Shackled to the Soil?

Inherited Land, Birth Order, and Labor Mobility

A. Nilesh Fernando

ABSTRACT

The inheritance of wealth promotes occupational choice, but may restrict it where its use is constrained by limited markets and cultural norms. This work investigates the effects of inheriting agricultural land in rural India and finds that while larger inheritances, on average, increase future household consumption, firstborn sons do not experience these gains. For firstborns, inheriting land reduces migration and entry into nonagricultural work. In contrast, inheriting land does not influence occupational choice or migration for latter-born sons. I attribute these differences, in part, to a cultural norm of parental support incumbent on firstborns and its interaction with inherited land.

I see young men, my townsmen, whose misfortune it is to have inherited farms…; for these are more easily acquired than got rid of. Who made them serfs of the soil?

—Henry David Thoreau, Chapter 1, *Walden*, 1854

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A. Nilesh Fernando https://orcid.org/0000-0002-0948-7420

I. Introduction

Systems of inheritance govern the transmission of wealth, thereby influencing the opportunities available to future generations. Across the developing world, agricultural land is among the most important assets to the rural poor, and it is more often inherited than bought—70 percent of households inherit agricultural land in Nigeria, 65 percent in Peru, 86 percent in Nepal, and 85 percent in India.[1] Models of poverty traps suggest that initial asset endowments like land can be transformative in their effect on poverty (Banerjee and Newman 1993; Galor and Zeira 1993)[2]. However, where assets are illiquid and the holder is even unable to abandon them, they may instead impede occupational and spatial mobility.

In this study, I first ask how inheriting agricultural land influences future occupational choice, urban migration, and household consumption in rural India. Second, I ask how inheriting land influences these outcomes when its use is constrained by a cultural norm.[3] I use data from 16 states across rural India, where custom dictates that sons inherit an equal amount of their parents' agricultural land among Hindu families, but a cultural norm of parental support is incumbent on the firstborn son. The institutional context motivates the use of sibling sex composition as an instrument for the inheritance of land. Among household heads whose parents owned land, I condition on the number of siblings a household head has and their parents' landholdings and find that a marginal brother reduces the amount of land inherited by 1.2 acres on average.[4]

The empirical estimates reveal that inheriting land reduces the likelihood of entering nonagricultural work in rural areas (−1.8 percentage points per acre). In addition, these point estimates are virtually unchanged when I include controls for net dowry receipts, average spacing between siblings, own education, and parents' education. However, these estimates mask substantial nonlinearities, as nonparametric estimates suggest that inheritances between one to two acres drive the effects on both occupational choice and migration. As expected, inheriting land eases borrowing constraints (the total value of loans is 15.2 percentage points more per acre) and increases household consumption (2.8 percentage points per acre) on average.

In addition, I find these average effects exhibit important heterogeneity by birth order. In the sample, firstborn sons are 17 percent more likely to work outside of agriculture and 1 percent more likely to migrate to urban areas than their latter-born counterparts.[5] However, as firstborns inherit more land, they are less likely to migrate to urban areas (−0.5 percentage points per acre inherited) or enter into nonagricultural work (−5.1 percentage points per acre inherited); in contrast there is no effect of inheriting land on these outcomes for latter-borns.

1. These figures are from the World Bank Living Standards Measurement Surveys. The India figure uses the 1999 Wave of the ARIS-REDS data set (National Council of Applied Economic Research 1999).
2. Experimental and nonexperimental evidence shows that asset transfers allow the poor to attain a higher level of consumption and support entry into the nonagricultural sector (Besley and Burgess 2000; Bandiera et al. 2017; Blattman, Fiala, and Martinez 2013).
3. By "cultural norm" I mean a prescription on behavior that has evolved as a decision-making heuristic (Boyd and Richerson 1988).
4. The precise functional form I use for the instrument, $Predicted\ Share = \left[\frac{1}{1+Brothers}\right]$, yields a first-stage F-statistic of 125.9.
5. The overall permanent urban migration rate is 1.1 percent in the sample.

I argue these results capture the interplay between the norm of parental support and inherited landholdings. With limited land, coresidence does not bind, and firstborns are free to support their parents with work outside of agriculture and away from home. As firstborns inherit more land, agriculture becomes a more viable means of support, coresidence binds, and firstborns must forego higher returns outside of agriculture and in urban areas. Indeed, while household consumption of latter-borns increases by three percentage points for each acre inherited, for firstborns, the effect of inheriting land is indistinguishable from zero.

Prior research suggests the importance of sex-selective fertility preferences in this context, but the most direct expression of such preferences, sex-selective abortions, are ruled out because nearly the entire sample under consideration was born prior to 1980, preceding the availability of low-cost ultrasound technologies in rural India (Sen 1990; Gupta 2005). In addition, I show that the instrument is not correlated with a range of individual and parent characteristics that precede the inheritance of land. In particular, mother's education—an important correlate of the demand for selective fertility preferences in the literature—is not correlated with the instrument (Pörtner 2010).

In support of instrument exogeneity, for individuals whose parents are landless—those who cannot inherit land by definition—I do not find reduced form effects on occupational choice or consumption. These results lend support to the instrument exogeneity assumptions, but I ask whether sibling sex composition could be "plausibly exogenous" and yield consistent estimates even if the exclusion restriction assumption does not hold exactly (Conley, Hansen, and Rossi 2012). I consider two key channels—differential human capital investment and dowry payments[6]—and model the size of the exclusion restriction violation using simulation methods. In each case, I find that the hypothetical violation would need to be many times larger than the estimated effects in order to seriously affect inference. Collectively, these results suggest that the inheritance of land is the primary channel through which sibling sex composition influences my outcomes of interest.

This work contributes primarily to a literature seeking to understand the frictions and barriers that restrict the movement of labor out of the agricultural sector (Blattman, Fiala, and Martinez 2013; Bianchi and Bobba 2013; Bryan, Chowdhury, and Mobarak 2014; Gollin and Rogerson 2010). The results I outline above suggest how the inheritance of assets can interact with cultural norms and create barriers to occupational and spatial mobility. In addition, the results suggest that the effects of inheriting land on occupational choice are nonlinear, with smaller inheritances having a much larger influence on occupational choice and migration.

Second, this work contributes to the literature quantifying the importance of misallocation in land markets (Adamopoulos and Restuccia 2014; Restuccia and Santaeulalia-Llopis 2017) by identifying a specific friction that inhibits the operation of these markets. More generally, it suggests the importance of nonmarket means of acquiring land.

Third, this work contributes to literature attempting to estimate the causal effects of land ownership. Recent work uses 19th century land lotteries in the U.S. state of Georgia to estimate the causal effect of land, but the authors are unable to evaluate the impact on measures of household consumption for lack of data (Bleakley and Ferrie 2013, 2016).

6. Dowry is an institution prevalent among Hindu families in India whereby a bride's family is responsible for sending the groom's family a combination of cash and other gifts at the time of marriage.

While many antipoverty programs focus specifically on land reform, these results may also be of relevance to other antipoverty programs—such as the large-scale targeted "ultra poor" programs in Bangladesh—that require that beneficiaries do not liquidate their assets (Das et al. 2013). These assets may still serve as collateral in the presence of credit constraints, but the inability to sell the asset easily may constrain rather than support occupational transitions, thereby harming household consumption.

Finally, these findings contribute to the literature investigating the labor market effects of reforms to how land can be utilized. In particular, Chernina, Castañeda Dower, and Markevich (2014) find that titling reforms in Russia that enabled the sale of previously communally owned land supported internal migration by easing credit constraints, while Emran and Shilpi (2010) find that land market restrictions influence the spatial pattern of wages. These findings are also consistent with the literature on titling in land markets, where reductions in transaction costs allow for the efficient reallocation of labor across space (Field 2007; De Janvry et al. 2012). Similarly, Wang (2012) finds that property reform in China allowing state employees to purchase homes at a subsidized price lead to increased job mobility through entrepreneurship.

The next section provides context on the inheritance of land and land markets in rural India. Section III motivates the empirical strategy with a conceptual framework. Section IV describes the data sources used in the empirical analysis. Section V describes the empirical strategy, while Section VI presents the results from this analysis. Section VII discusses heterogeneity in the results and the mechanisms underlying the observed effects. Section VIII describes robustness checks that test the validity of the identifying assumptions of the empirical strategy, and Section IX concludes.

II. Context: Agricultural Land in Rural India

A. Customs and Laws Governing the Inheritance of Agricultural Land

Most Hindu communities throughout rural India are characterized by patrilineal land inheritance customs. The ethnographic literature suggests that such customs largely hold sway over recent progressive reforms—in many cases agricultural land is exempt from such reforms—and continue to restrict the ability of women to inherit agricultural land. To this point, in her exhaustive study of gender and land rights in India, Agarwal (1994) concludes that women seldom inherit land.[7] However, the northeastern states of India and the southern state of Kerala are exceptions where matrilineal inheritance customs have historically been more prevalent.[8]

In patrilineal areas, agricultural land is typically inherited after the death of the father, with sons inheriting equal shares of their father's land.[9] The Hindu Succession Act

7. In particular, she states: "Ethnographic information, although it is extremely fragmentary, consistently indicates that women in traditionally patrilineal communities of South Asia rarely realize the rights that contemporary laws have promised them. Custom still dominates practice. Hence the vast majority of women do not inherit landed property as daughters, most don't do so even as widows, and few women inherit in other capacities. To the extent women inherit is usually under very restricted conditions" (Agarwal 1994).

