Property Rights and Gender Bias:
Evidence from Land Reform in West Bengal *

22 October 2013

Sonia Bhalotra
University of Essex

Abhishek Chakravarty
University of Essex

Abstract:

Evidence that formalization of land rights raises productivity and lowers poverty is accumulating. We show that improving land rights may in fact exacerbate gender bias in child health investments among communities with high son preference. We examine the impact on infant survival of sharecropper registration carried out in the Indian state of West Bengal to increase agricultural tenancy security. Previous work has shown sharecropper registration coincided with increased crop yields due to simultaneous agricultural policies introduced by the state government. We therefore examine the impact of sharecropper registration on the difference between girl and boy survival while carefully controlling for crop yield and acreage effects to identify the true impact of land reform. To identify the relevance of differing degrees of son preference we estimate the impact of land reform on the difference in excess girl mortality between Hindu and non-Hindu households, as son preference is markedly greater among the former. We find that children born in districts that had achieved at least a 50% sharecropper registration rate were on average 1.5% points less likely to die in infancy. However in Hindu families, the survival gains are restricted to sons. In Non-Hindu families, sons and daughters experience similar reductions in mortality risk comparable to that exhibited by Hindu boys. This suggests that institutionalized community differences in son preference such as norms governing inheritance and marital exogamy crucially determine who gains from improved land rights.

JEL Classification: I14, I24, J71, O15

Keywords: Land reform, property rights, infant mortality, gender bias, India

---

*We are grateful to Rachel Brule, Giacomo de Giorgi, Patrick Nolen, Stephan Litschig, Pushkar Maitra, Imran Rasul, Sanchari Roy, Alessandro Tarozzi, and participants at the CMPO 2013 Political Economy Workshop at the University of Bristol, the SSDEV 2013 development workshop in Italy, the NEUDC 2013 conference at the Harvard Kennedy School, the University of Essex Economics department internal seminar, and the Annual Conference on Economic Development and Growth at ISI Delhi for their comments. All errors remain our own.

Introduction

Secure property rights are a cornerstone of economic development. There is an extensive body of work specifically regarding the importance of tenancy and ownership security on agricultural land in increasing agricultural productivity, facilitating access to credit, and reducing poverty in India and other developing countries (E.g. see Besley & Burgess, 2000; Besley, 1995; Besley & Ghatak, 2010; Besley et al., 2012; Goldstein & Udry, 2008). However there is comparatively little research on the impact of increased household land security on gender discrimination in child health investments. More rights on agricultural land may lead to diverging returns to health investments by child gender, and thereby to greater gender inequality in adult income and human capital as an unintended consequence of land reform. There is growing evidence that gender differences in health, education, and mortality respond to changes in the gender gap in labour income and rights over property in developing countries (Deininger et al., 2013; Jensen, 2010; Roy, 2012; Almond et al., 2013). Existing work also shows that greater economic development encapsulated by improved property rights and income growth is often not enough to reduce gender discrimination, unless women themselves earn the income or receive their own property rights (Duflo, 2012; Qian, 2008). We address this gap in the literature by examining how sharecropper registration to protect tenancy carried out during the land reform programme Operation Barga initiated in 1978 affected infant mortality by gender in the Indian state of West Bengal.

West Bengal along with Kerala is one of the only states in India to have achieved any notable success in land reform, and the impacts of Operation Barga on agricultural productivity, human capital, poverty, and demographic outcomes have been closely studied as a result (E.g. see Banerjee et al., 2002; Bardhan & Mookherjee, 2011; Bardhan, Mookherjee, & Kumar, 2012; Bardhan et al., 2013; Deininger et al., 2011). India also has institutionally high prevailing son preference in the majority Hindu community due among other things to son-biased inheritance practices, reliance on sons for care in old age, and a Hindu dowry custom that can be cripplingly costly for parents at the time of a daughter's marriage. There is a large body of research documenting significant levels of parental discrimination against girl children in health and educational investments in India, as well as a highly skewed sex ratio in favour of males in parts of the country due to this discrimination and sex selective abortion (Anderson & Ray, 2010; Babu et al., 1993; Barcellos et al., 2013; Behrman, 1988; Bhalotra, 2010; Bhalotra & Cochrane, 2010; Borooah, 2004; Chakravarty, 2010; Jayachandran & Kuziemko, 2011; Murthi et al., 1995;

Oster, 2009; Rose, 2000). We contribute to both these literatures by investigating how improved land rights, which are advocated as inequality-reducing and growth-promoting, may actually exacerbate existing gender inequalities if these are not accounted for during the reform process. The only other paper we are aware of that investigates a similar question is Almond et. al. (2013), which shows that son-biased sex selection in China increased following land reform. Our findings for India are very much in the same vein.

Gender inequality in India is of particular relevance in this context as son preference norms are derived in part from a historical economic dependence on land and male agricultural labour for a majority of the country's population (Bardhan, 1974; Rahman & Rao, 2004). Further, redistributing agricultural land to small farmers and improving their tenancy security have long been considered necessary steps to reduce poverty and inequality in India. The central government passed several pieces of land reform legislation meant to accomplish exactly these goals immediately following national independence in 1947, reflecting the priority they were given in the policy agenda. As rights on agricultural land are such a high priority policy issue in the country, our results inform how future land reform initiatives should be implemented to avoid increasing gender inequality. Our findings are also significant given the role of maternal human capital in bettering welfare outcomes for future generations (E.g. see Black, et al., 2003; Currie & Moretti, 2003; Rosenzweig & Wolpin, 1994).

We combine annual data on district sharecropper registration rates from Banerjee et. al. (2002) with Demographic and Health Survey (DHS) data on fertility histories of individual women from West Bengal, and use a triple difference-in-differences estimation strategy exploiting exogenous variation in the sharecropper registration rate across districts and in child gender to empirically identify how increased sharecropping tenancy security at the district level affected infant mortality. We find that infant mortality declined by 1.5-1.6 percentage points in districts where 50% or more of all sharecroppers were registered. However in Hindu families who traditionally exhibit high son preference, only sons benefit by a 2.7-2.9 percentage point decline in infant mortality risk after high sharecropper registration. Hindu daughters on the other hand exhibit unchanged or even marginally greater infant mortality risk post-registration. In Non-Hindu families where son preference is relatively lower, both sons and daughters have 2.8-3.1 percentage point lower mortality risk in the first month of life following high rates of district sharecropper registration. The results are robust to potential bias from differential mortality trends across districts, impacts of other state policies, and alternative specifications.

Disaggregating the results further, we find that Hindu girls with firstborn older brothers actually face no parental discrimination and experience the same decline in infant mortality risk as Hindu boys. Hindu girls with firstborn older sisters however are 1.8 percentage points *likelier* to die in infancy following high district sharecropper registration than before, suggesting that Hindu girls face greater discrimination when the sex ratio among their siblings is more female. Collectively our findings show that institutional differences in son preference between communities fundamentally determine who gains from improved land rights.

The rest of the paper is organised as follows. Section 2 provides a background discussion of land reform in India, Operation Barga in West Bengal, and prevailing son preference norms. Section 3 presents the proposed mechanisms of impact that motivate the empirical analysis. In Section 4 we discuss the data that we use in our estimations. Section 5 outlines our empirical methodology, and in Section 6 we present our results. Finally, our conclusions and discussion of the results are presented in Section 7.

1. Background

Upon national independence in 1947, the Indian central government began three main types of land reforms to address large historical inequalities in land distribution. These were abolition of intermediaries, new tenancy laws to protect against eviction and extraction of excessive rental crop shares by landlords, and land ceilings to limit the amount of land held by any one household with the aim of vesting and redistributing surplus land to small farmers. Implementation of the reforms was left to individual state governments, and barring intermediary abolition in nearly all states landlords were able to subvert the remaining reform measures by way of pre-emptive tenant evictions and parcelling land to relatives to avoid state confiscation of above-ceiling holdings (Appu, 1996). Variation in state-level reform implementation and legislation over time has been used in previous studies to empirically estimate land reform impacts on poverty, equity, and human capital (Besley and Burgess, 2000; Ghatak & Roy, 2007; Ghosh, 2008).

Reforms in the state of West Bengal were spurred by the results of the 1977 state assembly election. The Left Front coalition headed by the CPM won an absolute majority, which it retained until 2011. This new government promptly created a three-tier system of local governments called *panchayats*, which for the first time would be democratically elected. These tiers in descending order of size of jurisdiction were district, block, and finally the *gram panchayat* that operated at the village level with a jurisdiction of 10-15 hamlets (*mouzas*). Many national development programmes as well as aspects of new state welfare initiatives such as Operation Barga were then decentralised to these *gram panchayats*, who were largely responsible for selecting local eligible beneficiaries and lobbying the upper tiers of the new system for funds (Bardhan & Mookherjee, 2011).

1.1 Operation Barga and the Green Revolution

West Bengal, along with Kerala, is an exceptional state in terms of the effort with which the state government pursued land reform implementation. The Left Front implemented Operation Barga rigorously to consolidate its rural vote base among small farmers, leading to higher sharecropper registration in areas where it faced greater competition in newly instituted local elections (Bardhan & Mookherjee, 2010). Registration gave sharecroppers permanent, hereditary tenancy rights, and limited the share of the crop payable as rent to landlords to 25 percent.[1] By 1981 over 1 million sharecropper tenants were registered due to the reform, and almost 1.5 million by 1990 (Lieten, 1992). Estimates of the fraction of sharecroppers registered in the state via the operation range from 45% (Bardhan & Mookherjee, 2011), to 65% (Banerjee et. al., 2002), to as high as 80% (Lieten, 1992).

As part of Operation Barga, the state also aimed to vest land held by households above the stipulated ceiling of 12.5 acres and redistribute it to the landless and small landowners. Most vesting of land had already taken place by 1978, so the new Left Front government's main role was in redistributing this land. Appu (1996) estimates that 6.72 percent of state operated area was distributed by 1992; several times the national average of 1.34 percent. However this land was redistributed in very small plots (less than half an acre on average in the sample of farms in Bardhan & Mookherjee, 2011), and was likely of low quality for cultivation as landlords would only part with their lowest quality above-ceiling holdings. Hence unlike tenant registration, land redistribution had virtually no impact on agricultural productivity.

Importantly, there were other government rural initiatives launched in the state at the same time that were aimed at boosting agricultural productivity and reducing poverty. Alongside Operation

[1] This share rose to 50 percent if landlords provided all non-labour inputs.

Barga, the state government also distributed minikits containing high yield variety (HYV) seeds, fertilisers, and insecticides to farmers throughout the state via *gram panchayats*.[2] Land reform in combination with minikit distribution led to a substantial increase in agricultural yields in West Bengal over the 1980s, transforming the state into one of the best agricultural performers in the country and leading this period to be called West Bengal's Green Revolution. This period is also associated with significant declines in poverty and growth in rural employment. Banerjee et. al. (2002) attributed the increase in yields to land reform, citing decreased Marshall-Mill sharecropping distortions from increased tenancy security. Bardhan & Mookherjee (2011) however shows that while decreased inefficiencies played a role in increasing yields, it was largely minikit distribution that was responsible for the agricultural growth in this period.[3] Other programmes administered in the 1980s with *gram panchayats* targeting local beneficiaries include the Integrated Rural Development Programme (IRDP) that provided subsidised credit, and employment initiatives such as the Food for Work (FFW) programme, the National Rural Employment Programme (NREP), and the National Rural Employment Guarantee Programme (NREGP).

1.2 Community Differences in Son Preference

The majority Hindu community in India traditionally exhibits greater son preference than other religious communities, as evidenced by conditional sex ratios in the population and empirical evidence on child mortality and education that reflect childhood parental investments (Bhalotra & Zamora, 2009; Bhalotra & Cochrane, 2010; Bhalotra, et al., 2010). The literature in this regard has focused on Hindu-Muslim differences, as other religious communities make up a very small part of the population.[4]

While no definitive explanation has been agreed upon for the differing degrees of son preference between the Indian Hindu and Muslim communities, existing arguments such as the Dyson-Moore hypothesis base them in marital institutions and inheritance practices. In North India including West Bengal, Hindu marriage is exogamous for women, who leave their natal family village to marry into families in villages much further away to avoid marrying a possible

---

[2] The crops for which seeds were distributed were rice, potatoes, oilseeds, and some other vegetables according to Bardhan & Mookherjee (2011).

[3] A companion paper Bardhan, Mookherjee, & Kumar (2012) also shows that tenancy reform crowded in large private investments in irrigation, the growth-inducing effects of which were far greater than those of reduced Marshall-Mill distortions.

