u>Panel A: Full Sample</u>					
HSAA Reform	0.188*** (0.066)	-0.073 (0.062)	-0.068* (0.037)	-0.002 (0.035)	0.028 (0.027)
Observations	21995	16713	16705	16708	22003
<u>Panel B: Landed Households</u>					
HSAA Reform	0.152 (0.108)	-0.241*** (0.083)	0.003 (0.069)	-0.102 (0.065)	0.043 (0.079)
Observations	5876	3999	3989	3994	5883

Notes: ***, **, * denote significance at 1%, 5% and 10% respectively. Standard errors are clustered at the state level and reported in parentheses. In Panel A, we provide estimation results for the full sample, and Panel B for land owning households. Regressions include state and year of marriage fixed effects, a full set of controls as listed in our empirical strategy, and the weights provided by the NFHS. Column (1) focuses on women's decision-making power, Columns (2) - (4) on 3 different measures of domestic violence, and Column (5) on whether women think beating is justified.

Appendix

A1: Existence of Son Preference in India

Several studies (Sen, 1990; Clark 2000, Afridi 2010; Bhalotra et al. 2016) have examined the existence of son preference in India and their findings indicate that son-preference leads to the following outcomes.

We test these two assertions using the NFHS data for rural India and find strong evidence in support of son preference in India. First, we conduct a hypothesis test and find that desired son proportion is significantly greater than 0.50 at all levels of significance (t-test statistic=73.12 and p-value \approx 0). To examine whether the second statement holds true, we conduct a two-sample hypothesis test where

$$H_o = \text{Total Number of Children}_{(\text{First Child Girl})} - \text{Total Number of Children}_{(\text{First Child Boy})} = 0$$

$$H_A = \text{Total Number of Children}_{(\text{First Child Girl})} - \text{Total Number of Children}_{(\text{First Child Boy})} > 0$$

We find that mothers had significantly more children when the first child is a girl than when the first child is a boy. This holds true for all levels of significance (t-test statistic=14.26 and p-value \approx 0).

A2: Indices for Women's Empowerment - Decision Making and Domestic Violence

In Section 5.3, we analyzed the impact of HSAA on women's empowerment by focusing on her ability to make household decision and her exposure to domestic violence. We look at domestic violence because it typically arises from issues of gendered power and control. To assess the impact of the property rights reform on decision-making, we create an index using the Women's Questionnaire section of the NFHS-3 survey, which asks the following:

- final say on own health care
- final say on making large household purchases
- final say on making household purchases for daily needs
- final say on visits to family or relatives
- final say on deciding what to do with money husband earns

The index equals 1 if women have a final say in any of the following decisions and equals zero otherwise.

Similarly, we create an index to capture if women think wife-beating was justified. The index equals 1 if a woman says that beating is justified for any of the following reasons and equals zero otherwise.

- wife beating justified if she goes out without telling him
- wife beating justified if she neglects the children
- wife beating justified if she argues with him
- wife beating justified if she refuses to have sex with him
- wife beating justified if she burns the food

We also use three indices for domestic violence to capture the three major categories of domestic violence - emotional violence, physical violence, and controlling behavior. Based on the extensive questionnaire on domestic violence (Section WD1), the NFHS has created indicator variables to capture if women were subject to emotional violence, major physical violence, and minor physical violence.³⁰ We use the last two measures to create an index for physical violence, which equals 1 if women experienced major or minor physical violence and equals zero otherwise. We use the index for emotional violence created by NFHS in our study.

³⁰ Emotional violence indicator is based on variables D103A – D104, minor physical violence indicator is based on variables D105A- D105D, and major physical violence indicator is based on variables D105E – D105G.

Finally, based on Section WD1, variables D101A – D101F, we create an index for ‘Domestic Violence-Controlling Behavior,’ which equals 1 if women faced any one of the following control issues and equals 0 otherwise.

- Husband jealous if talking to other men
- Husband accuses her of unfaithfulness
- Does not permit her to meet her girl-friends
- Husband tries to limit her contact with family
- Husband insists on knowing where she is
- Husband does not trust her with money

A3: Parallel Trend Analysis

The validity of our difference-in-differences analysis in Section 5.1 relies on the existence of parallel trend in the pre-treatment period: that is, the fertility outcomes of the treatment and control group trend similarly in the absence of the reform. We test this parallel trend assumption by estimating a dynamic model to capture the leads and lags from the reform year by using an equation similar to Equation 1. This model allows us to assess whether in years following the reform the impact stabilizes, accelerates, or reverts to the mean, and whether in the years preceding the reform, there are spillover effects on women not affected by the reform. Using,