8. The northeastern states include Assam, Arunachal Pradesh, Tripura, Meghalaya, and Nagaland.

9. Foster and Rosenzweig (2002), in their study of rural household division, also suggest that equal division among sons is the norm. Technically, inheritance claims extend to four generations of agnates, implying that

(HSA) of 1951 governs the inheritance of land in the absence of a will. Importantly, this act did not endow daughters with the rights to "ancestral property," known as coparcenary rights. Subsequent amendments to the act sought to address this issue were made in Kerala (1976), Andhra Pradesh (1986), Tamil Nadu (1989), Maharashtra (1994), and Karnataka (1994) to enable women to have equal coparcener rights (that is, a father could not will away his daughter's right). Recent work explores the effects of these amendments and finds mixed evidence on whether they increased the inheritance of land by women (Deininger, Goyal, and Nagarajan 2013; Roy 2015). However, both of these studies find that the reforms did improve the education of daughters, perhaps as "compensation," while others find that the reforms influenced fertility decisions, the bargaining position of women, and their labor supply (Calvi 2020; Heath and Tan 2019; Bhalotra, Brulé, and Roy 2018).

While these amendments have been adopted nationwide since 2005, significant barriers continue to exist. Data I collected from 1,037 landed households engaged in agriculture in the western Indian state of Gujarat support equal division and continued primacy of custom over law.[10] Among these respondents, 82 percent described standard practice as equal division among male sons, and 93 percent disagreed that their level of education or employment status had any influence on their inheritance (see Online Appendix 2).

B. Land Markets in Rural India

Deininger, Jin, and Nagarajan (2009) suggest that both micro studies focusing on collections of villages and nationally representative data sets point to very limited participation in sales and rental markets for agricultural land in rural India. Similarly, Skoufias (1995) uses ICRISAT data in India to show that 75 percent of households are unable to meet their "desired cultivated area"—predicted landholdings based on livestock and family labor endowments—using land markets. Reasons for limited market participation in India include rental restrictions (Deininger, Jin, and Nagarajan 2008), regulatory restrictions preventing the sale of land for nonagricultural purposes, and high stamp duties on land transactions (Morris and Pandey 2007).

Generic land market imperfections include poorly defined property rights resulting in uncertainty over ownership claims (Deininger and Goyal 2012) and information asymmetries in assessing quality of land and effort of tenants (Deininger and Feder 2001). An important barrier to land sales and rental of consequence to this paper is a desire for farmers to continue in the tradition of their ancestors (Jodhka 2006). While the latter study focuses on the Indian state of Punjab, a survey of landed adults aged 18–30 across 13 states in rural India (Sharma 2007) found that 60 percent of respondents had no intention of selling their land, with 34 percent suggesting that farming was a "mark of their identity" and that they would like their children to cultivate their land as had been done for generations.

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grandsons also have a claim upon birth. In practice these shares are typically claimed and registered after the more senior member in the agnatic line dies.

10. I collected data on household perceptions, understanding, and the administration of inheritance rules from a sample of 1,037 households in rural Gujarat. These households were randomly selected from village lists of cotton farmers as a part of a separate study on technology adoption in agriculture (Cole and Fernando 2018).

III. Conceptual Framework

The generic effect of inheriting land is an outward shift of the budget constraint affording an individual a more desirable consumption bundle: a "wealth effect." Additionally, in the context of credit constraints, individuals may be able to leverage land as collateral and take advantage of high-return opportunities elsewhere. However, where an inheritor is unable to part with land through sales and rental markets or leave it behind, inheriting land may limit their occupational and spatial mobility. In the main data set I consider, over the preceding 20 years, just 17 percent of the respondents report buying, selling, or mortgaging their land. In addition, only 40 percent of households in these villages own formal titles to their land, suggesting that even temporarily abandoning land may leave one vulnerable to expropriation (Goldstein and Udry 2008).

In such a context, in addition to a wealth effect, the long-term effect of inheriting land on household consumption will also include an opportunity cost that accumulates as a consequence of foregone opportunities, such as lost high-return migration episodes over a lifetime, unless land is an entirely fungible form of wealth. While Section II.B provides evidence to suggest that rental and sales markets are limited in an Indian context, an inability to leave the land behind requires further discussion (see Section III.A below).

While this may be the case for inheriting versus not, similar intuition applies to the extent of landholdings inherited. Consider an individual who inherited two acres of land relative to their counterfactual self who inherited an acre. While the pure wealth effect of two acres of land is larger than one acre, the change in the opportunity cost is indeterminate. An increase in wealth may afford an individual alternatives that were not available to someone with less wealth, for instance, the cost of transportation to a more remunerative market. Larger landholdings may absorb more of an individual's time endowment, resulting in less opportunity to diversify labor supply within rural areas and implying that the opportunity cost is increasing in the extent of landholdings. While the empirical strategy estimates local average treatment effects, nonparametric estimations of the reduced form reveal nonlinearities in the reduced form.

A. Why Not Abandon the Land?

The beneficiary of an asset transfer program may part with the asset at any time. An inheritance, however, may not be subject to the same type of "free disposal." First, inheritances are passed through generations of a family, and their possession is likely to include nonpecuniary benefits, such as a sentimental "attachment to the land" (Sharma 2007). Similarly, abandoning such an asset is likely to involve nonpecuniary costs, which maybe reinforced by community sanction.

Second, I consider a cultural norm among Hindu families that may make it especially difficult to vacate inherited land. For the eldest son, taking care of his parents in their old age is a "sacred duty" in Hindu scripture known as Pithru Rina (Kumari Bhat and Dhruvarajan 2001). Upon the retirement of the father, the oldest son is obligated to take over the affairs of the household. In agricultural households this often implies responsibility for the family land and occupational succession, although the land itself is split

equally regardless of birth order.[11] As such, for firstborns, the cost of leaving their land behind may be especially severe.

This discussion yields three points of note. First, while leaving land behind may be especially costly for firstborns, it does not mean that they are *entirely* prevented from doing so. Where there is insufficient land to provide support to their parents, firstborns may well venture away from agriculture and rural areas. Second, the fulfillment of a norm may well provide benefits leaving a firstborn better off, relative to abandoning the land and changing occupation, in utility terms. Lastly, where it is more costly to leave land behind and if keeping it fallow entails a risk of expropriation, then the *amount* of land inherited is also likely to influence the size of the labor distortion both on an extensive margin (urban migration) and on an intensive margin (hours worked across agriculture and nonagricultural work).

IV. Data and Summary Statistics

A. ARIS-REDS Data Set: Inherited Land and Labor Market Choices

The data used in this paper primarily draw from the 1999 wave of the ARIS/REDS[12] data set (hereafter, REDS) collected by the National Council for Applied Economic Research (NCAER). The REDS data set is a national probability survey intended to be representative of the rural population of India residing in 17 major states and 100 districts. Its distinctive features include a complete enumeration of the respondent's siblings and children—not limited to those present at the household at the time of surveying—and data on a respondent's inherited landholdings and parents' landholdings. Additionally, the survey contains detailed data on consumption, nonfarm and agricultural investments, and labor supply.

The REDS panel was collected in four waves conducted between 1971 and 2006 and has previously been used in several prominent studies of the Green Revolution in India (Foster and Rosenzweig 1995, 1996). The main sample in the analysis presented below uses data from the 1999 wave, which starts with 7,393 households. I further drop household heads whose parents owned no land (1,654 households) because, by definition, any landholdings they possess are not governed by the inheritance laws described above. While household heads from landless families are dropped from the main sample, they are used in reduced form regressions to support the validity of the exclusion restriction. Among the remaining 5,793 households, 338 female headed households are dropped because the data do not indicate whether the sibling data refer to the female head or her spouse, and a further 592 households of minorities are dropped as the study is restricted to Hindu households.

The primary unit of analysis in this study is the household head. However, data on all siblings and children of the household head are collected for a limited set of outcomes,

11. As a consequence of this responsibility or just the timing of labor demand, the oldest son may be exposed to farming earlier and develop more "farm-specific" human capital. A similar hypothesis is put forward by Laband and Lentz (1983), who argue that farm-specific human capital may be a reason for the much higher observed rate of occupational succession by sons of farmers in the United States.

12. Additional Rural Incomes Survey/Rural Economic and Demographic Survey. These data are made available online by Prof. Andrew Foster from: https://adfdell.pstc.brown.edu/arisreds_data/ (accessed August 26, 2021).

Table 1
Summary Statistics for Head-Level and Sibling-Level Data

	Head Level		Sibling Level	
Dependent Variable	Mean (1)	SD (2)	Mean (3)	SD (4)
Age (years)	48.641	14.239	47.941	38.298
Education (years)	5.540	5.196	4.396	4.312
Parents landed (dummy)	0.785	0.411	0.791	0.406
Currently owns land	0.766	0.424	0.636	0.481
Household size	6.089	3.337	4.999	2.857
Rural to urban migrant			0.012	0.109
Nonagricultural occupation	0.353	0.478		
Yearly HH consumption (Rs.)	39,554.710	35,188.780		
Years since headship assumed	15.932	13.392		
Father of head alive	0.187	0.405		
Loan (last 5 years)	0.172	0.377		
Number of brothers	1.901	1.421		
Number of siblings	3.710	2.183		
Predicted share (0–1)	0.455	0.265		
Firstborn	0.379	0.485		
Inherited land (acres)	3.278	6.209		
Current land (acres)	4.169	7.512		
N	6,124		18,672	

Source: ARIS-REDS data set
Notes: This table presents summary statistics for the data used from the 1999 Wave of the ARIS-REDS survey. Means are reported in Columns 1 and 3, while standard deviations are reported in Columns 2 and 4. Columns 1 and 2 contain summary statistics for all male Hindu household heads (HH). Column 3 and 4 contain summary statistics for sibling-level data. The data examined here correspond to all male siblings of household heads (including the head) used in the main analysis that reached the age of ten prior to their death.

including education, migration, and inherited and current landholdings. The very low level of permanent migration to urban areas in the period preceding the survey and the fact that most respondents were born prior to the introduction of affordable sex selection technologies make the 1999 wave particularly well suited to this analysis.[13] In addition, this wave was the first to include detailed information on household structure, inheritances, and agricultural labor.

13. In spite of low levels of permanent migration to urban areas, a potential selection concern arises from unobserved *family* migration to urban areas. While I observe whether all siblings and children of household heads migrate, I would not observe a household if entire families migrated to urban areas, which might influence the estimates that follow. While this form of migration is considered very rare in rural India (Munshi and Rosenzweig 2009), I perform a series of simulations that assess the robustness of the reduced form results to selective migration in Section VIII.A, which are described in further detail in Online Appendix 10.