[4] We do the same in this section, as Hindu and Muslim children constitute 97.98% of our estimation sample.

relative. The distance from natal family after marriage reduces Hindu women's bargaining power and also their claim to natal family land, which is seen as bringing no reciprocal benefit and lost to the family when daughters inherit. Sons on the other hand care for parents and natal family members in their old age by remaining with the natal family and working the family land, eventually inheriting it upon the death of the family patriarchs. Cultural taboos against Hindu women sharing public spaces with men and working agricultural land also often prevent them from claiming and cultivating land (Agarwal, 2003).

Under the *Mitakshara* Hindu doctrine followed in North India, women in fact have no claim to joint family property, whereas men are entitled at birth to a share of such family property held by their fathers, paternal grandfathers, and paternal great-grandfathers.[5] In South India close-kin marriages are more prevalent for Hindu women, allowing them to inherit a greater share of ancestral land despite prevailing *Mitakshara* doctrine as they reside close enough to participate in cultivation on natal family land after marriage. These marital institutions have been used to explain more favourable female-male sex ratios in South India compared to North India (Chakraborty & Kim, 2010). In West Bengal the *Dayabhaga* Hindu system of inheritance is followed where the concept of joint family property is absent, and all of a Hindu male's property is subject to equal claims by his widow, sons, and daughters upon his intestate death (Lingat, 1973). While this appears more gender-equal than the *Mitakshara* system in theory, in practice Hindu women nearly always relinquish their inheritance claims to their brothers and sons so as to avoid social exclusion, intimidation, and losing the family safety net in times of financial crisis (Agarwal, 2003). Hindu upper caste women also do not physically work agricultural land due to prevailing social norms. Lower caste women have higher work-force participation rates in agriculture as wage labourers, but still female employment rates in agriculture in the state have been persistently low.[6] Hindu women therefore are very much financially dependent on their male kin, leading them to give up their rights to family land to avoid losing that support.

Muslim communities follow inheritance practices based in the Shariat, which guarantees women at least half as much inheritance as their closest male counterpart inheritors. Consanguineous marriage is also practiced to keep all ancestral property within the family, allowing Muslim

---

[5] Some Indian states have since made reforms to the Hindu Succession Act of 1956 to give women equal inheritance rights to joint family property, but these reforms still explicitly exclude agricultural land from their purview.

[6] In the 1991 Census of India only 11.1 percent of women in West Bengal reported having any form of employment, and only 54.1% of the employed women were cultivators or agricultural labourers. National Sample Survey data also reflects decreasing female rural employment and increased casualisation of female agricultural labour since the late 1980s.

women to remain close to their natal families after marriage and inherit more family property in practice similar to Hindu women in South India.[7] Marital dowry is also less prevalent among Muslims, and abortion, sex selective or otherwise, is strictly forbidden under the Shariat. The effect of these institutions arguably reduces parental neglect of Muslim female children compared to Hindu female children in many parts of the country including West Bengal, despite the fact that the Muslim minority population experience nationally higher levels of poverty than the Hindu majority and Muslim female labour force participation in West Bengal is even lower than that of Hindu women (Nasir & Kalla, 2006; Chakraborty & Chakraborty, 2010).

2. Causal Impacts and Identification

3.1 Mechanisms of Interest

We first discuss the impact of sharecropper registration on infant mortality arising from mechanisms independent from increased productivity of land. Increased land productivity during the 1980s was driven only partially by registration and more so by the accompanying initiatives discussed previously, and make identification of registration impacts challenging. We deal with this econometric challenge by focusing on identification of sharecropper registration effects that are propagated through parental preference structures over child gender and are estimated *conditional* on crop productivity and acreage effects. Parental preference effects are determined largely by the institutional factors discussed in the previous section once the effects of rising productivity are controlled for, and are precisely what we are interested in estimating. It is also worth noting that our analysis focuses on the impacts of district-level sharecropper registration on individual mortality risk, and therefore captures general equilibrium effects of improved sharecropper tenancy security on infant mortality among all households in the district.

Considering tenant sharecropping households first, Operation Barga increased their security on rented land and bargaining power over the share of output paid as rent via actual or the threat of registration. This undoubtedly increased future expected returns to rented land for tenant sharecropper households, even if land productivity is held constant. The increased expected returns generate income and substitution effects between sons and daughters in parental child health investments. The income effect benefits both sons and daughters as there are more resources to go around, thereby reducing infant mortality risk for both. The substitution effect

[7] Bittles (2002) reported that 23% of Muslims in India practiced consanguineous marriages in 1992–1993.

however would lead parents to invest more in their sons at the cost of daughters if sons were perceived to be a "better" investment. We know from consumer theory that whether or not the substitution effect dominates the income effect depends on the parental preference structure over child gender, and specifically on whether girls are considered "close" substitutes for boys. As the increased returns to land are derived largely from sons' labour and provision of old age security, parents are likely to consider daughters poor substitutes for sons from a purely economic standpoint. A male advantage will therefore manifest in infant mortality after registration if the greater economic returns from sons following land reform also yield parents greater utility than the utility they receive from daughters, causing the substitution effect to outweigh the income effect in child health investments. We can ex-ante expect that the substitution effect would be more dominant in Hindu families than in Non-Hindu families based on the community differences in inheritance and dowry practices, and existing literature on Indian gender discrimination in health investments discussed earlier.

For land owning households, sharecropper registration reduced the rent that they could extract from existing tenants or new tenants, abstracting away from land productivity increases. Hence landlordism had lower future profitability, and sons arguably became more important than daughters to keep remaining land holdings in the family and maximise returns from own-cultivation. Hence a decline in expected future landlord income is expected to shift resources towards sons in land owning families, which were mostly Hindu during the reform period.

Sharecropper registration also generated land market transactions and household division rates that potentially affected son-bias. Bardhan et. al. (2013) show that registration increased land purchases by smaller farmers, while households with larger landholdings increased sales of their land as landlordism became less profitable. In both sets of households division rates declined as a result of sharecropper registration conditional on family size, potentially reflecting increased joint cultivation of family holdings that were converging in size as land inequality declined. Increased land holdings for previously smaller farmers potentially increase son-bias as sons would keep the land within the natal family via inheritance, and bring in more land as dowry at marriage in Hindu families. Hindu daughters conversely potentially meant land being lost to the natal family if it was given to their grooms as dowry or had to be sold to cover marriage expenses. The selling and exchanging of land for marriage expenses and dowry of Hindu daughters formed a significant part of the land market transactions brought to life by Operation Barga, presumably increasing son preference (Gupta, 1993; Kodoth, 2005). This is more likely to be true for Hindu families than in Non-Hindu families where dowry was much less prevalent. The income effect from larger holdings however could have benefited daughters as well in all communities. Smaller holdings for families with previously bigger plots of land would also make sons more important to prevent further reductions in holdings and work the remaining land, while income from land sales could benefit both sons and daughters.

Another causal channel of sharecropper registration on son preference is through changes in joint family size that create competition and free-riding on family land. This is particularly true if sharecropper registration reduced infant mortality, increasing the number of surviving offspring in the joint family. Bardhan et. al. (2013) show that during 1967-2004 family size did increase by an average of 1.3 members per year, leading to high rates of subdivision of households. Mortality declines resulting from registration could have played a role in this, and individual reductions in maternal fertility in response to lower risk of offspring death were unlikely to have compensated for growing joint family size through new marriages and births. The increased out-migration from joint families and greater competition on land would serve to reinforce son preference to keep plots from being lost to other male relatives. A male survival bias would also be generated if new nuclear households had fewer children due to having less land and more surviving offspring, and practiced gender-differentiated fertility stopping after having a son. Newborn sons would then have fewer siblings to compete with for household resources as compared to newborn daughters, as son-biased parents would likely keep having children to have a son soon after the birth of a daughter. Again we expect such gender-differentiated fertility stopping to be more pronounced in Hindu families with sharper son preference. Migration into districts with high registration likely exacerbated these effects by increasing competition for land.

3.2 Other Programmes and Identification

Bardhan, Mookherjee, and Kumar (2012) find that sharecropper registration crowded in significant private irrigation investments that triggered large productivity spillovers across both tenant and non-tenant farms. Hence Operation Barga potentially had large indirect impacts on small cultivators and wage labourers who were not involved in sharecropping as landlords or tenants. The 1980s period of accelerated rice and foodgrains production in West Bengal also saw disproportionate increases in consumption expenditure by the poor and reduced consumption inequality, due mainly to rising agricultural employment, productivity, and wages (Chattopadhyay, 2005). Reduced groundwater costs from irrigation investments undoubtedly played a role in this period of high agricultural growth and labour-absorptive expansion. As men were the primary wage labourers and small cultivators in the state, their increased incomes from registration-induced irrigation investment could have increased son-bias in child health investments among these households if the substitution effect dominated the income effect of higher labour returns on these investments.

HYV minikit distribution was however the likely primary driver of yield increases and agricultural growth in West Bengal in the 1980s as noted earlier. Subsidised rural credit also played a complementary role. The simultaneity of these different programmes with sharecropper registration therefore makes it difficult to disentangle the impact of registration on son preference driven by increased land productivity.

We therefore use an estimation approach that conditions on the effects of district yield and acreage of rice and cereals, while estimating the impact of sharecropper registration on infant mortality risk.[8] By doing this we control for the combined income and substitution effects of any yield and cultivation increases via HYV minikit distribution, rural credit disbursement, and other programmes on son-bias in parental health investments that determine infant mortality. At the same time, conditioning on yield and acreage effectively conditions on changes to income from increased agricultural output and employment arising from sharecropper registration as well, whether from crowded-in private irrigation investments or increased marginal returns from increased and improved input use on sharecropped land. This allows us to isolate the net effect of sharecropper registration on infant mortality through causal channels which are based in institutional parental preference structures and independent of the effects of increased yields, wages, and cropping intensity.

Differential fertility-stopping by child gender for reasons besides infant mortality declines stemming from sharecropper registration potentially confound our estimates. We therefore condition on the gender-specific effects of the presence of a firstborn son in the sibling birth order on infant mortality risk in our main specification. This is because Indian women, and Hindu women in particular, whose firstborn child is a son have significantly fewer subsequent births as their desire for male children is satisfied early.[9] The sex of the firstborn child is also

[8] Rice is the major crop in West Bengal, accounting for more than 70% of gross cropped area consistently during 1971-1991 according to state government economic reviews.

[9] We verify this in our sample by regressing each woman's total births on a dummy for whether her first child was a son and a vector of other controls including maternal age, educational attainment, religion, and caste. Hindu women

effectively random as has been argued previously (E.g. see Almond et. al., 2013; Bhalotra and Cochrane, 2010) and we will also show and exploit in our analysis. It is therefore an exogenous predictor of future fertility. Hence any son-biased fertility responses to agricultural growth that affect infant mortality are controlled for. We also use child birth order controls to condition further on total fertility effects in some specifications and show that our results do not change qualitatively with their inclusion, despite the potential endogeneity of total fertility in response to registration.

3. **Data and Descriptive Statistics**

Our data on infant mortality and household characteristics comes from the DHS survey carried out in India. The survey uses interviews with women aged 15-49 to collect a wealth of information on their fertility history, their children's health and mortality outcomes, household wealth, and their own health and education. Households are chosen for interview using stratified random sampling, with the probability of selection weighted by the area population as per the last Indian national census. We use the 1992-93 and 1998-99 waves of survey data for West Bengal women and children, and match their district of residence to district level data on sharecropping registration. The sharecropper registration data is the same as in Banerjee et. al. (2002), kindly granted to us by the authors.

Tables 1 and 2 outline some descriptive characteristics of Hindu and Non-Hindu mothers and children respectively, and how they change with increasing district sharecropper registration rate. For both communities we see increased maternal age at childbirth as well as increasing maternal education over time and with increasing registration. There is also evidence of declining fertility and increasing rural population with higher registration. Finally, there is suggestive evidence in both communities of declining infant mortality rates as sharecropper registration rises.

We use district-level data on yields and area under cultivation of rice and all other cereals in West Bengal from the ICRISAT Village Dynamics in South Asia (VDSA) database. Figure 1 plots annual sharecropper registration rate, total rice yield in thousands of tonnes, and the 3-year moving average of this total rice yield for each of the 14 districts in our dataset. There is a visibly high degree of correlation between rice output growth and increasing sharecropper registration

---

are shown to have 0.25 fewer births when their first child is a son, down from an average of 3.45. The results are in the appendix.

after 1980 across all districts reflecting the simultaneous implementation and complementary nature of HYV minikit distribution and land reform.

Figure 2 shows second-degree local polynomial regressions of district level mortality rates on district sharecropper registration rate by child gender for Hindus children in panel 2A and Non-Hindu children in panel 2B. For Hindu children there is a secular decline in male infant mortality rate with increasing registration rate, while the female infant mortality rate appears to stop declining and remain flat once approximately 50% or more of district sharecroppers have been registered. There is by contrast not much gender difference in the decline in the infant mortality rates with increasing registration in range of registration rates where mortality rates are precisely estimated.