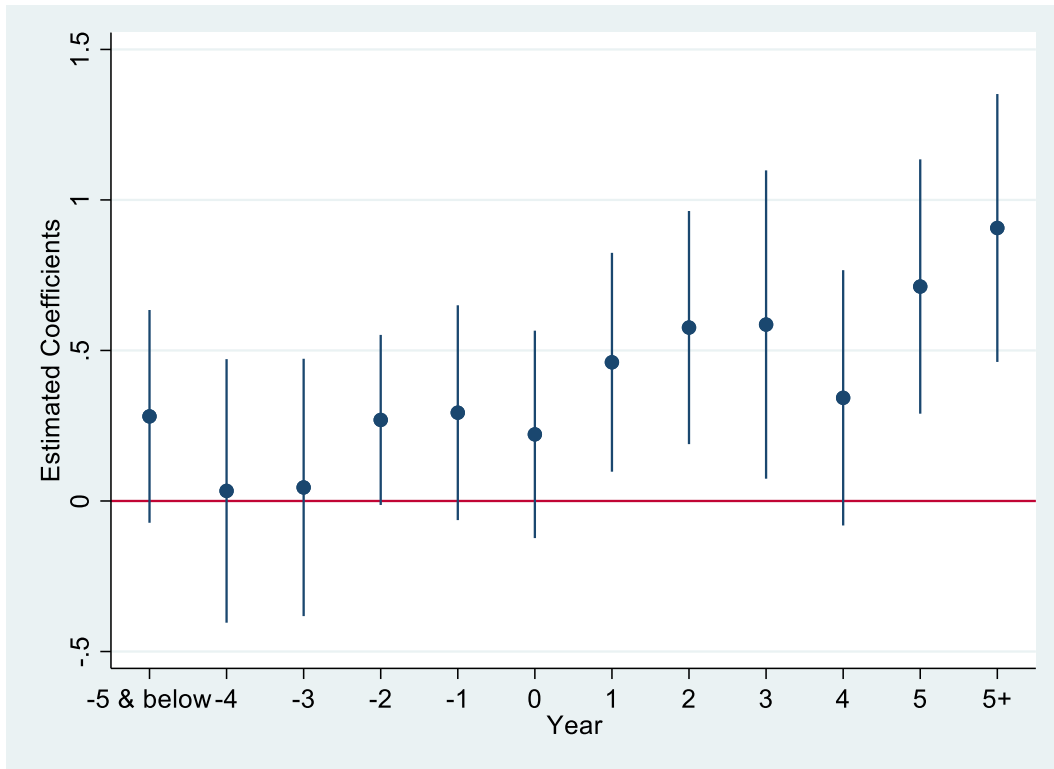
$$Y_{ist} = \alpha + \sum_{\tau < 0} \beta_{\tau} HSAA_{st+\tau} + \sum_{\tau=0}^5 \beta_{\tau} HSAA_{st+\tau} + \lambda_s + \delta_t + \Pi X_{ist} + \varepsilon_{ist} \quad (A1)$$

we focus on years prior to the reform and years post reform by introducing appropriate dummy variables. For the year of the reform ($\tau = 0$), the variable $HSAA_{st+\tau}$ equals 1 if a woman belongs to reform state s and was unmarried in the reform year t and equals 0 if she was not exposed to the reform. For the years prior to reform ($\tau < 0$), $HSAA_{st+\tau}$ equals 1 if a woman belongs to reform state s and was unmarried in the year $t + \tau$, and the value 0 otherwise. Similarly, for years post-reform ($\tau > 0$), $HSAA_{st+\tau}$ equals 1 if the woman belongs to reform state s and was unmarried in the year $t + \tau$ and equals 0 otherwise. The lags and leads (τ) focus on years before and after the reform was introduced and are captured by β_{τ} in the difference-in-difference analysis.

Appendix Figure 1 graphs the estimated coefficients from Equation A1 where X-axis plots values -4 to -1 to represent the number of years prior to the reform and values 1 to 4 correspond to the number of years after the reform. Here, ‘-5 & below’ represents ‘five years and before’ and ‘5+’ represents ‘five years and after’ the introduction of the reform. The coefficients indicate that prior to HSAA, women in the treatment and control group were exhibiting similar fertility choices except for two years before HSAA. Thus, there is some evidence of spillover effects on women who belonged to a similar cohort as treated women. They were likely influenced by reform women who were marrying and having children around the same time as them. Thus, treated women, with greater bargaining power due to the reform, may have had a role model effect on their cohort. A large literature shows that role model effects can create aspirational changes and reduce backlash against women who may be going

against social norms (Beaman et al., 2012; Gardiner et al., 2007). Given that the coefficients are not significant for the years where $\tau < -2$, one can assume that the parallel trend holds, and this gives us assurance that our results capture the causal effect of the property rights reform. In the years following HSAA, we see an accelerating impact of the reform. Thus, we can conclude that as women had greater exposure to the reform, they were better able to pursue their fertility goals.

Figure A1
Dynamic Differences-in-Difference Estimates of HSAA on Women's Fertility



Notes: Dynamic difference-in-differences estimates using Equation A1. Standard errors are clustered at the state level. 95% confidence intervals are shown. Data set is from NFHS-3 from 2005-06.