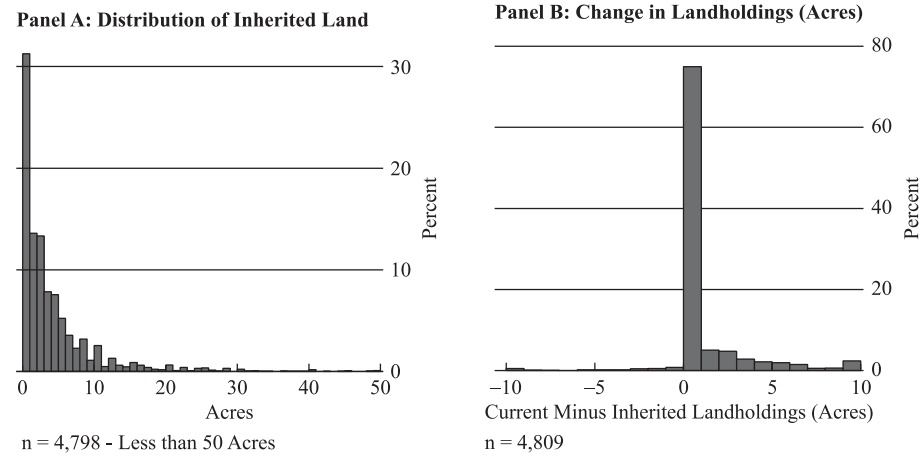

Figure 1

Distribution of Inherited Land and Changes in Landholdings

Source: ARIS-REDS data set.

Notes: Panel A plots the distribution of inherited landholdings. Panel B plots the difference between current and inherited landholdings. In the full sample ($n = 4{,}809$), 20.8 percent of households report that they inherited no land, 17.2 percent report inherited landholdings of 0–1 acre, 15.2 percent report inherited landholdings between 1–2 acres, 10.0 percent report between 2–3 acres, 8.3 percent report between 3–4 acres, and the remainder (>4 acres) account for 28.2 percent of the sample. The mean is 4.12 acres and the median is 2 acres. Panel A limits the domain to those who inherit ≤50 acres of land. Panel B codes increases of >10 acres as 10 and decreases of >10 acres as −10. 70 percent of respondents report no change in inherited landholdings, while 84.4 percent report changes of less than 2 acres. The 95th percentile is a change of +6 acres, while the fifth percentile is zero.

B. Summary Statistics for ARIS-REDS Data

The first two columns of Table 1 report summary statistics for household head–level data, the primary unit of analysis. The remaining columns report summary statistics for sibling-level data, for which fewer outcomes are available. The mean age of a household head is 48.6 years, and they have 5.5 years of education and spend roughly $80 per month on household expenses.[14] Nearly 80 percent of respondents have landed parents ($n = 4{,}809$), and 35 percent of the sample describe their primary activity status as being in a nonagricultural occupation. Of these respondents, 32 percent hold a salaried job, 22 percent are engaged in nonagricultural wage labor, and 18 percent report operating a nonfarm business.[15] Mean inherited landholdings are 3.2 acres, while the median is one acre, suggesting a distribution of landholdings with a long right tail, as in Panel A of Figure 1.

14. The Appendix provides details of the variables discussed in the analysis.

15. The REDS data do not contain details on nonagricultural wage work. However, for roughly 3000 respondents reporting nonagricultural wage labor in the IHDS, 36 percent are involved in construction work.

On average respondents became the head of their household at age 33 (median 32), or 16 years (median 14) prior to when their outcomes are observed. Despite this, Panel B shows that 70 percent of respondents have experienced no change in the current landholdings over their inherited landholdings, and 84 percent of respondents have experienced increases or decreases of less than two acres during this period. For the median respondent, all current landholdings are inherited, while the average share of inherited land in total landholdings is 83 percent. Nearly 19 percent of the sample still have a living father. Among this subset, 20 percent of respondents have inherited land, while for those with no living father 93 percent of respondents have inherited land.[16] The average household has six persons residing in it, and nearly one-fifth of the sample has taken out a loan in the last five years. Respondents have four siblings on average, 52.3 percent of whom are male.

The means and standard deviations for sibling-level data are reported in Columns 3 and 4. The average age of siblings is comparable to that of household heads. Rural to urban migration is very low at just 1.2 percent.

V. Empirical Strategy

A. Structural Equation

The goal of my empirical strategy is to estimate the causal effect of inherited landholdings L_{ij} on household consumption and labor mobility. For example, where Y_{ij} equals one if household head i in district j holds a nonagricultural occupation, and zero otherwise, the structural equation of interest is:

$$(1) \quad Y_{ij} = \alpha_j + \rho L_{ij} + X_{ij} + \nu_{ij}$$

where α_j is a district fixed effect, and X_{ij} is a set of controls, which include characteristics of i and his family background that might influence occupational choice. The concern here is that L_{ij} is correlated with ν_{ij}. For example, people who inherit more land may also have higher ability, A_{ij}, and this may in turn be positively correlated with exiting agriculture. When A_{ij} is omitted, ordinary least squares (OLS) will biased upwards relative to ρ. In order to address this concern, I make use of an inheritance rule that results in land being divided equally between sons after a father's death to instrument for L_{ij}.

B. Inheritance Rule

If the number of brothers an individual has is the product of a random process, and parents' land is split equally among brothers, then inheritance shares are also the result of a random process. The functional form for an individual's inheritance share is nonlinear and equal to: $Predicted\ Share = \left[\frac{1}{1+Brothers}\right]$.

16. Sixty percent of respondents became the head of their household after their father died. While the survey does not give the exact time at which they inherited land, consistent with the summary statistics, land is typically inherited upon a father's death. As is evident, however, household headship does not necessitate the inheritance of land or a father's death. Foster and Rosenzweig (2002) using the REDS panel find that household division (that is, headship) is predicted by age of the respondent, household size, and a coresident wife but not by parent's landholdings.

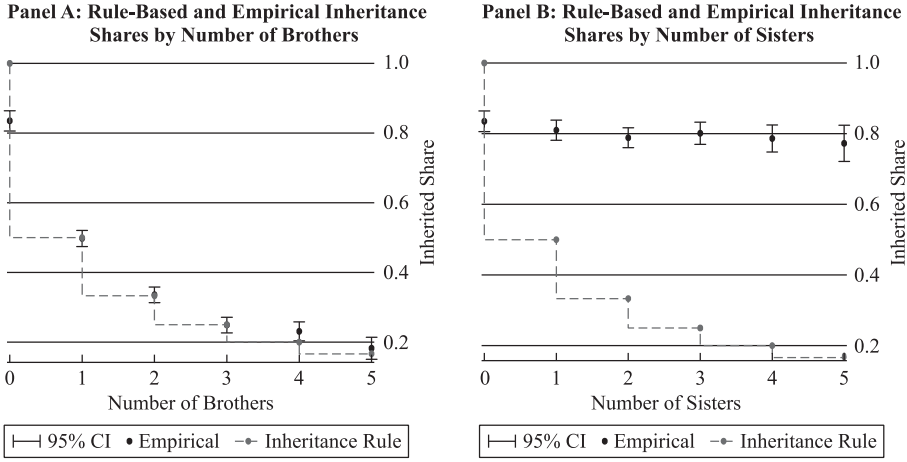

Figure 2

Rule-Based and Empirical Inheritance Shares of Family Land

Source: ARIS-REDS data set.

Notes: These figures plot the inheritance shares predicted by the instrument and the empirical inheritance shares observed in the data. Panel A shows empirical inheritance shares by the number of brothers a respondent has, while Panel B shows it by the number of sisters. The "Inheritance Rule" in each panel is the value of the instrument, that is, 1/(1+Brothers). The empirical share is calculated as the land inherited by the head divided by the land owned by his family. For Panel A this value is regressed on a set of dummies for the number of brothers (sisters for Panel B) an individual has, controlling for the number of sisters (brothers for Panel B). Household heads with five brothers or fewer (domain of Panel A) account for 98.49 percent of the sample. Household heads with five sisters or fewer (domain of Panel B) account for 98.05 percent of the sample.

Panels A and B in Figure 2 demonstrate the validity of this functional form assumption by showing how the empirical shares of inherited land vary with what is predicted by the rule. Panel A plots inheritance shares observed in the data by a household head's number of brothers (black dots). The empirical shares closely track what is predicted by the inheritance rule (dashed line). In contrast, Panel B shows that no such relationship exists in the analogous visualization by number of sisters.

C. Instrument Specification and Identifying Assumptions

Given the empirical validity of this rule, I can instrument inherited landholdings, L_{ij} using $Predicted\ Share = \left[\frac{1}{1+Brothers}\right]$, after conditioning on a respondent's total number of siblings and his parents' landholdings, the latter of which adds an important control for parent wealth.[17] The identifying assumption is that the predicted inheritance share is independent

17. *"Predicted Share"* is the preferred specification for the instrument because the functional form has a clear parallel to the visual in Panel A of Figure 1. Relative to instrumenting with the predicted *level* of land, the share has the advantage of being uncorrelated with controls for parents' land, being far less sensitive to outliers and

of potential outcomes and only affects these outcomes through the inheritance of land. To illustrate the use of this instrument, consider the case of a respondent with one sibling. If that sibling is a brother, then the individual inherits half his parents' land and the value of the instrument, *Predicted Share*, equals 0.5. If, on the other hand, the respondent has a sister, the instrument equals one, and he inherits all his parents' land.

1. Correlation between instrument and observable characteristics

A priori it is unclear which household attributes are correlated with sibling sex composition, after conditioning on number of siblings and parents' land. One possibility is that households that prefer sons are also those willing to invest additional parenting effort in supporting them, implying that the coefficient on inherited land is biased upward. Alternatively, households that prefer more sons and are willing to influence the sex composition of their children may be less educated. Such parents may consequently also lack the human capital to guide their sons into more lucrative occupations, and this would bias the estimate downwards.