4. Empirical Strategy

We exploit the variation in sharecropper registration intensity across districts along with variation in child gender in a triple difference-in-differences strategy to identify the impacts of increased tenancy security on infant mortality. We also estimate specifications with neonatal death (child death in the first month of life) as an alternative outcome, as this particular form of infant mortality more accurately captures maternal health during pregnancy that could potentially respond to district sharecropper registration. We implement the following specification,

$$y_{it} = a + \beta_1\, SCROP50_{it-1} * FEMALE_i + \beta_2\, SCROP25_{it-1} * FEMALE_i + \gamma_1\, SCROP50_{it-1} + \gamma_2\, SCROP25_{it-1} + \lambda X_{it} + d_t + \theta_i + \varepsilon_{it} \qquad (1)$$

where y_{it} is a dummy variable taking value 1 if child i born in year t dies aged 0-12 months and 0 otherwise when we are considering infant mortality. In the case of neonatal mortality it takes value 1 if child i dies aged 1 month or less. We define dummy variables $SCROP25_{it-1}$ and $SCROP50_{it-1}$ which take value 1 if sharecropper registration rate in the district where child i resides reaches at least 25% or 50% respectively in the year preceding his birth year, and 0 otherwise. These are our measures of low and high intensity sharecropper registration.[10] It is worth noting that these measures are such that $SCROP25_{it-1}$ is always equal to 1 when $SCROP50_{it-1}$ is equal to 1, so that high intensity sharecropper registration captures a cumulative effect of

[10] We show that the estimates are robust to alternative measures of sharecropper registration intensity in the results section of the paper.

programme intensity on infant mortality. The omitted category of children constitutes those born in districts where registration is less than 25% in the year preceding birth. We define a gender dummy $FEMALE_i$ taking the value 1 if child i is a girl. The β parameters on the female child-registration rate interaction terms will therefore capture any gender-specific impacts of sharecropper registration intensity on infant mortality in West Bengal, over and above overall registration impacts on infant mortality captured in parameter estimates of γ. The three dimensions across which we are taking differences to achieve identification are therefore across district, year, and child gender. The impacts are identified independently of child birth year and district fixed effects captured in dummies d_{it} and θ_i. In more stringent specifications we also include a full set of district-birth year fixed effects to fully control for any within-district time trends that may simultaneously determine sharecropper registration rates and infant mortality risk. The covariate vector X_{it} includes the un-interacted female child indicator and indicators for child birth order, an indicator for having a firstborn brother (*FIRSTSON*) and its interaction with the female dummy variable, indicators for household religion and caste, whether the household is rural, and mother's educational attainment, and finally linear and quadratic terms of the mother's age at which the child is born. ε_{it} is an idiosyncratic error term.

To explicitly control for the effects of minikit distribution, rural credit, and similar initiatives on infant mortality via increased agricultural acreage and yields, we estimate specifications including logs of total district area and quantity produced of rice ($LN\ RICE\ AREA_{t-1}$, $LN\ RICE\ QTY_{t-1}$) and other cereals ($LN\ CER\ AREA_{t-1}$, $LN\ CER\ QTY_{t-1}$) in the year prior to the child's birth as regressors. We also include interaction terms of these district acreage and yield measures with the female child indicator in the controls. In other specifications we include the log of district productivity per 1000 hectares of rice and other cereals ($LN\ RICE\ PR_{t-1}$, $LN\ CER\ PR_{t-1}$) in the year preceding the child's birth and their interactions with the female child dummy as alternative regressors. This is to estimate any impacts of land productivity on son preference in child health investments, which may differ from the effects of total production and area under cultivation.

We additionally show results from a specification that disaggregates sharecropper registration impacts further between girls with firstborn older brothers and those with firstborn older daughters. We do this by introducing additionally interacting the registration intensity-female child interaction terms with the *FIRSTON* indicator. This will show how improved land rights influences gender bias in child health investments when parents' offspring sex ratio is exogenously more or less male.

We estimate (1) using OLS, using the sample of children born in West Bengal districts from the NFHS I and NFHS II surveys for which we have sharecropper registration data. We also carry out separate estimations for Hindu and Non-Hindu children when examining gender-specific mortality to account for the different preference structures over child gender between communities. As there are only 14 districts, we report results with wild cluster-bootstrapped p-values to accurately do inference on parameter estimates.

5. Results

The double difference-in-differences results for infant mortality from estimating (1) on the pooled sample without gender interactions are in Table 5. The estimates in column 1 without the inclusion of child birth order fixed effects show that infant mortality declined by 1.5 percentage points for all children born in districts where sharecropper registration rates reached at least 50% in the year preceding their birth. The effect constitutes 15.15% of the baseline 9.9 percent infant mortality rate in the estimation sample and is significant at the 5% level. There is no impact of registration rates of 25-50%, indicating the programme only reduced infant mortality in districts where it was implemented with high intensity. Female children have a small, statistically insignificant survival advantage over boys during infancy in the pooled sample. Children born to mothers with at least a complete primary education have infant mortality risk 1.8 percentage points lower than the reference category of children born to mothers with no education; an effect significant at the 10% level. For children born to mothers with a complete secondary education, the reduction in infant mortality risk is even larger at 4.2 percentage points and highly significant at the 1% level. The remaining regressors have no statistically significant impacts on infant mortality risk.

The inclusion of birth order fixed effects in column 2 does not materially change the size and significance of the registration impact estimates or the estimated coefficients on the standard regressors, lending confidence that endogenous fertility responses are not driving the results. Column 3 includes the district log-productivity measures of rice and other cereals in the year preceding the child's birth. The coefficient estimate on the high-intensity registration indicator increases marginally to 1.6 percentage points despite the smaller sample size, and is still significant at the 5% level. Increasing land productivity per unit cultivated area induced by sharecropper registration and the other agricultural initiatives undertaken during this period therefore do not appear to play a part in the causal mechanism between sharecropper registration and infant mortality. Column 4 includes district log-area and log-total yield of rice and cereals in the year preceding the child's birth instead of the productivity measures in column 3. The estimated beneficial impact of high intensity sharecropper registration on infant mortality risk remains nearly identical at 1.5 percentage points and significant at the 5% level. The estimated impacts of high-intensity registration in columns 3 and 4 constitute 15.6-16.2% of the 9.6 percent infant mortality rate in the smaller sample. It is worth noting that an incremental increase in area under rice cultivation has a strongly significant, harmful impact on infant mortality risk. A similarly harmful impact of total cereal output is also present, but much smaller and marginally significant at the 10% level.

Columns 5-8 estimate the same specifications as in columns 1-4, but with neonatal mortality as the outcome variable. The results show significant declines in neonatal mortality risk following high-intensity district sharecropper registration of 1.1-1.2 percentage points across all four specifications, very similar to the impact estimates found for infant mortality. This effect is 16.2-17.9% of the baseline 6.7-6.8 percent neonatal mortality rate in the estimation samples. Sharecropper registration therefore appears to have had a significant beneficial impact on maternal health during pregnancy as well as child health investments during infancy. There is a consistent female advantage in neonatal survival of 0.9-1.0 percentage points across the specifications that is marginally significant at the 10% level, reflecting the well-known greater relative health fragility of newborn boys. There appear to be no significant effects of district rice and cereal output or acreage on neonatal mortality risk, while the estimated impacts of the remaining regressors are qualitatively the same as those found for infant mortality risk.

In Table 6 we present results for the sample of Hindu children, and include the female child interaction terms to capture the gender specific mortality effects of sharecropper registration via triple difference-in-differences. In column 1 we see that high-intensity sharecropper registration in the year before birth reduces infant mortality risk by 2.7 percentage points for Hindu boys; an effect significant at the 10% level. However the interaction term of high-intensity registration with the female child indicator shows that Hindu girls receive no such health benefit from higher registration. The coefficient reveals a 3.2 percentage point higher risk of infant death for girls than boys in high registration districts, cancelling out the beneficial impact of higher registration for boys. This differential effect for girls is significant at the 5% level. It therefore appears that Hindu families invest more in their infant sons' health than their daughters' at high levels of district sharecropper registration. Column 2 includes the district land productivity for rice and cereals and their interactions with the female child indicator. The results do not change qualitatively, with boys experiencing a 2.9 percentage point decline in infant mortality risk following high-intensity registration. Girls conversely have a 3.3 percentage point greater risk of infant death than boys following high registration, receiving practically no benefit from greater district level tenancy security. Both effects however have marginal statistical significance at the 10% level. There is also a harmful impact on both boys' and girls' infant survival of increased cereals productivity per unit area that is significant at the 5% level. In column 3 we replace the productivity measures and their gender interactions with the area and quantity measures and their corresponding interactions with the female child indicator. The beneficial high-intensity registration impact on male infant mortality remains identical to that in column 2, but becomes statistically significant at the 5% level. Girls continue to receive no benefit from high-intensity registration, having a marginally significant 3.4 percentage point greater infant mortality risk than boys following exposure. There continues to be a significantly harmful effect of increased rice acreage on male and female infant survival as in the pooled sample in Table 3. There is also a beneficial effect of cereal acreage on Hindu male infant survival that is significant at the 5% level, but Hindu girls receive no such survival benefit as revealed by the interaction term with the female child indicator.

In columns 4, 5, and 6 we repeat the specifications from columns 1, 2, and 3 with neonatal mortality as the outcome variable. The estimates in all three columns show no impact on male neonatal mortality risk of low or high-intensity registration. There is however an increase in female neonatal mortality risk following high-intensity registration in all three columns that is significant at the 10% level. In column 4 the coefficient estimate on the high-registration-female child interaction term shows girls have a 2.5 percentage point higher risk of neonatal death after exposure. In columns 5 and 6 the estimated increases in female neonatal mortality risk following high registration are 2.8 and 2.7 percentage points respectively. Given that girls have a biological survival advantage over boys as newborns, this increase in neonatal mortality risk points strongly towards parental health discrimination towards daughters in Hindu families following high levels of district sharecropper registration. The greater female neonatal death risk cannot be explained by better maternal health during pregnancy, as the latter should instead lead to lower neonatal death risk for all children with a potentially greater gain for sons. The harmful impact of rice acreage found for infant mortality risk is not present for neonatal mortality risk in column 6, and the corresponding impacts found for cereal acreage persist but are smaller and less statistically significant.

In Table 7 we re-estimate the specifications from Table 4 for the sample of Non-Hindu children. In columns 1-3 we find no statistically significant impacts on infant mortality of sharecropper registration for boys or girls. There is a harmful impact of increased rice acreage on infant survival in column 3 as in previous results, but this effect is nearly twice as large for boys than girls. In columns 4-6 however, we find large declines in neonatal mortality risk following high-intensity registration of 2.8-3.1 percentage points. The estimates are significant at the 10% level in columns 4 and 6, and more strongly significant at the 5% level in column 5. Furthermore, the gains in neonatal survival appear to be the same for boys and girls with the high registration-female child indicator indicating no statistically significant difference for the impact on female children. This pattern of results suggests that maternal health during pregnancy improved among minority communities as a result of greater property rights security at the district level from sharecropper registration, leading to better newborn health. There is no discernible evidence of any gender discrimination in parental health investments among these communities arising from registration, unlike what we find for Hindu families. There also appear to be no significant impacts of rice and cereal yield or acreage on neonatal mortality risk in columns 4-6.

5.1 Alternative Measures of Registration Intensity

We re-estimate (1) with alternative measures of sharecropper registration intensity to examine the robustness of our results on gender-specific mortality so far. We experiment with using three categories rather than two, and changing the cut-off points for each category of sharecropper registration intensity. The results for infant mortality among Hindu children are in Table 8. In column 1 we introduce a third treatment indicator of children born in districts where registration was at least 75% in the year preceding their birth and its interaction term with the female child indicator. The results remain nearly identical to those in Table 7, with Hindu boys benefiting from 3.1 percentage points lower infant mortality risk if district registration exceeds 50% the year before they are born. Girls however still appear to receive no benefit from this level of registration, having 3.9 percentage points higher infant mortality risk than boys after exposure. Both estimates are significant at the 10% level. The new high intensity treatment category has no additional statistically significant impact on mortality risk for either boys or girls, indicating that our estimates are not driven by effects in the extreme tails of the registration distribution. In column 2 we change the registration rate lower bounds of the lowest and highest treatment categories to 30% and 70%. The results do not change qualitatively for female infant survival, but the impact on boys' survival becomes statistically insignificant. In column 3 we change the category lower bounds to 25%, 40%, and 70%. This specification yields stronger estimates of gender bias. Boys see a 2.1 percentage point reduction in infant mortality risk in districts where at least 40% of sharecroppers were registered the year previous to their birth; an effect significant at the 5% level. Girls however see an estimated 2.0 percentage point *increase* in infant mortality risk after exposure to this level of registration, also significant at the 5% level. In column 4 we change the lower bound of the highest treatment category to 75%, and the results are qualitatively identical to those in column 3.