Online Appendix Table 8 reports coefficient estimates from regressions of individual and parent characteristics on the instrument, predicted share, while controlling for the number of siblings and parents' landholdings as in Equation 2 below. Columns 2–5 report the coefficient on the instrument by number of siblings a respondent has, while Column 6 includes the entire sample. The estimates suggest that the instrument is independent of several respondent characteristics, including age, education, and birth order for the respondents. In addition, the literature on sex-selective abortion in India finds that a mother's education is an important (positive) correlate of sex-selective abortion (Pörtner 2010). While I observe such an imbalance for respondents with four siblings, this effect is reversed for those with three siblings. More generally, the pooled sample (Column 6) reveals that there is no systematic relationship between sibling sex composition and mother's education across sibling cohort sizes.[18]

Another important imbalance I observe is for average spacing between siblings. For all sibling cohort sizes, this relationship is negative, suggesting that, holding fixed the number of siblings, those with more daughters tend to have shorter spacing between siblings. This might be expected if having a daughter motivates parents to (quickly) conceive again because of a desire to have a son (Anukriti, Bhalotra, and Tam 2016). In the main results reported below, I control for average sibling spacing to assess the robustness of results to this imbalance.

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having a larger first-stage *F*-statistic. While using the natural logarithm of the level of land attenuates some of these concerns, estimates giving the marginal effect of an acre of inherited land are preferred to elasticities.

18. Although there are imbalances for a few characteristics in specific sibling cohort sizes, they vary qualitatively across cohort sizes, suggesting the absence of systematic bias across these characteristics, and are not significant in the pooled sample (Column 6). The only imbalance that is significant for the pooled sample is the time at which the respondent became the head of the household, with those with a higher predicted share becoming heads at a slightly younger age. This result appears to be driven by individuals with four siblings and is only marginally significant in the pooled sample. Online Appendix 10 reports the 2SLS estimates for the effect of inherited land on occupational choice and household consumption by sibling cohort size. The estimated effects do not vary qualitatively across sibling cohort sizes, once again reducing concerns about the imbalances in Online Appendix 8.

D. First-Stage and Second-Stage Specifications

The two-stage least squares (2SLS) estimate computes a weighted average of the Wald estimator across individuals with varying numbers of siblings and family landholdings, weighted by the strength of the covariate specific first stage. Conceptualizing this in the local average treatment effect (LATE) framework (Angrist and Imbens 1995), the 2SLS estimate gives us the local average treatment effect for the compliers: the individuals who would have stood to inherit a larger share of their parent's land had one or more of their brothers been sisters. As such, the first-stage (Equation 2) and second-stage equations (Equation 3) are:

$$(2) \quad L_{ij} = \alpha_j + \pi\, Pred\ Share_{ij} + \gamma_k \sum_{k=1}^{K} I\left(sibs_{ij} = k\right) + \gamma_l \sum_{l=1}^{L} I\left(fam\ land_{ij} = l\right) + \epsilon_{ij}$$

$$(3) \quad Y_{ij} = \alpha_j + \rho \hat{L}_{ij} + \gamma_k \sum_{k=1}^{K} I\left(sibs_{ij} = k\right) + \gamma_l \sum_{l=1}^{L} I\left(fam\ land_{ij} = l\right) + \eta_{ij}$$

where α_j is a district fixed effect, $Pred\ Share_{ij}$ is the instrument as described above, $\sum_{k=1}^{K} I(sibs_{ij} = k)$ is a set of dummy variables for the number of siblings k in i's family, $\sum_{l=1}^{L} I(fam\ land_{ij} = l)$ is a set of dummy variables for parents' landholdings, Y_{ij} is the outcome variable of interest, and $\hat{L}_{ij}$ are the first-stage fitted values.[19]

The causal effect of inherited land may also vary with underlying heterogeneity. Below I explore how these effects vary by birth order. To test these hypotheses, I incorporate interaction effects into the structural equation (Equation 1). In this case, for individual i in district j the structural equation is:

$$(4) \quad Y_{ij} = \alpha_j + \rho_1 (L{*}FB)_{ij} + \rho_2 (L{*}LB)_{ij} + \rho_3 FB_{ij} + \gamma X_{ij} + \nu_{ij}$$

where Y_{ij}, L_{ij}, and X_{ij} are as above, α_j is a district fixed effect, FB_{ij} is a dummy variable that switches on if the household head is a firstborn son, and LB_{ij} switches on when FB_{ij} switches off, that is, for latter-born sons. ρ_1 is the causal effect of inherited land on holding a nonagricultural occupation for firstborns, and ρ_2 is the causal effect of land for latter-borns. Given two endogenous variables, I require at least two instruments: $(Pred\ Share{*}FB)_{ij}$ and $(Pred\ Share{*}LB)_{ij}$.

VI. Results

In the following sections, I use the terms "household head" and "respondent" interchangeably. Additionally, I use the term "predicted share" to refer to the instrument.

19. The empirical inheritance shares are calculated as self-reported inherited land divided by total land owned by parents, both of which are directly reported in the survey.

A. First-Stage and Reduced Form Estimates

1. First stage

Panel A of Figure 2 reveals that the data on empirical inheritance shares closely approximate what is predicted by the inheritance rule.[20] Table 2 confirms this graphical intuition and assesses five other parameterizations for the instrument, with all specifications including district fixed effects and a set of fixed effects for number of siblings and the amount of land owned by an individual's parents. Column 1 in Table 2 reports the coefficient on the linear specification of the instrument which yields a first-stage *F*-statistic of 128. Column 2 reports the coefficient on "predicted share" = $\left[\frac{1}{1+Brothers}\right]$ and is precisely estimated with an *F*-statistic of 126. Column 3 in turn reports the coefficient on "predicted land" = $\left[\frac{Family\ Land}{1+Brothers}\right]$, which has a weaker first stage (*F*-statistic = 101), likely due to the fact that family landholdings are themselves highly correlated with "predicted land" leading to a lower partial *F*-statistic.[21] Column 4 reports the coefficient on the natural logarithm of "predicted land," which yields an *F*-statistic of 142. Finally, in Column 5 the coefficients on a set of dummies for the number of brothers are reported; these instruments have an *F*-statistic of 22.[22]

In the results that follow, I use the "predicted share" parameterization of the instrument after conditioning on a set of fixed effects for number of siblings and parents' landholdings, as it avoids issues of multicollinearity when controlling for parents' landholdings and the formulation follows closely to the actual rule. Substantively, an additional brother leads to a reduction in inherited landholdings of 1.24 acres on average, or one-third of median landholdings in rural India.

2. Reduced form effects in landed and landless families

Columns 3–5 in Table 3 report the reduced form for Hindu males with landed and landless parents using the ARIS-REDS data set. The table reports the coefficient on the interaction between predicted share—the instrument—and a dummy for landed, as well as the coefficient for the interaction for predicted share and a dummy for having landless parents. The latter respondents, by definition, cannot inherit land from their parents, but any independent effects of sibling sex composition should still influence their outcomes.

In Column 3 the dependent variable is a dummy coded as zero if the respondent's "primary status" is a nonagricultural occupation. I observe that the coefficient on *Predicted share*Landed* has a statistically significant (1 percent level) and negative coefficient, while the coefficient on *Predicted share*Landless* is not significantly different

20. The empirical inheritance shares are calculated as self-reported inherited land divided by total land owned by parents, both of which are directly reported in the survey.

21. Additionally, using an instrument specification that uses the level of inherited land will result in families with larger landholdings receiving disproportionate weight in the overall LATE as a marginal brother will induce more variation in the instrument for such families relative to those with smaller landholdings. In combination with a highly nonlinear reduced form, this can yield estimates that do not reflect the actual distribution of land that has a long right tail as in Panel A of Figure 2 but are rather driven by functional form assumptions.

22. Online Appendix 9 shows that these alternative instrument specifications yield similar 2SLS estimates.

Table 2
First Stage with Alternative Instrument Specifications

	Dependent Variable: Inherited Land (Acres)				
	(1)	(2)	(3)	(4)	(5)
Number of brothers	−1.248***				
	(0.110)				
Predicted share		7.174***			
		(0.639)			
Predicted land			0.542***		
			(0.054)		
Log(predicted land)				1.757***	
				(0.148)	
1 brother					−2.704***
					(0.390)
2 brothers					−4.425***
					(0.444)
3 brothers					−5.313***
					(0.488)
4 brothers					−6.481***
					(0.559)
5 brothers					−6.689***
					(0.757)
Dependent variable mean	4.120	4.120	4.120	4.120	4.120
First-stage *F*-statistic	128.137	125.952	101.458	141.607	22.433
N	4,809	4,809	4,809	4,809	4,809
Number of siblings FE	Y	Y	Y	Y	Y
Parents' land FE	Y	Y	Y	Y	Y
District FE	Y	Y	Y	Y	Y

Source: ARIS-REDS data set.
Notes: This table reports first-stage estimates with alternative instrument specifications. The sample is restricted to Hindu male household heads whose parents owned land in the 1999 ARIS-REDS survey. Column 1 reports estimates with the instrument specified as the (linear) number of brothers, in Column 2 it is "Predicted Share" = 1/(1+Brothers), in Column 3 it is "Predicted Land" = Family Land/(1+Brothers), in Column 4 it is Log(Predicted Land), and in Column 5 it is the a set of dummies for the number of brothers (eight dummies in total, as I report the coefficients for up to five brothers, which account for 98.11 percent of sample). The *F*-statistic reported is the partial *F*-statistic for the instrument (s) (Cragg-Donald Wald *F*-statistic). Robust standard errors are given in parentheses.

Table 3
Reduced Form Estimates for Main Outcomes

	Dependent Variable					
	Nonagricultural Occupation (Binary)	HH Consumption Log(Rs.)	Rural–Urban Migration (Binary)	Nonagricultural Occupation (Binary)	HH Consumption Log(Rs.)	Rural–Urban Migration (Binary)
Sample & Data Source:	Landed Parents, ARIS REDS			Landed and Landless Parents, ARIS REDS		
	(1)	(2)	(3)	(4)	(5)	(6)
Predicted share	–0.126***	0.195***	–0.014***			
	(0.035)	(0.043)	(0.005)			
Predicted share*Landed				–0.107***	0.198***	–0.014***
				(0.033)	(0.040)	(0.005)
Predicted share*Landless				0.031	–0.001	–0.030***
				(0.053)	(0.063)	(0.009)
Mean of dep. var.	0.298	10.442	0.011	0.353	10.377	0.012
First-stage *F*-statistic	125.952	125.952	186.771			
N	4,809	4,809	14,773	6,124	6,124	18,672
District FE	Y	Y	Y	Y	Y	Y
No. of siblings FE	Y	Y	Y	Y	Y	Y
Parents' land FE	Y	Y	Y	Y	Y	Y
Reject equality of coefficients	N/A	N/A	N/A	Y	Y	N
Data level	Head-level	Head-level	Sibling-level	Head-level	Head-level	Sibling-level

Source: ARIS-REDS data set.

Notes: Columns 1–3 report reduced form estimates using "Predicted Share" as the instrument for Hindu male household heads (HH) whose parents owned land. Columns 4–5 expands the sample to Hindu male household heads with landed and landless parents. Landed is a dummy for heads with parents who owned land, Landless is a dummy for heads whose parents did not own land. Nonagricultural occupation is defined by the primary status reported by the respondent in the survey. The variable is coded as zero if this is self-cultivation or agricultural labor, and one otherwise. Yearly household consumption includes food and nonfood items and values home production at village-specific market prices. Robust standard errors are given in parentheses. "Reject equality of coefficients" tests whether one can reject equality of coefficients between the study sample landed and the landless with a *p*-value less than 0.1. The *F*-statistic reported is the partial *F*-statistic for the instrument(s) (Cragg-Donald Wald *F*-statistic). Robust standard errors are given in parentheses. Standard errors are clustered at the family level for sibling-level regressions.

from zero.[23] Similarly, in Column 4, where the dependent variable is the log of yearly household consumption, I again observe a large positive coefficient for *Predicted share*Landed* (significant at the 1 percent level) and a coefficient indistinguishable from zero on *Predicted share*Landless*.[24]

A concern here could be that sibling sex composition operates differently among landed and landless families. To address this concern, I separately test whether the first stage for education and dowry payments varies across landed and landless families and I do not find that the first-stage effects vary differentially (Online Appendix 13, Panel B, Column 1). In the case of occupational choice and household consumption, the results support the instrument exogeneity assumptions by showing that sibling sex composition influences the outcomes of interest largely through the land inheritance channel.

However, in the case of urban migration—a sibling-level regression—I observe negative and significant (1 percent level) reduced form effects for both landed and landless families. These results may suggest that respondents with more brothers benefit from being able to share the fixed costs of migration and information that aid their ability to migrate independent of inheriting land.[25] While this is of concern, in the analysis that follows, I consider how the inheritance of land differentially affects firstborn and latter-born siblings who have an equal number of brothers and siblings and should presumably have the same access to networks. In addition, in Section VIII.C I explore how large violations of the exclusion restriction would need to be in order to yield inconsistent 2SLS estimates, when the endogenous regressor is inherited land. In short, the violations needed to yield inconsistent 2SLS estimates are at odds with the estimated first stages for two important alternative channels: dowry payments and years of education.

B. Two-Stage Least Squares Estimates

In the following sections, I estimate Equation 1 using 2SLS, where the first-stage specification is Equation 2. All specifications include sibling, parents' landholdings, and district fixed effects.[26] In addition, specifications in Columns 2, 4, and 6 include controls for net dowry receipts, average sibling spacing, respondent education and age, and parents' education and age.

1. Occupational choice

Table 4 reports the 2SLS (Columns 1 and 2) estimates for the effect of inherited land on holding a nonagricultural occupation. Inheriting an additional acre of land, contrary to the predictions of standard models of occupational choice, *reduces* the probability of

23. *Nonagricultural Occupation* is coded as one if the primary status reported by the respondent in the REDS survey is not self-cultivation or agricultural labor. Online Appendix 14 shows that these results are robust to using an alternative definition that directly computes primary occupation from reported sources of income.
24. Household consumption is the preferred metric for empirical studies assessing poverty in India (Deaton and Dreze 2002). Deaton (1997) suggests that income-based measures may be more vulnerable to imputations, recall bias, and seasonality. In addition, in this context the measurement of profits is made even more complicated by the valuation of household labor in both farm and nonfarm businesses.
25. Munshi and Rosenzweig (2016) suggest a role for caste networks in rural–urban migration in India.
26. All specifications include district fixed effects (99 dummies), fixed effects for parents' landholdings (0–80 + acres, five-acre intervals, 15 dummies), and the number of siblings (14 dummies).

Table 4
Two-Stage Least Squares Estimates for Main Outcomes

Dependent Variable	Nonagricultural Occupation Binary Variable (1)	Nonagricultural Occupation Binary Variable (2)	Rural–Urban Migration Binary Variable (3)	Rural–Urban Migration Binary Variable (4)	Household Consumption Log(Rs.) (5)	Household Consumption Log(Rs.) (6)	Total Value of Loans Log(Rs.) (7)	Total Value of Loans Log(Rs.) (8)
Inherited land (Acres)	–0.018*** (0.005)	–0.022*** (0.005)	–0.002*** (0.001)	–0.002*** (0.001)	0.027*** (0.006)	0.022*** (0.006)	0.153*** (0.036)	0.155*** (0.037)
Mean of dep. var.	0.298	0.298	0.011	0.011	10.442	10.442	1.700	1.700
First-stage *F*-statistic	125.952	121.815	186.771	189.210	125.952	121.815	125.952	121.815
N	4,809	4,768	14,773	14,773	4,809	4,768	4,809	4,768
Number of siblings FE	Y	Y	Y	Y	Y	Y	Y	Y
Parents' land FE	Y	Y	Y	Y	Y	Y	Y	Y
District FE	Y	Y	Y	Y	Y	Y	Y	Y
Controls	N	Y	N	Y	N	Y	N	Y
Data level	Head-level	Head-level	Sibling-level	Sibling-level	Head-level	Head-level	Head-level	Head-level

Source: ARIS-REDS data set.
Notes: All columns report 2SLS estimates using "Predicted Share" as the instrument where the sample is restricted to Hindu male household heads (HH) whose parents owned land in the 1999 ARIS-REDS survey. Specifications 2, 4, 6, and 8 include controls for own education, mother's education, father's education, average spacing between siblings (winsorized [1 percent]), net dowry receipts (adjusted for inflation), birth order, and age. The dependent variable in Columns 1 and 2 is nonagricultural occupation and is defined as the primary status reported by the respondent in the REDS survey. The variable is coded as zero if this is self-cultivation or agricultural labor, and one otherwise. The dependent variable in Columns 3 and 4 is a dummy variable for whether the sibling migrated to an urban area in the same district or outside of it. The dependent variable in Columns 5 and 6 is the natural logarithm of yearly household consumption. This includes food and nonfood items and values home production at village-specific market prices. The dependent variable in Columns 7 and 8 is the log of the total value of all loans taken out in the last five years. The sample in Columns 3 and 4 are all male siblings of these household heads (including the heads) older than ten years. The instrument specification used is Predicted Share = 1/(1+Brothers). The *F*-statistic reported is the partial *F*-statistic for the instrument(s) (Cragg-Donald Wald *F*-statistic). Robust standard errors are given in parentheses. Standard errors are clustered at the family level for sibling-level regressions.

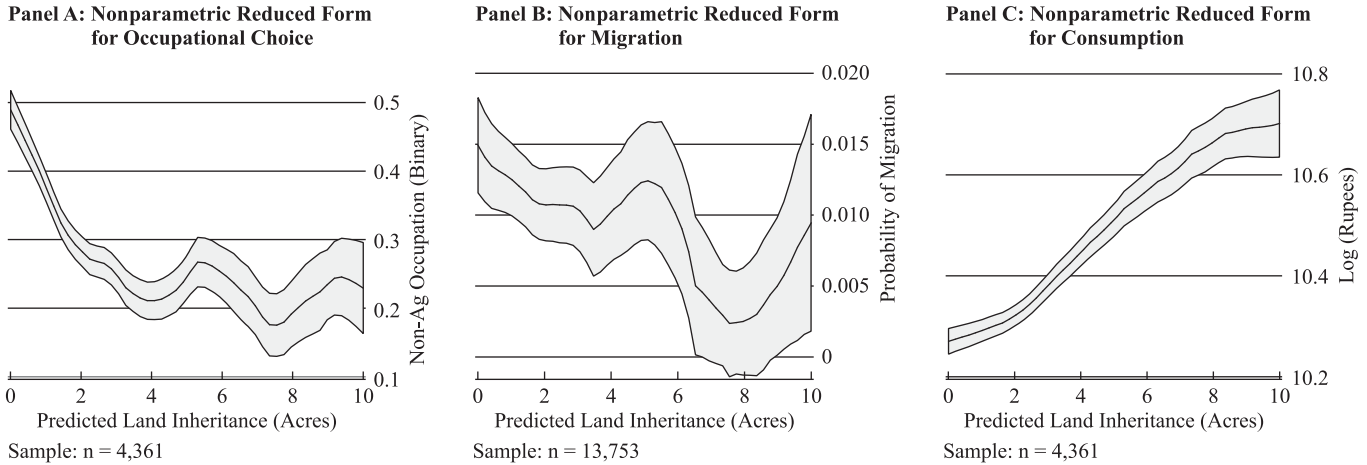

Figure 3

Nonparametric Visualizations of Reduced Form Equations for Occupational Choice, Consumption, and Migration

Source: ARIS-REDS data set.