In Table 9 we show estimates for neonatal mortality among Non-Hindu children using the same variations in registration intensity measures as in Table 8. In column 1 the estimates again are nearly identical to those in Table 7, with boys and girls both experiencing a 3.1 percentage point reduction in neonatal mortality risk in districts where registration rates were at least 50% in the year preceding their birth. The effect is significant at the 10% level, and there are no additional significant effects of the new minimum 75% registration category. In column 2 changing the lowest and highest treatment categories yield results that are qualitatively the same as in column 1. Columns 3 and 4 yield entirely statistically insignificant results, indicating that neonatal mortality among Non-Hindu children does not decline until registration rates exceed 50%.

5.2 Do Firstborn Sons Reduce Discrimination?

We now investigate whether the increased son preference we find in Hindu families exposed to high district sharecropper registration is mitigated when the parents already have a firstborn son. This is plausible as a firstborn son satisfies his parents' desire for old-age security, dowry wealth, labour on land, and keeping land in the natal family at the earliest stage of their fertility cycle. This could reduce bias in health investments against female children that are born afterwards, and indirectly increase the resources available for investment in younger daughters by reducing the number of children parents have in their attempts to have at least one son. To this end we re-estimate (1) with additional interaction terms of the sharecropper registration intensity indicators with the female child and firstborn son dummy variables. All the specifications include the corresponding interaction terms of the firstborn son and female child indicators with the district yield and acreage measures for rice and cereals to simultaneously condition on any confounding effects of increased land productivity, employment, and wages. The results are presented in Table 10.

Column 1 estimates the specification on the whole sample of children, and includes only the interaction terms of registration intensity with the firstborn son indicator. There appears to be no differential effect of registration on infant mortality risk between children that have firstborn older brothers and those that do not. The coefficient estimates on these interaction terms are close to zero and statistically insignificant. In column 2 we introduce the additional interaction terms with the female child indicator. There is now a marginally significant beneficial effect on survival of having firstborn older brothers for girls exposed to high intensity registration of 6.3 percentage points compared to similarly exposed girls with firstborn older sisters. This counterbalances the harmful and statistically significant 5.3 percentage point effect on infant survival of higher registration found for girls with firstborn older sisters. There accordingly does appear to be reduced discrimination against girls born in districts with higher sharecropper registration if their parents already have a firstborn son.

We re-estimate the specifications in columns 1 and 2 on the Hindu and Non-Hindu samples of children respectively to investigate if firstborn sons have the same protective impact on female sibling infant survival across communities after exposure to higher registration. In column 3 we find that in Hindu families firstborn sons have no significant protective or harmful effects on infant survival before disaggregating their impact by sibling gender, as we did for the combined sample in column 1. In column 4 we find that Hindu boys born in districts with higher registration have 5.2 percentage points lower risk of infant mortality. However Hindu girls with firstborn older sisters have a statistically significant 7.0 percentage point greater infant mortality risk than Hindu boys after exposure, indicating that infant mortality among these girls actually *increases* by 1.8 percentage points if they are born after high intensity district registration. Hindu girls with a firstborn older brother have a marginally significant 7.5 percentage point lower infant mortality risk after high registration than Hindu girls without, indicating that they experience practically no such discrimination. Among Non-Hindu children, there is no evidence of similar heterogeneous impacts of registration on infant mortality risk between children with and without a firstborn older brother in columns 5 and 6, regardless of child gender. This shows that girls faced greater discrimination in Hindu families after high registration when they did not have firstborn older brothers that satisfied their parents' desire for sons early in the birth order.

5.3 Gender-Differentiated Fertility Stopping

We now examine whether sharecropper registration led families to practice fertility stopping, and particularly if such stopping was driven by the gender of the last child. We re-estimate (1) with a new binary outcome variable taking the value 1 if the child has a younger sibling and 0 otherwise. The results are shown in Table 11. In column 1 the estimates indicate that high intensity registration reduces the probability of an additional birth by 2.1 percentage points in the whole sample of children; an effect significant at the 5% level. Disaggregating the effect by child gender in column 2, we find that the probability of having another child after exposure to high intensity registration declines by a larger 2.7 percentage points when the last child is a boy. This indicates gender-differentiated fertility stopping is part of the mechanism that leads sons to disproportionately benefit from sharecropper registration, as they are likelier to grow up in smaller families with more household resources available for each child. Introducing the rice and cereal acreage and yield measures and their interaction terms with the female child indicator in column 3 do not change the estimates.

Re-estimating the specifications in columns 1, 2, and 3 separately for Hindu and Non-Hindu children shows that gender-differentiated fertility stopping occurred largely in Hindu families in response to high registration. Column 4 reveals a 2.4 percentage point decline in probability of having another child after exposure to high intensity registration, although it is statistically insignificant. However in column 5 we find that the probability of having another child after exposure to high registration declines by a larger 3.4 percentage points if the last child is a son, and the effect becomes statistically significant at the 10% level. Introducing the acreage and yield terms and their gender interaction terms actually increases the estimated decline in additional fertility to 3.5 percentage points and strengthens the statistical significance to the 5% level in column 6. There are no such corresponding effects in the Non-Hindu sample in columns 7, 8, and 9, with the respective coefficients being close to zero and highly statistically insignificant.

5.4 Pre-Registration Trends in Mortality

To rule out the possibility of our results being driven by differential trends in mortality by child gender across districts rather than sharecropper registration, we test for the existence of trends in infant mortality prior to 1978 when the Left Front came to power in West Bengal. We specifically examine whether female infant mortality was increasing faster than male infant mortality in the state among Hindu children born during 1965-1977. We create a variable *YEAR* measuring the number of years after 1965 a child is born, and interact it with the female child indicator to identify any such linear trend in infant mortality.[11] The results are in Table 12. In columns 1 and 2 we find that there is actually a marginally significant, faster linear decline over time in female infant mortality than male infant mortality in the entire sample of children during this period. This indicates that rather than correlating with existing trends, sharecropper registration actually reversed this female infant survival advantage in the state. Looking at just the Hindu children in columns 3 and 4 however, we find no statistically significant trends in infant mortality for children of either gender over this period. This is still reassuring as it reduces concerns of omitted trends driving the results we find for Hindu families. In columns 5 and 6 we see that it was among Non-Hindu families that the female infant survival advantage was strongly significant and growing over this period, again illustrating their lack of son-preferring behaviour.

5.5 Was Sharecropper Registration Targeted?

Bardhan and Mookherjee (2010) shows that the Left Front carried out sharecropper registration drives most intensively in areas where they faced the most electoral competition. It is therefore unlikely that registration was also targeted to districts with higher Hindu female infant mortality, unless these districts also happened to be those where elections were most tightly contested. To test whether our results are threatened by programme targeting and reverse causality we regress infant mortality outcomes for children born during 1967-1977, which is the initial sample period in our main regressions inclusive of agricultural yield and acreage measures, on district sharecropper registration rates in 1980 and 1981. The estimates indicate whether pre-registration mortality rates, overall and by gender, determine how quickly registration was then carried out upon the initiation of land reform in 1979. The results from these regressions are in Table 13. In column 1 we find no statistically significant correlation between pre-registration infant mortality and registration rates in 1980 or 1981. In column 2 we introduce interaction terms of the registration rates in 1980 and 1981 with the female child indicator, and again find no evidence of correlation between gender-specific mortality before land reform and registration intensity. In columns 3 and 4 we repeat the specifications from columns 1 and 2 for Hindu children, and in columns 5 and 6 we do the same for Non-Hindu children. We find no statistically significant correlations between pre-reform infant mortality and registration intensity in any of these estimations.

[11] Tests for quadratic and higher order trends yield statistically insignificant results.

5.6 Placebo Registration Rates

It is possible our results are being driven by contemporaneous omitted trends in mortality within districts that correlate with sharecropper registration intensity. To check for this we generate a placebo rate of registration that begins in the same year as actual registration and progresses randomly over time in each district. We do this by first assigning a random initial rate of sharecropper registration PL in 1979 such that $PL_{1979} \sim U[0, 0.5]$. Then for each year t between 1980-1983, we allow this placebo sharecropper registration rate to progress such that $PL_t \sim U[PL_{t-1}, 0.75]$. Finally for years beyond 1983, we alter this random rate progression so that $PL_t \sim U[PL_{t-1}, 1]$. This allows the placebo registration rate in each district to mimic the pace of actual sharecropper registration over time. Finally we define indicators for low and high placebo district sharecropper registration in the year preceding children's birth in the same way as we do for actual registration, $PL25_{t-1}$ and $PL50_{t-1}$ respectively for children born in year t, and check for spurious overall and gender-specific effects of these indicators on infant mortality. Estimates from (1) replacing the true registration indicators and their interactions with the female child dummy with their placebo counterparts are shown in Table 14. Neither the placebo indicators nor their interactions with the gender dummy are significant in any of the samples in columns 1-3, which is further supportive evidence for the validity of our findings.

5 Discussion and Conclusions

Our findings show a strong exacerbating effect of increased tenancy security on land on son-bias in parental health investments among Hindu children, indicating that the substitution effects of sharecropper registration outweigh any gender-neutral gains in infant survival. For Non-Hindu children on the other hand, there is a decline in infant mortality for both boys and girls. The gender-neutral income effect therefore seems to dominate in these minority communities where son preference is not as marked. Institutional differences in marital exogamy, female labour force participation, and son preference therefore play a significant role in determining the distribution of benefits by gender.

References

Agarwal, B., 2003. Gender and Land Rights Revisited: Exploring New Prospects via the State, Family, and Market. *Journal of Agrarian Change,* 3(1,2), pp. 184-224.

Almond, D., Li, H. & Zhang, S., 2013. Land Reform and Sex Selection in China. *NBER Working Paper No. 19153.*

Anderson, S. & Ray, D., 2010. Missing Women: Age and Disease. *Review of Economic Studies,* 77(4), pp. 1262-1300.

Appu, P. S., 1996. *Land reforms in India: A survey of policy, legislation, and implementation.* New Delhi: Vikas Publishing House.

Babu, S. C., Thirumaran, S. & Mohanam, T., 1993. Agricultural productivity, seasonality, and gender bias in rural nutrition: Empirical evidence from South India. *Social Science and Medicine,* pp. 1313-1319.

Banerjee, A., Gertler, M. & Ghatak, M., 2002. Empowerment and efficiency: Tenancy reform in West Bengal. *Journal of Political Economy.*

Barcellos, S. H., Carvalho, L. & Lleras-Muney, A., 2013. Child gender and parental investments in India: Are boys and girls treated differently?. *Mimeo.*

Bardhan, P., 1974. On life and death questions. *Economic and Political Weekly.*

Bardhan, P., Luca, M., Mookherjee, D. & Pino, F., 2013. Evolution of land distribution in West Bengal 1967-2004: Role of land reform and demographic changes. *mimeo.*

Bardhan, P. & Mookherjee, D., 2010. Determinants of redistributive politics: An empirical analysis of land reforms in West Bengal, India. *The American Economic Review,* pp. 1572-1600.

Bardhan, P. & Mookherjee, D., 2011. Subsidized farm input programs and agricultural performance: A farm-level analysis of West Bengal's green revolution, 1982-1995. *American Economic Journal: Applied Economics,* pp. 186-214.

Bardhan, P., Mookherjee, D. & Kumar, N., 2012. State-led or market-led green revolution? Role of private irrigation investment vis-a-vis local government programs in West Bengal's farm productivity growth. *Journal of Development Economics,* pp. 222-235.

Behrman, J. R., 1988. Intrahousehold allocation of nutrients in rural India: Are boys favoured? Do households exhibit inequality aversion?. *Oxford Economic Papers,* pp. 32-54.

Besley, T., 1995. Property rights and investment incentives: Theory and evidence from Ghana. *Journal of Political Economy.*

Besley, T. & Burgess, R., 2000. Land reform, poverty reduction, and growth: Evidence from India. *The Quarterly Journal of Economics,* pp. 389-430.

Besley, T. & Ghatak, M., 2010. Property Rights and Economic Development. In: D. Rodrik & M. Rosenzweig, eds. *Handbook of Development Economics.* s.l.:s.n., pp. 4525-4595.

Besley, T., Leight, J., Pande, R. & Rao, V., 2012. The Regulation of Land Markets: Evidence from Tenancy Reform in India. *CEPR Discussion Paper No. 8736.*

Bhalotra, S., 2010. Fatal fluctuations? Cyclicality in infant mortality in India. *Journal of Development Economics,* pp. 7-19.

Bhalotra, S. & Cochrane, T., 2010. Where have all the young girls gone? Identification of sex selection in India. *IZA Discussion Paper No. 5381.*

Bhalotra, S., Valente, C. & van Soest, A., 2010. The Puzzle of Muslim Advantage in Child Survival in India. *Journal of Health Economics,* 29(2), pp. 191-204.