Notes: These figures plot the reduced form for occupational choice (Panel A), urban migration (Panel B), and household consumption (Panel C). All figures plot smoothed values from kernel-weighted local polynomial regressions of the dependent variable in question on the predicted land instrument, which is equal to Parents' Land/(1 + Brothers). All figures use the epanechnikov kernel with the STATA calculated rule of thumb (ROT) bandwidth. The white bands show the 95 percent confidence interval, which are calculated using the default normalized weighted residual sum of squares from a local polynomial fit of a higher order using a pilot bandwidth of 1.5*ROT. All figures limit the domain to 10 acres, which accounts for 90 percent of the sample.

transitioning out of agriculture by −1.8 percentage points per acre.[27] Adding controls for net dowry receipts, education measured in years and a number of other household head and parent controls leaves the coefficient estimate largely unchanged in Column 2.

Panel A of Figure 3 plots the smoothed values and the 95 percent confidence bands from kernel-weighted local polynomial regressions of a dummy for holding a nonagricultural occupation on predicted land.[28] The estimated slope is much steeper across zero to four acres and levels off thereafter. This suggests that inherited landholdings are a particularly important determinant of occupational choice among those with smaller landholdings.[29] They are also likely to be the individuals with the most to gain from higher returns to their labor in the nonagricultural sector, as their agriculture is characterized by subsistence rather than large profits.[30]

2. *Migration to urban areas*

Inherited land may also facilitate movement of labor across space to take advantage of higher returns to labor in urban areas (Bryan, Chowdhury, and Mobarak 2014; Beegle, De Weerdt, and Dercon 2011). While the REDS data only surveys household heads in rural India, it records the movements of their siblings over space and records their inherited landholdings.[31] This permits the estimation of Equation 3 using data on all siblings. As before, the variation is across households as within a family all male siblings stand to inherit the same amount of land.

Columns 3 and 4 in Table 4 report the 2SLS estimate for the effect of inherited land on rural to urban migration. The effect of inherited land on the rate of urban migration is negative and significant at −0.02 percentage points per acre. However, the interpretation of this coefficient is complicated by the fact that reduced form regressions for household heads with landless parents also show a similar negative relationship. As such, the effects may operate through both the inheritance of land and an independent effect of sibling sex composition, potentially because more male siblings provide better urban networks and allow for sharing in the costs of migration. Panel B in Figure 3 plots the smoothed values and the 95 percent confidence bands from kernel-weighted local polynomial

27. Online Appendix 5 shows that this effect is driven by those with more land being less likely to own a nonfarm business. While the effects on entry into salaried work and nonagricultural wage work are negative, they are imprecisely estimated.

28. In order to show the reduced form along a continuous support, $Predicted\ Share = \left[\frac{Parents\ Land}{1+Brothers}\right]$ is used instead of the main instrument *Predicted Share*. The parents' land control is dropped in this specification.

29. When restricting the sample to individuals whose parents' landholdings are below the median of the distribution of parents' landholdings, this effect increases substantially to −7.3 percentage points per acre.

30. This claim is supported by the stylized facts that emerge from the analysis in Online Appendix 3. Using data from the Indian Human Development Survey, this appendix reports estimates for occupational wage gaps in rural India and how they differ for farmers with varying sizes of landholdings. The analysis is similar to Gollin, Lagakos, and Waugh (2014) in computing wage gaps between the agricultural and nonagricultural sectors, but differs in that it restricts this analysis to rural areas. The equivalent daily wage is higher in agriculture for those with landholdings above three acres relative to nonfarm business and nonagricultural wage labor. However, for those with landholdings below three acres, daily wages in nonfarm businesses (37 percent), salaried work (74 percent), and nonagricultural wage work (9.2 percent) are higher on average. These estimates control for human capital, age, sex, and district-level unobservables, but there could still be individual-level unobservables that drive these wedges.

31. Note, these results are not from a household roster, which only gives details for coresident siblings, but from a complete enumeration of all siblings irrespective of whether they are coresident.

regressions of rural–urban migration on predicted land. Once again, I see that while the estimated negative relationship is steep for amounts of land up to four acres, beyond this point the estimates are imprecise and qualitatively unclear.

3. Household consumption

While the prior estimates suggest that inherited land is an important determinant of occupational choice, the implications of these findings for the level of consumption remain unclear. It may be the case that those with more land are more likely to remain in agriculture because it leaves them better off than switching into nonagricultural work. Alternatively, inherited land may reduce spatial and occupational mobility to such an extent that it causes a lower level of consumption.

Columns 5 and 6 in Table 4 report the estimated effect of inherited land on the log of yearly household consumption. An additional acre of land increases household consumption in the long run by 2.7 percentage points Again, the addition of dowry, education, and other controls has little influence on the point estimate. Panel C in Figure 3 shows the reduced form relationship graphically using local polynomial regressions. The estimated effect of predicted land on consumption is flatter from zero to two acres and begins to increase at a higher rate thereafter.

C. Access to Credit

Initial endowments of land may facilitate a transition out of agriculture through increasing the ability of the landed to borrow and invest in high-return opportunities in the nonagricultural sector. However, if land does not effectively serve as collateral or financial institutions are absent, this may not be the case.

Columns 7 and 8 in Table 4 show that an additional acre of land increases the value of loans taken out on average by 15.2 percentage points (measured in log rupees), and this result is robust to the inclusion of several individual and parent controls. These results suggest that inherited land increases the ability of the landed to borrow and its effects on occupational choice, migration, and household consumption despite this.

VII. Heterogeneity by Birth Order

This section considers heterogeneity in the effect of inherited land across firstborn and latter-born sons.[32] In Section III.A, I describe how a cultural norm among Hindu families obligates firstborn sons to support their parents. However, this heterogeneity in birth order is of course correlated with other attributes. For example, Jayachandran and Pande (2013) find that parents invest more heavily in the human capital of firstborn sons in India; they are nearly 0.2 standard deviations taller for their

32. Firstborn in this case refers to the firstborn in the family, regardless of sex. If this definition were sex-specific, it would not be independent of the instrument, as those with fewer male siblings are more likely to be the firstborn son. This implies that some eldest sons are classified as "latter-borns" because they have older sisters. Columns 3–6 in Online Appendix 14 show that controlling for latter-born eldest sons does not change the qualitative interpretation of the results.

Table 5
Two-Stage Least Squares by Birth Order

Dependent Variable	Nonagricultural Occupation Binary (1)	Agricultural Labor Total Person Days (2)	Land Improvement Log(Rs.) (3)	Household Consumption Log(Rs.) (4)	Total Value of Loans Log(Rs.) (5)	Rural–Urban Migration Binary (6)
Firstborn	0.171***	–6.240*	–0.479**	0.163***	–0.037	0.007
	(0.056)	(3.691)	(0.230)	(0.063)	(0.386)	(0.007)
Land*Firstborn	–0.051***	3.012***	0.109**	–0.000	0.194**	–0.005***
	(0.012)	(0.755)	(0.048)	(0.013)	(0.078)	(0.002)
Land*Latter born	–0.007	1.352***	–0.016	0.030***	0.137***	–0.001
	(0.006)	(0.404)	(0.023)	(0.007)	(0.043)	(0.001)
Dependent variable mean	0.298	28.981	0.925	10.442	1.700	0.011
First-stage *F*-stat	26.513	26.513	26.513	26.513	26.513	42.46
N	4,809	4,809	4,809	4,809	4,809	14,773
No. of siblings FE	Y	Y	Y	Y	Y	Y
Age FE	Y	Y	Y	Y	Y	Y
Parents' land FE	Y	Y	Y	Y	Y	Y
District FE	Y	Y	Y	Y	Y	Y
Dowry, education and other controls	Y	Y	Y	Y	Y	Y
Reject equality of coefficients	Y	Y	Y	Y	N	Y
Data level	Head-level	Head-level	Head-level	Head-level	Head-level	Sibling-level

Source: ARIS-REDS data set.

Notes: This table reports the 2SLS coefficients from a regression on firstborn—a dummy coded as one if the respondent was the firstborn in his family, inherited land interacted with firstborn, and inherited land interacted with latter born (defined as all household heads who are not firstborns) where instruments are Predicted share*Firstborn dummy and Predicted Share*Latter born dummy. The sample is restricted to Hindu male household heads whose parents owned land. Dowry, education, and other controls include own education, mother's education, father's education, average spacing between siblings (winsorized [1 percent]), net dowry receipts (adjusted for inflation) and age. Nonagricultural occupation (Column 1) is defined as the primary status reported by the respondent in the REDS survey. The variable is coded as zero if this is self-cultivation or agricultural labor, and one otherwise. Agricultural labor (Column 2) is the total number of days of agricultural labor performed by the head in the prior season, and Land improvement (Column 3) is the log of the total expenditure on improvements in land (for example, terracing, bunding, fencing, leveling, reclamation etc.) undertaken in the last ten years. The dependent variable (Column 4) is the natural logarithm of yearly household consumption. This includes food and nonfood items and values home production at village-specific market prices. The dependent variable in Column 5 is the log of the total value of all loans taken out in the last five years. The dependent variable in Column 6 is a dummy variable for whether the sibling migrated to an urban area within the district or outside it. "Reject equality of coefficients" tests whether one can reject equality of coefficients for firstborn and latter-born with a *p*-value less than 0.1. The *F*-statistic reported is the partial *F*-statistic for the instrument(s) (Cragg-Donald Wald *F*-statistic). Robust standard errors are given in parentheses. Standard errors are clustered at the family for sibling-level regressions.

age and have almost two years more schooling on average relative to second-borns, suggesting that they start out with better endowments of human capital relative to latter-borns. As such, ex ante I might expect firstborn sons to work in occupations and areas with the highest returns to human capital, resulting in higher household consumption relative to their latter-born counterparts, irrespective of how much land they inherit.

Table 5 estimates Equation 4 from the empirical section, interacting land with a dummy for whether the respondent is the firstborn and another dummy for whether he is a latter-born. As such, I interact the instrument with both dummies to produce two instruments in order to recover separate causal estimates for firstborn sons and latter-born sons. All reported specifications include controls for the number of siblings, parents' landholdings, net dowry receipts, own and parents' education, age, and average sibling spacing. To the extent possible, the regressions partial out observable differences in human capital.

Column 1 in Table 5 shows that the effect of land on transitioning out of agriculture is −5 percentage points (significant at the 1 percent level) for each acre for firstborn respondents and virtually zero (and not significant) for latter-born siblings. Turning to the intensive margin, the amount of time spent by firstborn household heads in agricultural labor on their own farms (Column 2) is differentially increasing in the extent of inherited land. The same is true of investments in improving the land, including terracing and bunding (Column 3). Using sibling-level data, Column 6 shows that the probability of a firstborn sibling migrating to urban areas is also decreasing in their inherited landholdings, but this relationship is not significantly different from zero for latter-borns.[33]

Next, Column 4 shows that firstborn respondents have higher consumption on average, consistent with parents investing heavily in children obligated to support them. While inherited land has a positive effect on household consumption (three percentage points per acre) for latter-borns, for firstborn respondents the causal effect of land on consumption is indistinguishable from zero.[34] In contrast, the reduced form results for household consumption using the sample of household heads with landless parents yields a point estimate on *firstborn* interacted with *Predicted Share* that is positive, though not significant (Online Appendix 6, Column 4). These estimates once again suggest that the results are not driven by the interaction of birth order with sibling sex composition, except when the latter influences one's inheritance of land.

A. Discussion of Birth Order Results

Relative to latter-borns, firstborns have 16 percent higher household consumption, they are 17 percent more likely to work outside of agriculture, and are more likely to migrate to urban areas (not significant). The pattern of results above suggests that with smaller

33. Online Appendix 6 reports the reduced form for Table 5 but instead uses the sample of household heads with *landless* parents. Overall, the pattern of effects supports the proposition that the firstborn effect operates in combination with the inheritance of land, as there are no independent effects on occupational choice or migration for firstborns with a higher predicted share.

34. In results not reported, I estimate kernel-weighted local polynomial regressions of household consumption on predicted land by birth order. I find a dip in consumption for firstborns for inheritances of one acre but no corresponding dip for latter-borns (although the estimates are imprecise, with overlapping confidence intervals), suggesting that the opportunity cost is particularly high for marginal inheritances and reduces thereafter, which is also supported by the nonlinearity of the reduced form for household consumption.

landholdings, agriculture may not be a viable way to support one's parents. In this case, coresidence is not binding, and occupational choice and the spatial mobility of firstborns is not constrained by the norm. As inherited landholdings increase, providing support for one's parents becomes more viable through agriculture, and coresidence is binding. As such, with increasing landholdings, firstborns are differentially more likely to work in agriculture, invest in their land, and less likely to migrate to urban areas. In contrast, latter-borns face no restrictions from this norm. Their coresidence and occupational choices are not systematically related to inherited landholdings. There is some evidence to support that they "lease" their land to their firstborn siblings, and their household consumption is increasing inherited landholdings.[35]

Higher human capital for firstborns and complementarities with land do not explain these results. In addition, while birth order may also be correlated with "farm-specific" human capital, the fact that firstborns are more likely to work in nonagricultural occupations on average is at odds with this explanation, as is the fact that Jayachandran and Pande (2013) find that parents invest more in the formal education of firstborns. Overall, while it is certainly possible that other factors are correlated with birth order, controlling for a number of variables—years of education, mother and father's education, average sibling spacing, and net dowry receipts—has minimal influence on the point estimates, reducing concerns about omitted variable bias. Overall, the pattern of effects suggests that the cultural norm of parental support and the extent of land inherited plays an important role in explaining these results.

VIII. Robustness Tests

A. Selection Concerns from Urban Migration

A potential selection concern arises from the fact that all surveyed household heads in the REDS data set reside in rural areas. I observe the location of *all* siblings of household heads—irrespective of whether they reside in rural or urban areas—and their inherited landholdings, which allows me to estimate the negative effect of inherited land on urban migration. However, it may still be the case that *entire* families inherited large amounts of land that facilitated their migration to urban areas, and I do not observe this in the data. Omitting these "missing migrants" may result in an overestimate of the negative effect of land on migration or occupational choice. However, studies suggest that the wholesale rural to urban migration of families is extremely rare in India. Munshi and Rosenzweig (2009) and Foster and Rosenzweig (2007) estimate that just 3–5 percent of all males aged 15–24 migrated in each of the three decades preceding the 1999 wave of the REDS survey.

35. In unreported within-family estimates, latter-borns are less likely to experience an increase in their landholdings relative to the amount they inherited. In the main sample, 26 percent of household heads report that they experienced an increase in their landholdings over the prior two decades. Of these respondents, nearly 40 percent report receiving "gifts" of land, a category distinct from inheriting, leasing, or purchasing land. While no further details are given about these gifts in the 1999 wave, in the 2006 wave of the REDS survey, 80 percent of land leased is from family members. The majority of these contracts are oral rather than written, they do not involve a fee and have no specified term. Taken together, these facts support the interpretation that latter-borns, unbound by the norm of parental support, "lease" their land to firstborn siblings and are more likely to specialize in nonagricultural occupations to the benefit of their family's future consumption.

Nevertheless, I simulate the effect of a 10 percent rural to urban migration rate on the reduced form relationship for nonagricultural occupation.[36] Across a series of covariate values—parents' landholdings and number of siblings—that are most favorable to yielding inconsistent reduced form effects, I find that the implied sex composition of such migrants is very different to what is empirically observed in the IHDS data set that surveys such migrants.[37] In particular, even assuming that all "missing migrant" families have landholdings in the 95th percentile, virtually all such migrants would also need to be the only son in their family for the confidence interval to not contain the actual reduced form estimate. In contrast, the IHDS data reveal that just 11 percent of such rural to urban migrants are only sons.

B. Addressing Instrument Validity: Conditional Independence Assumption

1. "Missing women": Addressing sex selection and differential care

Several studies (Sen 1990; Gupta 2005) document the fact that sex ratios, particularly in northwestern India, are substantially skewed towards males, reflecting a preference for sons. In this context, parents may influence the sex composition of their children through sex-selective abortion or differential care for daughters. However, 99.7 percent of the RED sample were born prior to 1980, when ultrasound technologies became widely available, providing the main low-cost way to facilitate sex-selective abortion in rural India. While other methods, such as amniocentesis, may have preceded this, their availability in rural areas was limited (Arnold, Kishor, and Roy 2002).

Yet, differential investment or care may still pose a concern if the types of families who, for example, selectively provide less nutrition to female children also have unobserved characteristics that influence the future success of their sons. In order to address this concern, in Online Appendix 12, Column 3, I check whether the results are robust to a set of 18 dummies (zero to older than ten years, six-month intervals) that control for the average spacing between siblings. The assumption here is that differential care would influence the average spacing between births of siblings, as the incidence of female children may increase the desire for additional births (Anukriti, Bhalotra, and Tam 2016). Controlling for spacing has a minimal effect on the estimated coefficients and does not change their qualitative interpretation.

2. Two tests addressing differential stopping rules

Given a preference for sons, differential stopping behavior may result in families with otherwise similar resources having different numbers of children based on when they achieve their desired number of sons. On average, women in India are more likely to belong to families with a larger number of siblings and to have less education (Jensen 2003). While the inclusion of sibling fixed effects takes care of some of these concerns, it may still be the case that families with different fertility constraints or preferences end up with a similar number of children, resulting in an apples to oranges comparison in the regressions of interest.

36. This is the census-based *individual* urban migration rate for the three decades preceding the REDS survey.
37. Online Appendix 10 contains a detailed discussion of these simulations and the choice of covariate values.

I carry out two robustness checks that control for proxies of the demand for sex selection and differential stopping established in the literature. First, I check whether the results are robust to the inclusion of 223 fixed effects for the exact sex permutation of a respondent's older siblings, as in Vogl (2013). These controls are intended to test the robustness of the results to selective fertility choices, whereby the decision to continue having children is a function of the precise ordering of births preceding a respondent. The estimates in Column 2 of Online Appendix 12 report the results of this test. The estimated effects are significant and are qualitatively like those in the main specification. The only difference is that the point estimate for consumption is less precise, presumably on account of the reduction in covariate-specific variation induced by the controls (the first-stage *F*-statistic reduces by one-third).

Next, I restrict the sample to the subset of respondents whose youngest sibling is female. Such families could not have engaged in son-preferring differential stopping behavior since they "stopped" on a girl. The estimates are largely consistent with those from the preferred specification. Column 4 of Online Appendix 12 reports the estimates for the subset of respondents whose youngest sibling is female. Once again, the estimated coefficients are comparable to those obtained in the main specification in Column 1, and in this case, they are also precisely estimated.

C. Addressing Instrument Validity: Exclusion Restriction Assumption

1. Robustness of 2SLS estimates to relaxing exclusion restriction

A key concern with estimation strategies relying on instrumental variables is the validity of the exclusion restriction assumption. In this context, the independent effects of sibling sex composition on human capital and dowry payments are of particular concern. In the former case, either a desire for diversification through reducing income covariance or decreasing returns to investing in the education of successive male children may result in respondents from families with more brothers having less education on average. In the case of dowry payments, families must typically pay a substantial sum for the dowry of a daughter when she marries. This may result in families with a higher composition of female children being more credit constrained, thereby potentially influencing the cash reserves their sons are able to access.

Controlling for education and dowry payments does not change the 2SLS estimates.[38] However, Column 1 in Online Appendix 13 shows that the first stage for years of education is indeed negative, implying that those with more land have more education and that this bias runs counter to the finding that less land may be beneficial. In contrast, the parents of respondents with fewer sisters incur less dowry payments, suggesting that those who have less land may also have less credit-constrained parents.[39] The first stage

38. In Column 2 of Online Appendix 13 I add a set of 12 dummy variables (0–13, one-year intervals) that control for the education of the respondent to the main specification (Equation 2). These controls mostly leave the estimates unchanged relative to the main specification. Similarly, in Column 2, I add to the main specification a set of 19 dummy variables (Rs. −50,000 –Rs. 50,000, Rs. 5000 intervals) that control for net dowry receipts. Once again, the 2SLS estimates are left largely unchanged.