Bhalotra, S. & Zamora, B., 2009. Social Divisions in Education in India. In: A. Sharif & R. Basant, eds. *Handbook of Muslims in India.* Delhi: Oxford University Press.

Bittles, A., 2002. Endogamy, Cosanguinuity, and Community Genetics. *Journal of Genetics,* 81(3).

Black, S., Devereux, P. & Salvanes, K., 2003. Why the apple doesn't fall far: Understanding intergenerational transmission of human capital. *NBER Working Paper No. w10066.*

Borooah, V. K., 2004. Gender bias among children in India in their diet and immunisation against disease. *Social Science and Medicine,* pp. 1719-1731.

Chakraborty, I. & Chakraborty, A., 2010. Female Work Participation and Gender Differential in Earning in West Bengal, India. *Journal of Quantitative Economics,* 8(2).

Chakraborty, T. & Kim, S., 2010. Kinship Institutions and Sex Ratios in India. *Demography,* 47(4), pp. 989-1012.

Chakravarty, A., 2010. Supply shocks and gender bias in child health investments: Evidence from the ICDS programme in India. *The B.E. Journal of Economic Analysis and Policy.*

Chattopadhyay, A. K., 2005. Distributive Impact of Agricultural Growth in West Bengal. *Economic and Political Weekly,* 40(53).

Currie, J. & Moretti, E., 2003. Mother's education and the intergenerational transmission of human capital: Evidence from college openings. *The Quarterly Journal of Economics,* 118(4), pp. 1495-1532.

Dasgupta, B., 1984. Sharecropping in West Bengal: From independence to Operation Barga. *Economic and Political Weekly,* 19(26).

Deininger, K., Goyal, A. & Nagarajan, H., 2013. Women's inheritance rights and intergenerational transmission of resources in India. *Journal of Human Resources,* 48(1), pp. 114-141.

Deininger, K., Jin, S. & Yadav, V., 2011. Long term effects of land reform on human capital accumulation: Evidence from West Bengal. *UNU-WIDER Working Paper No. 2011/82.*

Duflo, E., 2012. Women Empowerment and Economic Development. *Journal of Economic Literature,* 50(4), pp. 1051-1079.

Ghatak, M. & Roy, S., 2007. Land reform and agricultural productivity in India: A review of the Evidence. *Oxford Review of Economic Policy.*

Ghosh, A., 2008. The effect of land reforms on long-term health and well-being in India. *RAND Dissertations (mimeo).*

Goldstein, M. & Udry, C., 2008. The profits of power: Land rights and agricultural investment in Ghana. *Journal of Political Economy.*

Gupta, J., 1993. Land, dowry, labour: women in the changing economy of Midnapur. *Social Scientist,* pp. 74-90.

Jayachandran, S. & Kuziemko, I., 2011. Why do mothers breastfeed girls less than boys? Evidence and implications for child health in India. *The Quarterly Journal of Economics,* pp. 1485-1538.

Jensen, R., 2010. Economic opportunities and gender differences in human capital: Experimental evidence for India. *NBER Working Paper No. w16021.*

Kodoth, P., 2005. Fostering Insecure Livelihoods: Dowry and Female Seclusion in Left Developmental Contexts in West Bengal and Kerala. *Economic and Political Weekly,* 40(25), pp. 2543-2554.

Lieten, G. K., 1992. *Continuity and change in rural West Bengal.* New Delhi: Sage Publications.

Lingat, R., 1973. *The Classical Law of India.* New York: Oxford University Press.

Murthi, M., Guio, A.-C. & Dreze, J., 1995. Mortality, fertility, and gender bias in India: A district-level analysis. *Population and Development Review,* pp. 745-782.

Nasir, R. & Kalla, A., 2006. Kinship System, Fertility, and Son Preference Among the Muslims: A Review. *Anthropologist,* 8(4), pp. 275-281.

Oster, E., 2009. Does increased access increase inequality? Gender and child health investments in India. *Journal of Development Economics,* pp. 62-76.

Qian, N., 2008. Missing women and the price of tea in China: The effect of sex-specific earnings on sex imbalance. *The Quarterly Journal of Economics,* pp. 1251-1285.

Rahman, L. & Rao, V., 2004. The determinants of gender equity in India: Examining Dyson and Moore's thesis with new data. *Population and Development Review,* 30(2), pp. 239-268.

Rose, E., 2000. Gender bias, credit constraints, and time allocation in rural India. *Economic Journal,* pp. 738-758.

Rosenzweig, M. & Wolpin, K., 1994. Are there increasing returns to the intergenerational production of human capital? Maternal schooling and child intellectual achievement. *Journal of Human Resources.*

Roy, S., 2012. Empowering women: Inheritance rights, female education and dowry payments in India. *University of Warwick (mimeo).*

Figure 1: Total Rice Yield and Sharecropper Registration by District

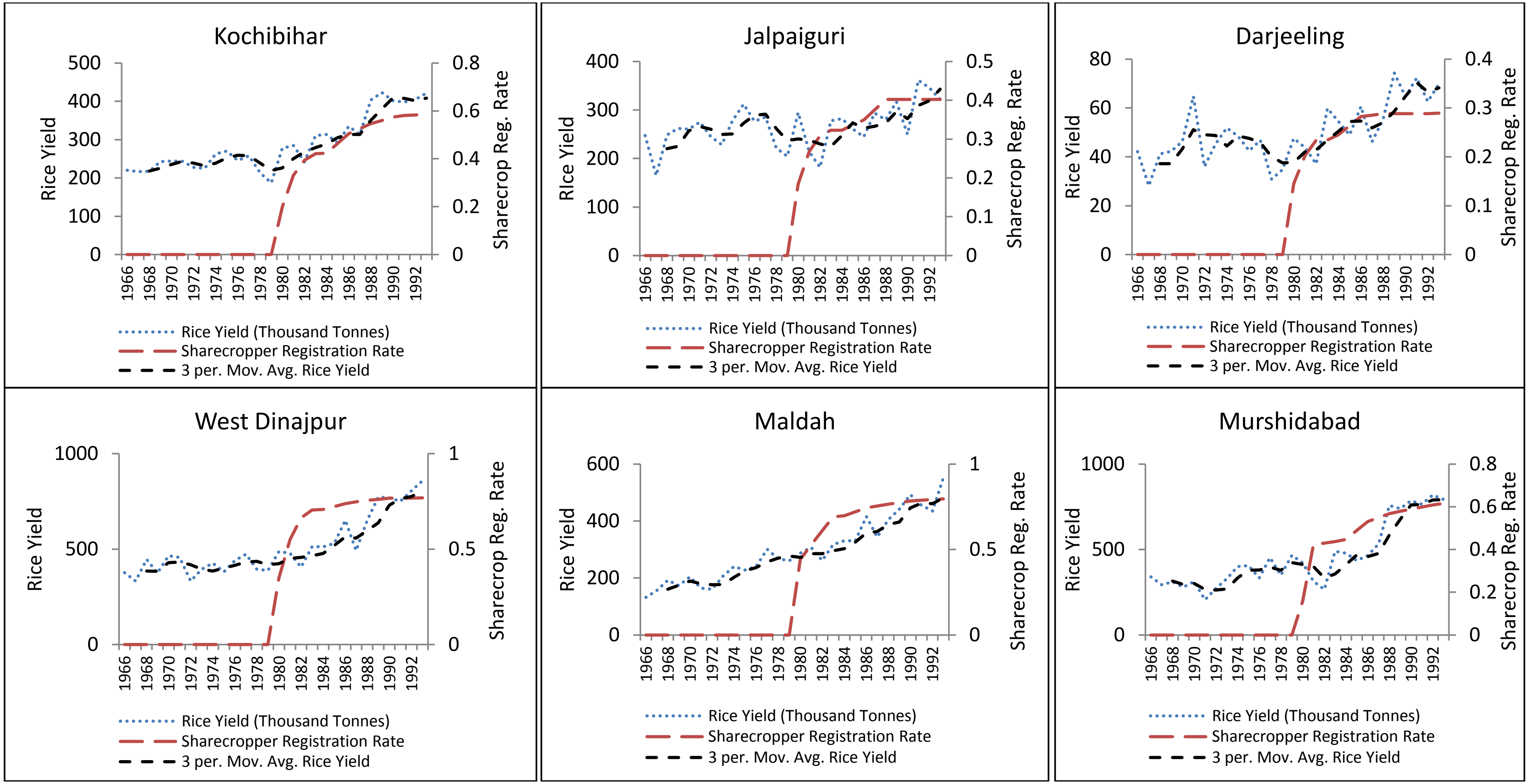


Figure 1 (continued)

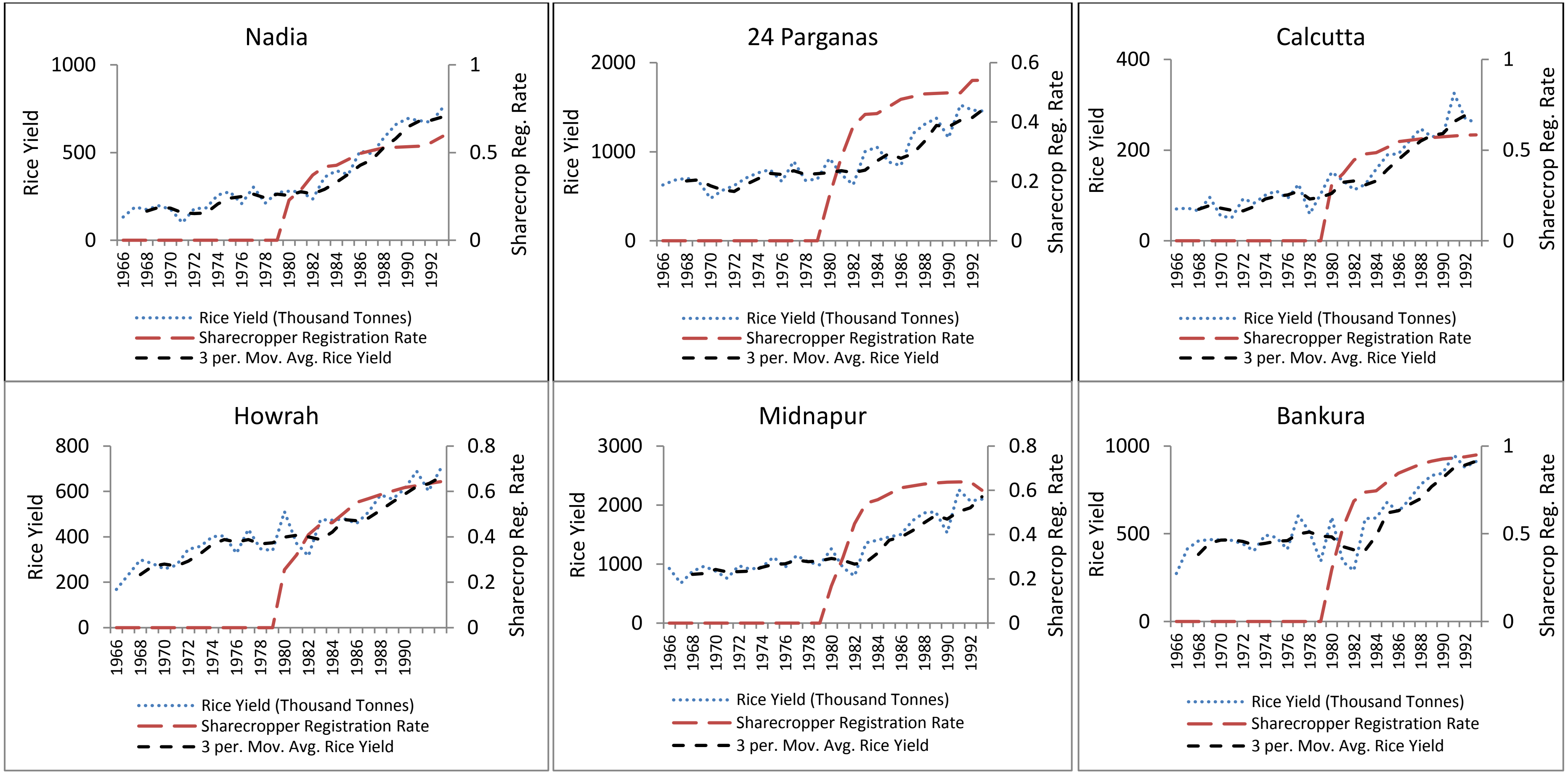
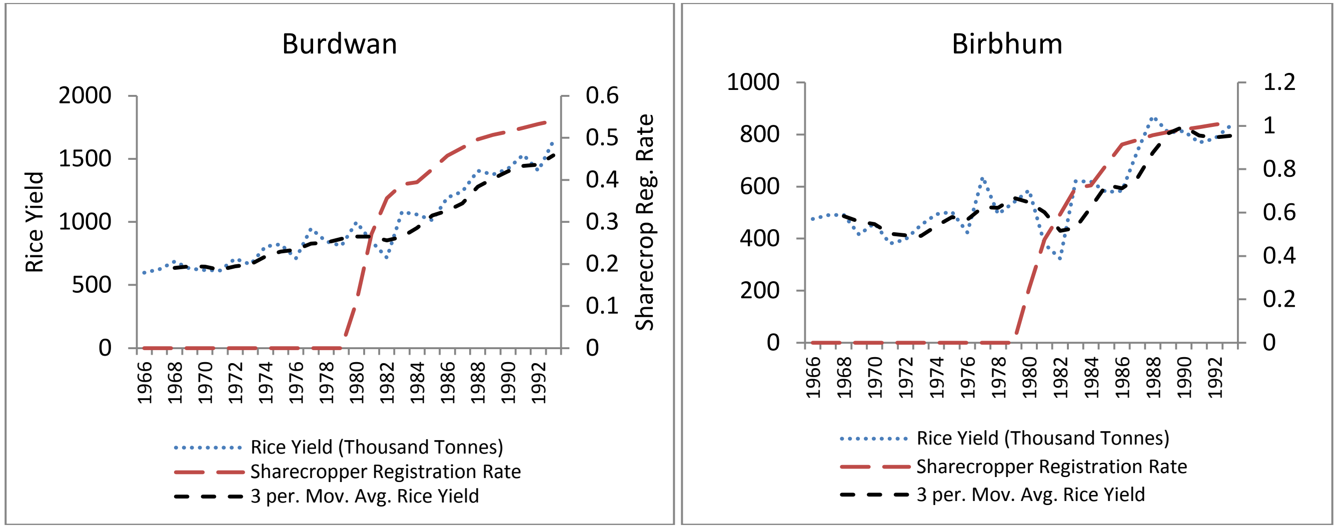


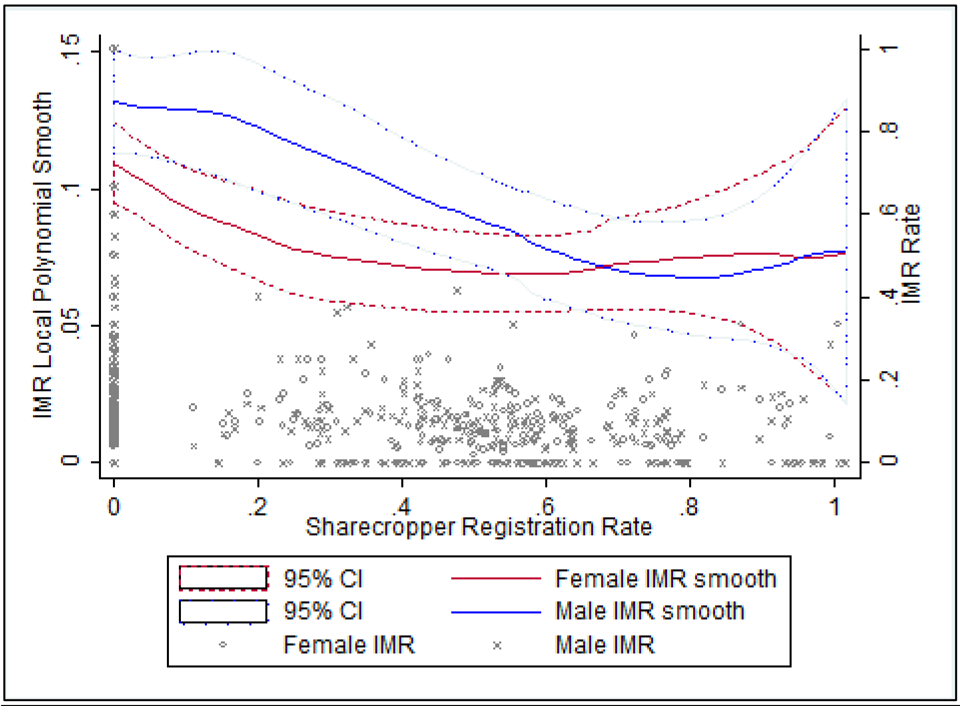
Figure 1 (continued)



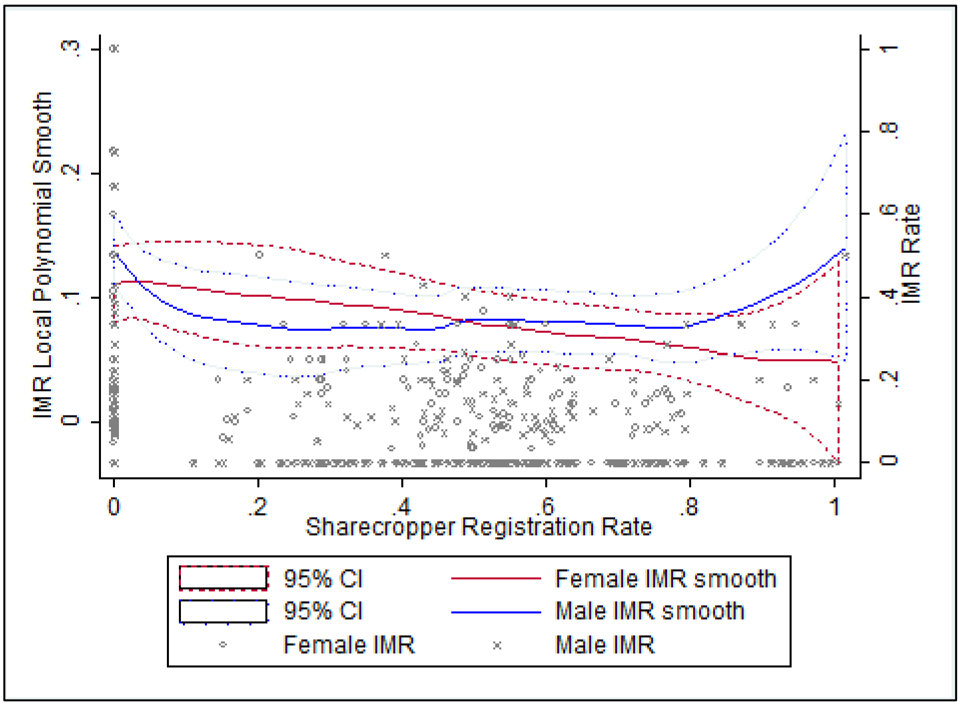
Notes: The figure shows annual rice yield in thousand tonnes and sharecropper registration rate for each of our sample districts in West Bengal over the period 1966-1993. The 3-month moving average of total rice yield is also plotted for each district over this period. The data on rice yields is from the ICRISAT-VDSA dataset, and the data on sharecropper registration is that used in Banerjee, Gertler, and Ghatak (2002).

<u>Figure 2: Sharecropper Registration and Infant Mortality by District</u>

2A: Hindu Children



2B: Non-Hindu Children



<u>Notes:</u> The figures show scatter and smoothed local polynomial plots of district level infant mortality rates on district sharecropper registration rates in West Bengal. Second degree polynomials are used to produce the smoothed estimates shown in the curves. The estimation sample is children born in 1970-1993.

Table 1: Hindu Mother and Child Characteristics by District Sharecropper Registration Rate

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A	*0 ≤ R < 0.25*	*0.25 ≤ R < 0.50*	*0.5 ≤ R ≤ 1*	*(2)-(1)*	*(3)-(2)*	*N(1)*	*N(2)*	*N(3)*
Mother's Education (years)	2.420	2.747	2.626	0.327***	-0.121	5,454	3,095	3,956
Mother's Height (cm)	148.690	149.324	149.339	0.635***	0.014	1,492	1,269	1,908
Mother's Age at Birth (years)	21.269	23.210	23.153	1.941***	-0.057	5,466	3,103	3,973
Birth Order	2.474	2.803	2.699	0.329***	-0.104**	5,466	3,103	3,973
Mother's Total Fertility	5.048	4.052	3.549	-0.996***	-0.502***	5,466	3,103	3,973
Panel B	*0 ≤ R < 0.25*	*0.25 ≤ R < 0.50*	*0.5 ≤ R ≤ 1*	*(2)-(1)*	*(3)-(2)*	*N(1)*	*N(2)*	*N(3)*
Infant Death	0.121	0.088	0.076	-0.033***	-0.012*	5,466	3,103	3,973
Scheduled Caste/Tribe	0.248	0.292	0.349	0.044***	0.057***	5,466	3,103	3,973
Other Backward Caste	0.016	0.026	0.026	0.010***	-0.000	5,466	3,103	3,973
Rural	0.731	0.728	0.766	-0.003	0.038***	5,466	3,103	3,973

Notes: *R* denotes the district sharecropper registration rate in the year preceding that of the child's birth. Panel A shows results from t-tests of continuous variables, and Panel B shows results from proportions tests of binary variables. The sample of children is from cohorts of birth 1956-1993. *** p<0.01, ** p<0.05, * p<0.1

Table 2: Non-Hindu Mother and Child Characteristics by District Sharecropper Registration Rate

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A	*0 ≤ R < 0.25*	*0.25 ≤ R < 0.50*	*0.5 ≤ R ≤ 1*	*(2)-(1)*	*(3)-(2)*	*N(1)*	*N(2)*	*N(3)*
Mother's Education (years)	1.165	1.395	1.594	0.230***	0.199**	2,058	1,574	2,131
Mother's Height (cm)	150.128	150.763	151.020	0.635	0.257	481	583	841
Mother's Age at Birth (years)	21.107	23.306	23.874	2.199***	0.569***	2,074	1,583	2,142
Birth Order	2.709	3.354	3.484	0.645***	0.130*	2,074	1,583	2,142
Mother's Total Fertility	6.503	5.311	4.721	-1.192***	-0.590***	2,074	1,583	2,142
Panel B	*0 ≤ R < 0.25*	*0.25 ≤ R < 0.50*	*0.5 ≤ R ≤ 1*	*(2)-(1)*	*(3)-(2)*	*N(1)*	*N(2)*	*N(3)*
Infant Death	0.125	0.090	0.079	-0.035***	-0.011	2,074	1,583	2,142
Scheduled Caste/Tribe	0.052	0.035	0.060	-0.016**	0.024***	2,074	1,583	2,142
Other Backward Caste	0.004	0.006	0.001	0.002	0.004**	2,074	1,583	2,142
Rural	0.899	0.880	0.932	-0.019*	0.052***	2,074	1,583	2,142

Notes: *R* denotes the district sharecropper registration rate in the year preceding that of the child's birth. Panel A shows results from t-tests of continuous variables, and Panel B shows results from proportions tests of binary variables. The sample of children is from cohorts of birth 1956-1993. *** p<0.01, ** p<0.05, * p<0.1

Table 3 – Mother Characteristics by Sex of First Child

	(1)	(2)	(3)	(4)	(5)
	First Daughter	*First Son*	*(2)-(1)*	*N(1)*	*N(2)*
Education (years)	3.067	3.023	0.044	2,608	2,805
Height (cm)	149.997	149.732	0.265	1,037	1,153
Hindu	0.730	0.731	-0.001	2,619	2,815
Non-Hindu	0.270	0.269	0.001	2,619	2,815
Scheduled Caste/Tribe	0.208	0.212	-0.004	2,619	2,815
Other Backward Caste	0.019	0.020	0.000	2,619	2,815
Rural	0.752	0.766	-0.014	2,619	2,815

Notes: Columns (1) and (2) show means and proportions of mothers' characteristics by the sex of their first child. Column (3) shows differences between columns (1) and (2), which are all statistically insignificant. Columns (4) and (5) report frequencies in columns (1) and (2) respectively.

Table 4 – District Sharecropper Registration Rates by Year

	1979	*1981*	*1983*	*1985*	*1987*	*1989*	*1991*
Kochibihar	19.96	39.42	42.34	50.54	54.65	57.46	58.31
Jalpaiguri	18.44	30.88	32.30	34.95	40.25	40.25	40.25
Darjeeling	14.49	23.40	24.52	28.22	28.84	28.84	28.84
West Dinajpur	34.88	66.41	70.77	73.86	75.63	76.74	76.77
Maldah	44.15	60.93	69.75	74.40	76.57	78.32	79.24
Murshidabad	15.82	43.01	44.69	53.09	56.80	58.89	60.79
Nadia	22.99	37.20	42.79	49.52	52.74	53.35	55.71
24-Parganas	15.22	38.54	42.84	47.67	49.51	49.84	54.05
Howrah	31.05	44.56	48.67	54.63	56.12	57.32	58.22
Hooghly	25.50	40.94	46.26	55.11	58.60	61.62	63.45
Midnapur	16.79	44.89	55.70	61.09	62.84	63.64	63.82
Bankura	29.69	68.67	74.48	84.46	89.66	92.56	93.83
Burdwan	11.00	35.64	39.45	45.74	49.60	51.42	53.31
Birbhum	25.01	59.26	72.49	91.37	95.67	98.30	100.00

Notes: The table shows district sharecropper registration rates by year as reported in Banerjee et. al. (2002).

Table 5 – Infant and Neonatal Mortality and Sharecropper Registration

	Infant Death				Neonatal Death			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
SCROP50 $_{t-1}$	-0.015**	-0.015**	-0.016**	-0.015**	-0.012**	-0.011**	-0.012***	-0.012***
	(0.028)	(0.016)	(0.018)	(0.022)	(0.020)	(0.026)	(0.006)	(0.008)
SCROP25 $_{t-1}$	0.000	0.000	-0.005	-0.003	-0.009	-0.009	-0.010	-0.009
	(0.985)	(0.981)	(0.739)	(0.829)	(0.296)	(0.292)	(0.282)	(0.344)
FEMALE	-0.012	-0.011	-0.011	-0.011	-0.009*	-0.009*	-0.009*	-0.009*
	(0.112)	(0.142)	(0.204)	(0.176)	(0.088)	(0.094)	(0.084)	(0.062)
LN RICE PR $_{t-1}$	-	-	-0.015	-	-	-	-0.003	-
			(0.659)				(0.877)	
LN CER PR $_{t-1}$	-	-	0.020	-	-	-	0.006	-
			(0.116)				(0.382)	
LN RICE AREA $_{t-1}$	-	-	-	0.114***	-	-	-	0.071
				(0.002)				(0.126)
LN RICE QTY $_{t-1}$	-	-	-	-0.020	-	-	-	-0.013
				(0.394)				(0.458)
LN CER AREA $_{t-1}$	-	-	-	-0.007	-	-	-	-0.002
				(0.216)				(0.805)
LN CER QTY $_{t-1}$	-	-	-	0.010*	-	-	-	0.004
				(0.084)				(0.236)
FIRSTSON	0.001	0.002	0.001	0.001	0.005	0.005	0.004	0.004
	(0.883)	(0.795)	(0.865)	(0.887)	(0.348)	(0.330)	(0.416)	(0.434)
PRIM. EDUC.	-0.018*	-0.016*	-0.017**	-0.017**	-0.012***	-0.011**	-0.011**	-0.012**
	(0.054)	(0.052)	(0.024)	(0.036)	(0.008)	(0.020)	(0.012)	(0.012)
SEC. EDUC.	-0.042***	-0.037***	-0.037***	-0.037***	-0.028***	-0.026***	-0.026***	-0.026***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.004)	(0.002)
HIGHER EDUC.	-0.023	-0.010	-0.010	-0.010	-0.021*	-0.017*	-0.015*	-0.016
	(0.120)	(0.388)	(0.382)	(0.342)	(0.082)	(0.096)	(0.068)	(0.104)
AGE BIRTH	-0.023***	-0.024***	-0.025***	-0.025***	-0.020***	-0.020***	-0.021***	-0.021***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
AGE BIRTH ^ 2	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
RURAL	0.007	0.007	0.007	0.007	0.002	0.002	0.002	0.001
	(0.182)	(0.184)	(0.264)	(0.390)	(0.551)	(0.597)	(0.725)	(0.713)
MUSLIM	0.004	0.001	-0.001	-0.001	0.003	0.002	0.000	0.000
	(0.278)	(0.755)	(0.757)	(0.755)	(0.440)	(0.581)	(0.977)	(0.917)
OTHER REL.	-0.028	-0.026	-0.028	-0.028	-0.027**	-0.026**	-0.024*	-0.024*
	(0.170)	(0.176)	(0.176)	(0.170)	(0.026)	(0.036)	(0.054)	(0.058)
SC/ST	0.021***	0.020***	0.018***	0.019***	0.007	0.007	0.006	0.007
	(0.004)	(0.006)	(0.002)	(0.000)	(0.340)	(0.378)	(0.396)	(0.388)
OBC	-0.014	-0.013	-0.014	-0.013	-0.005	-0.005	-0.006	-0.005
	(0.322)	(0.310)	(0.314)	(0.322)	(0.725)	(0.681)	(0.715)	(0.756)
Observations	17,835	17,835	17,154	17,154	17,835	17,835	17,154	17,154
Cohorts	1956-93	1956-93	1967-93	1967-93	1956-93	1956-93	1967-93	1967-93
Birth Order FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mortality Rate	0.099	0.099	0.096	0.096	0.068	0.068	0.067	0.067

Notes: Wild cluster bootstrapped p-values in parentheses. Columns (1)-(4) show results for infant mortality risk, and columns (5)-(8) for neonatal mortality risk. All specifications also include birth year fixed effects. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 6 – Hindu Infant and Neonatal Mortality and Sharecropper Registration

	Infant Death			Neonatal Death		
	(1)	(2)	(3)	(4)	(5)	(6)
*$SCROP50_{t-1}$ * FEMALE*	0.032**	0.033*	0.034*	0.025*	0.028*	0.027*
	(0.016)	(0.054)	(0.090)	(0.094)	(0.096)	(0.090)
*$SCROP25_{t-1}$ * FEMALE*	-0.020	-0.021	-0.012	-0.016	-0.014	-0.006
	(0.250)	(0.132)	(0.244)	(0.246)	(0.224)	(0.649)
$SCROP50_{t-1}$	-0.027*	-0.029*	-0.029**	-0.017	-0.020	-0.020
	(0.068)	(0.052)	(0.048)	(0.204)	(0.118)	(0.140)
$SCROP25_{t-1}$	0.005	-0.001	-0.003	-0.001	-0.003	-0.005
	(0.801)	(0.953)	(0.865)	(0.955)	(0.877)	(0.731)
FEMALE	-0.010	-0.001	-0.084	-0.005	0.013	-0.059*
	(0.352)	(0.989)	(0.150)	(0.517)	(0.623)	(0.052)
*LN RICE PR_{t-1} * FEMALE*	-	0.015	-	-	-0.008	-
		(0.749)			(0.787)	
*LN CER PR_{t-1} * FEMALE*	-	-0.024	-	-	-0.016	-
		(0.192)			(0.382)	
LN RICE PR_{t-1}	-	-0.015	-	-	0.022	-
		(0.739)			(0.496)	
LN CER PR_{t-1}	-	0.037**	-	-	0.017	-
		(0.042)			(0.364)	
*LN RICE $AREA_{t-1}$ * FEMALE*	-	-	-0.017	-	-	-0.007
			(0.476)			(0.669)
*LN RICE QTY_{t-1} * FEMALE*	-	-	-0.016	-	-	-0.025
			(0.571)			(0.230)
*LN CER $AREA_{t-1}$ * FEMALE*	-	-	0.042**	-	-	0.034**
			(0.018)			(0.014)
*LN CER QTY_{t-1} * FEMALE*	-	-	0.002	-	-	0.006*
			(0.691)			(0.068)
LN RICE $AREA_{t-1}$	-	-	0.118***	-	-	0.070
			(0.002)			(0.242)
LN RICE QTY_{t-1}	-	-	-0.006	-	-	0.010
			(0.867)			(0.605)
LN CER $AREA_{t-1}$	-	-	-0.030**	-	-	-0.018*
			(0.018)			(0.100)
LN CER QTY_{t-1}	-	-	0.007	-	-	-0.001
			(0.232)			(0.769)
Observations	12,229	11,753	11,753	12,229	11,753	11,753
Cohorts	1956-93	1967-93	1967-93	1956-93	1967-93	1967-93
Birth Order FE	Yes	Yes	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes	Yes	Yes
Mortality Rate	0.098	0.096	0.096	0.071	0.068	0.068

Notes: Wild cluster bootstrapped p-values in parentheses. Columns (1)-(3) show results for infant mortality risk, and columns (4)-(6) for neonatal mortality risk. All specifications also include birth year fixed effects, the standard covariates, and an interaction term of the firstborn son indicator with the female child indicator.. *** p<0.01, ** p<0.05, * p<0.1

Table 7 – Non-Hindu Infant and Neonatal Mortality and Sharecropper Registration

	Infant Death			Neonatal Death		
	(1)	(2)	(3)	(4)	(5)	(6)
$SCROP50_{t-1} * FEMALE$	0.005	-0.003	-0.006	0.015	0.014	0.012
	(0.897)	(0.941)	(0.809)	(0.368)	(0.232)	(0.158)
$SCROP25_{t-1} * FEMALE$	-0.003	-0.011	-0.004	-0.006	-0.006	0.000
	(0.903)	(0.661)	(0.871)	(0.731)	(0.733)	(0.925)
$SCROP50_{t-1}$	-0.026	-0.021	-0.018	-0.031*	-0.029**	-0.028*
	(0.112)	(0.250)	(0.432)	(0.010)	(0.046)	(0.074)
$SCROP25_{t-1}$	0.014	0.017	0.017	-0.006	-0.007	-0.009
	(0.655)	(0.599)	(0.619)	(0.871)	(0.781)	(0.779)
$FEMALE$	0.011	-0.031	0.066	0.005	-0.002	0.043
	(0.657)	(0.591)	(0.504)	(0.775)	(0.983)	(0.472)
$LN\ RICE\ PR_{t-1} * FEMALE$	-	0.069	-	-	0.010	-
		(0.196)			(0.833)	
$LN\ CER\ PR_{t-1} * FEMALE$	-	-0.011	-	-	-0.004	-
		(0.785)			(0.973)	
$LN\ RICE\ PR_{t-1}$	-	-0.058	-	-	-0.054	-
		(0.496)			(0.400)	
$LN\ CER\ PR_{t-1}$	-	0.001	-	-	-0.005	-
		(0.957)			(0.765)	
$LN\ RICE\ AREA_{t-1} * FEMALE$	-	-	-0.088**	-	-	-0.039
			(0.014)			(0.186)
$LN\ RICE\ QTY_{t-1} * FEMALE$	-	-	0.035	-	-	-0.001
			(0.272)			(0.971)
$LN\ CER\ AREA_{t-1} * FEMALE$	-	-	0.034	-	-	0.023
			(0.190)			(0.346)
$LN\ CER\ QTY_{t-1} * FEMALE$	-	-	0.007	-	-	0.008
			(0.555)			(0.424)
$LN\ RICE\ AREA_{t-1}$	-	-	0.173**	-	-	0.122
			(0.038)			(0.218)
$LN\ RICE\ QTY_{t-1}$	-	-	-0.052	-	-	-0.040
			(0.294)			(0.292)
$LN\ CER\ AREA_{t-1}$	-	-	-0.008	-	-	-0.006
			(0.743)			(0.747)
$LN\ CER\ QTY_{t-1}$	-	-	0.012	-	-	0.005
			(0.440)			(0.735)
Observations	5,606	5,401	5,401	5,606	5,401	5,401
Cohorts	1956-93	1967-93	1967-93	1956-93	1967-93	1967-93
Birth Order FE	Yes	Yes	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes	Yes	Yes
Mortality Rate	0.010	0.096	0.096	0.071	0.068	0.068

Notes: Wild cluster bootstrapped p-values in parentheses. Columns (1)-(3) show results for infant mortality risk, and columns (4)-(6) for neonatal mortality risk. All specifications also include birth year fixed effects, the standard covariates, and an interaction term of the firstborn son indicator with the female child indicator.. *** p<0.01, ** p<0.05, * p<0.1

Table 8 – Hindu Infant Mortality and Alternative Measures of Sharecropper Registration Intensity

	Infant Death						
	(1)		(2)		(3)		(4)
$SCROP75_{t-1}$ * *FEMALE*	-0.027	$SCROP70_{t-1}$ * *FEMALE*	-0.031	$SCROP70_{t-1}$ * *FEMALE*	-0.015	$SCROP75_{t-1}$ * *FEMALE*	-0.015
	(0.533)		(0.372)		(0.561)		(0.651)
$SCROP50_{t-1}$ * *FEMALE*	0.039*	$SCROP50_{t-1}$ * *FEMALE*	0.044*	$SCROP40_{t-1}$ * *FEMALE*	0.041**	$SCROP40_{t-1}$ * *FEMALE*	0.040**
	(0.064)		(0.064)		(0.036)		(0.036)
$SCROP25_{t-1}$ * *FEMALE*	-0.012	$SCROP30_{t-1}$ * *FEMALE*	-0.010	$SCROP25_{t-1}$ * *FEMALE*	-0.027	$SCROP25_{t-1}$ * *FEMALE*	-0.027
	(0.272)		(0.276)		(0.178)		(0.132)
$SCROP75_{t-1}$	-0.000	$SCROP70_{t-1}$	-0.002	$SCROP70_{t-1}$	-0.012	$SCROP75_{t-1}$	-0.007
	(0.983)		(0.905)		(0.390)		(0.725)
$SCROP50_{t-1}$	-0.032*	$SCROP50_{t-1}$	-0.031	$SCROP40_{t-1}$	-0.021**	$SCROP40_{t-1}$	-0.020*
	(0.052)		(0.106)		(0.044)		(0.054)
$SCROP25_{t-1}$	-0.005	$SCROP30_{t-1}$	-0.012	$SCROP25_{t-1}$	0.003	$SCROP25_{t-1}$	0.005
	(0.765)		(0.486)		(0.865)		(0.785)
FEMALE	-0.086	*FEMALE*	-0.090	*FEMALE*	-0.075	*FEMALE*	-0.075
	(0.178)		(0.126)		(0.182)		(0.258)
Observations	11,753		11,753		11,753		11,753
Cohorts	1967-93		1967-93		1967-93		1967-93
Birth Order FE	Yes		Yes		Yes		Yes
District FE	Yes		Yes		Yes		Yes
Mortality Rate	0.096		0.096		0.096		0.096

Notes: Wild cluster bootstrapped p-values in parentheses. All specifications also include birth year fixed effects, the standard covariates, log-acreage and log-production measures for rice and cereals and their interactions with the female child indicator, and an interaction term of the firstborn son indicator with the female child indicator..
*** p<0.01, ** p<0.05, * p<0.1

Table 9 – Non-Hindu Neonatal Mortality and Alternative Measures of Sharecropper Registration Intensity

			Neonatal Death				
	(1)		(2)		(3)		(4)
$SCROP75_{t-1} * FEMALE$	-0.016	$SCROP70_{t-1} * FEMALE$	-0.021	$SCROP70_{t-1} * FEMALE$	-0.011	$SCROP75_{t-1} * FEMALE$	-0.009
	(0.553)		(0.480)		(0.486)		(0.691)
$SCROP50_{t-1} * FEMALE$	0.015	$SCROP50_{t-1} * FEMALE$	0.022	$SCROP40_{t-1} * FEMALE$	-0.007	$SCROP40_{t-1} * FEMALE$	-0.009
	(0.244)		(0.196)		(0.599)		(0.563)
$SCROP25_{t-1} * FEMALE$	0.001	$SCROP30_{t-1} * FEMALE$	-0.004	$SCROP25_{t-1} * FEMALE$	0.013	$SCROP25_{t-1} * FEMALE$	0.013
	(0.969)		(0.803)		(0.611)		(0.637)
$SCROP75_{t-1}$	-0.002	$SCROP70_{t-1}$	-0.005	$SCROP70_{t-1}$	-0.016	$SCROP75_{t-1}$	-0.006
	(0.927)		(0.757)		(0.549)		(0.703)
$SCROP50_{t-1}$	-0.031*	$SCROP50_{t-1}$	-0.031*	$SCROP40_{t-1}$	-0.001	$SCROP40_{t-1}$	0.000
	(0.056)		(0.090)		(0.977)		(0.981)
$SCROP25_{t-1}$	-0.014	$SCROP30_{t-1}$	0.008	$SCROP25_{t-1}$	-0.017	$SCROP25_{t-1}$	-0.013
	(0.687)		(0.681)		(0.587)		(0.699)
FEMALE	0.036	*FEMALE*	0.036	*FEMALE*	0.034	*FEMALE*	0.033
	(0.567)		(0.575)		(0.531)		(0.617)
Observations	5,401		5,401		5,401		5,401
Cohorts	1967-93		1967-93		1967-93		1967-93
Birth Order FE	Yes		Yes		Yes		Yes
District FE	Yes		Yes		Yes		Yes
Mortality Rate	0.068		0.068		0.068		0.068

Notes: Wild cluster bootstrapped p-values in parentheses. All specifications also include birth year fixed effects, the standard covariates, log-acreage and log-production measures for rice and cereals and their interactions with the female child indicator, and an interaction term of the firstborn son indicator with the female child indicator..
*** p<0.01, ** p<0.05, * p<0.1

Table 10 – Infant Mortality, Firstborn Sons, and Sharecropper Registration

	Infant Death					
	All Children		Hindu Children		Non-Hindu Children	
	(1)	(2)	(3)	(4)	(5)	(6)
SCROP50 $_{t-1}$ * *FIRSTSON* * *FEMALE*	-	-0.063*	-	-0.075*	-	-0.037
		(0.086)		(0.062)		(0.392)
SCROP25 $_{t-1}$ * *FIRSTSON* * *FEMALE*	-	0.041	-	0.029	-	0.078
		(0.186)		(0.472)		(0.122)
SCROP50 $_{t-1}$ * *FEMALE*	0.022	0.053**	0.033	0.070**	-0.006	0.015
	(0.170)	(0.018)	(0.132)	(0.028)	(0.787)	(0.687)
SCROP25 $_{t-1}$ * *FEMALE*	-0.007	-0.028	-0.013	-0.028	0.002	-0.039
	(0.581)	(0.268)	(0.398)	(0.270)	(0.975)	(0.264)
SCROP50 $_{t-1}$ * *FIRSTSON*	0.000	0.031	-0.002	0.035	0.001	0.021
	(0.969)	(0.162)	(0.947)	(0.192)	(0.961)	(0.418)
SCROP25 $_{t-1}$ * *FIRSTSON*	0.003	-0.017	-0.002	-0.017	0.019	-0.020
	(0.841)	(0.366)	(0.893)	(0.513)	(0.454)	(0.420)
SCROP50 $_{t-1}$	-0.026*	-0.045**	-0.029	-0.052**	-0.020	-0.033
	(0.090)	(0.014)	(0.176)	(0.048)	(0.308)	(0.226)
SCROP25 $_{t-1}$	-0.001	0.012	0.000	0.009	0.002	0.027
	(0.941)	(0.605)	(0.971)	(0.709)	(0.967)	(0.509)
FIRSTSON * *FEMALE*	-0.015	-0.121	-0.012	-0.122	-0.018	-0.122
	(0.168)	(0.218)	(0.362)	(0.502)	(0.196)	(0.458)
FIRSTSON	-0.010	0.041	0.006	0.057	-0.043	0.011
	(0.825)	(0.601)	(0.947)	(0.567)	(0.635)	(0.853)
FEMALE	-0.053	0.002	-0.085**	-0.031	0.057	0.110
	(0.128)	(0.937)	(0.040)	(0.573)	(0.575)	(0.256)
Observations	17,154	17,154	11,753	11,753	5,401	5,401
Cohorts	1967-93	1967-93	1967-93	1967-93	1967-93	1967-93
Birth Order FE	Yes	Yes	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Wild cluster bootstrapped p-values in parentheses. All specifications also include birth year fixed effects, the standard covariates, log-acreage and log-production measures for rice and cereals, and their interactions with the female child and the firstborn son indicators. Columns (2), (4), and (6) also include interaction terms of the log-acreage and log-production measures for rice and cereals, the female child indicator, and the firstborn son indicator. *** p<0.01, ** p<0.05, * p<0.1

Table 11 – Younger Siblings and Sharecropper Registration

	Has a Younger Sibling								
	All Children			Hindu Children			Non-Hindu		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
SCROP50 $_{t-1}$ * *FEMALE*	-	0.012	0.011	-	0.021	0.018	-	-0.003	0.002
		(0.511)	(0.535)		(0.408)	(0.482)		(0.801)	(0.953)
SCROP25 $_{t-1}$ * *FEMALE*	-	-0.004	-0.010	-	-0.003	-0.008	-	-0.003	-0.005
		(0.741)	(0.256)		(0.915)	(0.619)		(0.859)	(0.845)
SCROP50 $_{t-1}$	-0.021**	-0.027**	-0.028*	-0.024	-0.034*	-0.035**	-0.018	-0.016	-0.019
	(0.044)	(0.042)	(0.052)	(0.144)	(0.066)	(0.042)	(0.388)	(0.352)	(0.332)
SCROP25 $_{t-1}$	-0.003	-0.001	-0.002	0.009	0.010	0.009	-0.034	-0.033	-0.038
	(0.845)	(0.943)	(0.989)	(0.657)	(0.739)	(0.755)	(0.248)	(0.226)	(0.202)
FEMALE	0.054***	0.053***	-0.112	0.070***	0.064***	-0.122	0.013	0.016	-0.062
	(0.002)	(0.004)	(0.260)	(0.000)	(0.000)	(0.404)	(0.555)	(0.468)	(0.507)
FIRSTSON	0.013	0.013	0.012	0.011	0.010	0.010	0.010	0.010	0.011
	(0.296)	(0.324)	(0.322)	(0.434)	(0.424)	(0.498)	(0.575)	(0.569)	(0.553)
FIRSTSON * *FEMALE*	-0.064***	-0.064***	-0.064***	-0.076***	-0.075***	-0.076***	-0.040	-0.040	-0.040
	(0.010)	(0.006)	(0.004)	(0.008)	(0.002)	(0.002)	(0.212)	(0.232)	(0.226)
Observations	17,835	17,835	17,154	12,229	12,229	11,753	5,606	5,606	5,401
Cohorts	1956-93	1956-93	1967-93	1956-93	1956-93	1967-93	1956-93	1956-93	1967-93
Birth Order FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Wild cluster bootstrapped p-values in parentheses. All specifications also include birth year fixed effects, the standard covariates. Columns (3), (6), and (9) also include log-acreage and log-production measures for rice and cereals, and their interactions with the female child indicator. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 12 – Mortality Trends Before Sharecropper Registration

	Infant Death					
	All Children		Hindu Children		Non-Hindu Children	
	(1)	(2)	(3)	(4)	(5)	(6)
FEMALE	0.030	0.029	0.006	0.008	0.093*	0.084
	(0.278)	(0.240)	(0.877)	(0.779)	(0.082)	(0.124)
*FEMALE * YEAR*	-0.006*	-0.006*	-0.003	-0.003	-0.013**	-0.012**
	(0.072)	(0.076)	(0.424)	(0.400)	(0.017)	(0.036)
YEAR	0.001	0.001	0.000	0.000	0.003	0.002
	(0.651)	(0.755)	(0.965)	(0.987)	(0.286)	(0.414)
Observations	4,918	4,918	3,594	3,594	1,324	1,324
Cohorts	1965-77	1965-77	1965-77	1965-77	1965-77	1965-77
District FE	No	Yes	No	Yes	No	Yes

Notes: Wild cluster bootstrapped p-values in parentheses. The covariate *YEAR* measures the number of years since 1965 that the child is born. *** p<0.01, ** p<0.05, * p<0.1

Table 13 – Test of Targeted Sharecropper Registration

	Infant Death					
	All Children		Hindu Children		Non-Hindu Children	
	(1)	(2)	(3)	(4)	(5)	(6)
SCROP 1980	-0.047	-0.130	0.031	-0.035	-0.240	-0.359
	(0.837)	(0.537)	(0.879)	(0.831)	(0.408)	(0.232)
SCROP 1981	0.095	0.194	0.028	0.084	0.283	0.471
	(0.318)	(0.312)	(0.729)	(0.611)	(0.132)	(0.176)
*SCROP 1980 * FEMALE*	-	0.184	-	0.149	-	0.258
		(0.959)		(0.985)		(0.911)
*SCROP 1980 * FEMALE*	-	-0.217	-	-0.125	-	-0.424
		(0.961)		(0.945)		(0.867)
FEMALE	-0.015	0.017	-0.013	-0.010	-0.017	0.079
	(0.228)	(0.731)	(0.278)	(0.805)	(0.426)	(0.446)
Observations	4,591	4,591	3,369	3,369	1,222	1,222
Cohorts	1967-77	1967-77	1967-77	1967-77	1967-77	1967-77

Notes: Wild cluster bootstrapped p-values in parentheses. All specifications include the standard covariates. The covariates *SCROP 1980* and *SCROP 1981* denote district sharecropper registration rates in the years 1980 and 1981 respectively. *** p<0.01, ** p<0.05, * p<0.1

Table 14 – Infant Mortality and Placebo Registration

	Infant Death		
	All Children	Hindu	Non-Hindu
	(1)	(2)	(3)
$PL50_{t-1}$	-0.030	-0.028	-0.036
	(0.138)	(0.286)	(0.278)
$PL25_{t-1}$	0.017	0.027	-0.016
	(0.488)	(0.412)	(0.757)
$PL50_{t-1}$ FEMALE*	0.000	0.018	-0.051
	(0.971)	(0.587)	(0.280)
$PL25_{t-1}$ FEMALE*	0.005	-0.015	0.059
	(0.767)	(0.593)	(0.164)
FEMALE	-0.015	-0.018*	-0.008
	(0.146)	(0.080)	(0.715)
Observations	17,835	12,229	5,606
Cohorts	1956-93	1956-93	1956-93
Birth Order FE	Yes	Yes	Yes
District FE	Yes	Yes	Yes

Notes: Wild cluster bootstrapped p-values in parentheses. All specifications also include the standard covariates, and an interaction term of the firstborn son indicator with the female child indicator. *** p<0.01, ** p<0.05, * p<0.1