39. Column 2 in Online Appendix 13 reports the first stage for a dummy coded as one if net dowry receipts are above the median (Rs. 0). Net dowry receipts are defined as the net sum of all dowry paid and received for all siblings of the respondent, adjusted for inflation using the date of marriage. The use of a median threshold rather than the natural logarithm—used for all other rupee values—is on account of many values being negative.

for land is 10–15 times as large as the first stage for these alternative channels, suggesting that 2SLS coefficients are less sensitive to these exclusion restriction violations.

In Online Appendix 15, I model how violations of the exclusion restriction would influence inference for the three main outcome variables using the methods developed by Conley, Hansen, and Rossi (2012). Importantly, they show that in the just identified case, the bias in the 2SLS estimate resulting from a violation of the exclusion restriction is proportional to γ/π, where γ is the size of the exclusion restriction violation, and π is the first-stage coefficient for the endogenous variable of interest. Given that in this case π is 125.95 in the preferred specification, γ must be extremely large in order to bias the estimates.

In Panels A–C, I use the union of confidence intervals approach, which assumes the support for the size of exclusion restriction to be $\gamma = [-2\delta, 2\ \delta]$. Using a 95 percent confidence interval, these simulations show that even when the size of the exclusion restriction is very large (12 percentage points for nonagricultural occupation, ten percentage points for household consumption, and 1.2 percentage points for urban migration), one can still reject the null hypothesis. The local-to-zero approach imposes explicit distributional assumptions to model the prior distribution of the exclusion restriction violation. In Panels D–F, I model the effect as coming from a normal distribution with $N(0,\delta^2)$ as the dowry and education violations go in opposite directions. For each of the main outcomes, I observe that the size of the exclusion restriction violation would need to be at least three times as large as the estimated 2SLS coefficient to seriously influence inference.

2. Placebo using variation in inheritance customs

In a similar vein to the placebo tests using landless families, Online Appendix 7 uses the main sample and separate data from the Indian Human Development Survey (IHDS) to estimate reduced form regressions in regions of India with historically matrilineal, bilineal, and patrilineal inheritance customs. Matrilineal and bilineal inheritance customs entitle women to inherit more land on average relative to other parts of India. As such, the first stage for inherited land in these areas may be much weaker, but any other effects of sibling sex composition that operate through alternative causal channels should still influence outcomes in these areas.

The classification of communities with matrilineal and bilineal (hereafter, matrilineals) inheritance customs follows Agarwal (1994).[40] In the ARIS-REDS data, I'm able to identify two historically matrilineal castes: the Nayyars and Ezhava of Kerala, but they account for just 106 respondents, leaving these tests likely underpowered. In contrast, the IHDS does not allow me to identify specific caste groups but has a superior geographic coverage, including several northeastern states with large, historically matrilineal inheritance customs. As such, for the IHDS, I instead classify Kerala, Assam, Arunachal Pradesh, Meghalaya, Tripura, and Nagaland as having significant communities with matrilineal inheritance customs.

However, the 5th percentile is Rs. –439,937, and the 95th percentile is Rs. 291,390, although the mean is just –Rs. 24,799 leading to OLS estimation in levels to be greatly influenced by outliers.

40. Specifically, I follow Agarwal (1994, Table 3.1, p. 141). While Assam is in the ARIS-REDS data, none of the castes in the sample have matrilineal or bilineal inheritance customs.

In this case, the outcome of interest is regressed on a dummy (*Patrilineal*) for a state with historically patrilineal inheritance customs, the interaction of *Predicted Share***Patrilineal* and the interaction of *Predicted Share***Matrilineal*, where *Matrilineal* refers to states with historically matrilineal and bilineal inheritance customs. Column 1 shows that the first stage for matrilineals is much smaller than it is for patrilineals, and we're able to reject equality of coefficients. While this is also true for household consumption (Column 3), this is not so for agricultural occupation and urban migration.

Columns 5–7 report analogous reduced form estimates using the IHDS data.[41] Column 5 shows that while the instrument predicts landholdings in patrilineal states, there is no first stage in matrilineal states, and one can reject equality of coefficients. Columns 6 and 7 show that while there are precisely estimated reduced form effects for occupational choice and household consumption in patrilineal states, there are no reduced form effects in matrilineal areas, and equality of coefficients can be rejected.

IX. Discussion and Conclusion

A. Assessing Welfare Claims

Recent literature has documented persistent differences in the returns to labor between rural and urban areas in the developing world and has posed the question as to why the rural poor do not take advantage of higher return opportunities outside agriculture (Gollin, Lagakos, and Waugh 2014; Bryan, Chowdhury, and Mobarak 2014; Munshi and Rosenzweig 2016). In this work, I show that the long-term consequences of inheriting agricultural land are to leave inheritors more likely to work in the agricultural sector and less likely to migrate to urban areas. Furthermore, I show that in a context with limited land markets, firstborn sons—on whom a cultural norm is incumbent—are less likely to transition out of agriculture and are *differentially more likely* to supply labor on and invest in their farms. In addition, they are *differentially less likely* to work in nonagricultural enterprises and migrate to urban areas, with these effects increasing in the amount of land inherited. Perhaps as a result, firstborn sons inheriting land has no effect on household consumption and their advantage relative to latter-borns—documented elsewhere in the literature—narrows with the size of their inheritance.

The results do not suggest that firstborn sons who inherit land are worse off in welfare terms. Firstborns may experience utility from satisfying a cultural norm, the utility of their parents may enter into their own—that is, their actions may be welfare-maximizing for the household—or they may receive other material benefits from their parents that are not captured by household consumption. However, it is clear that the inheritance of land differentially influences their occupational choice, propensity to migrate, and household consumption. As such, these results inform the literature exploring why the rural poor do not migrate to urban areas and/or leave the agricultural sector.

41. The IHDS data do not contain information on parents' landholdings or inherited land. Therefore, in Column 5 I instead use land owned.

B. Conclusion

Using an instrumental variables strategy that relies on variation arising from sibling sex composition and Hindu inheritance customs, this work's primary contribution is to show how the inheritance of an illiquid asset, agricultural land, and cultural norms can interact to limit the movement of labor moving out of the agricultural sector.

Contrary to theories of poverty traps emphasizing the importance of wealth for accessing opportunities outside of agriculture, I find that the inheritance of agricultural land does the contrary: inheriting land reduces the likelihood of exiting agriculture both within rural areas and through migration to urban areas. For those inheriting below-median landholdings, the effect sizes are two to four times as large.

Second, inheriting lands increases household consumption, but I find that a cultural norm may undermine these benefits of inherited land. Importantly, the results suggest that the norm itself isn't sufficient to influence occupational choice but rather acts in combination with inheriting agricultural land. In so doing, these results also show how a norm—in this case the incidence of coresidence with parents—may or may not bind depending on economic circumstances.

The findings of this study suggest that cultural norms may be a source of labor market misallocation in rural India. Individuals wishing to part with inherited land passed through a family for generations may face unique constraints. However, as entry into smallholder farming in the developing world continues to be dominated by systems of inheritance rather than markets, these concerns need not be limited to the present context. Consequently, the most productive farmers may be unable to enter agriculture, resulting in suboptimal agricultural productivity. Future work may test this implication by estimating how land market reforms and changes to inheritance laws influence agricultural productivity and labor mobility.[42] A second implication is that interventions that improve the returns to unproductive farmers remaining in agriculture will create additional distortions in labor markets. Spatial and temporal variation in large-scale programs intended to improve agriculture would provide a test of this implication.

An important caveat to my findings is that consumption may not adequately capture welfare. Incorporating measures of productivity as discussed above and subjective measures of well-being will strengthen the evidence for misallocation. Finally, given the preponderance of patrilineal inheritance laws across the developing world, a similar instrumental variables strategy can be used to understand the importance of inherited assets for labor market outcomes across a number of contexts.[43]

42. For example, in India the computerization of land registries and amendments to the Hindu Succession Act may have important consequences for labor market outcomes through influencing the channels discussed here.
43. For example, Kuran (2012) studies the implications of Islamic inheritance laws, where male heirs typically inherit twice the amount that daughters inherit.

Appendix

Variable Definitions

Birth Order: This variable is constructed using the date of birth of all siblings of the head of the household and their own date of birth. The variable is ordered by year of birth, and any siblings born in the same year are assigned the same birth order.

Changes in Landholdings: This variable is constructed for all siblings of the household head including himself. It is the difference between the reported amount of current land owned by the sibling and the land inherited.

Household Consumption: This variable is an aggregate of yearly expenditure on cereals (rice, wheat, maize, bajra, jowar, ragi, and other cereals), pulses (tur, gram, urd, moong, and other pulses) and values home production of these crops at village specific market prices. Other food items include gur/khandsari, edible oils, spices, milk, milk products, eggs, meat, fish, fruits, vegetables, bread, biscuits, confectionary, processed food, beverages, cooked meals as wages, and any other items. Any home production of these items is also valued at village-specific market prices.

This measure of consumption also includes yearly expenditure on durables, including radios, transistors, fans, torches, lanterns, petromax, metal utensils, water boilers, buckets, kerosene stoves, bicycles, tricycles, motorcycles/scooters, cars/jeeps/vans, sewing machines, wooden furniture, cots, wooden boxes, almirahs, steel trunks/boxes, steel furniture, watches, clocks/time pieces, cameras, televisions, VCRs, cassette recorders, washing machines, pressure cookers, mixers/grinders, electric irons, geysers, refrigerators, cassette players, and Walkmans.

Expenditure on clothing was elicited separately and includes expenditure on readymade garments, dhotis, saris, cloth for garments, shawls/pullovers, hosiery, footwear, and tailoring charges. Expenditure on fuel—and any home production used for consumption—was also elicited separately and is included in the measure of consumption. This includes firewood, kerosene, charcoal, soft coke, gas, electricity, and other fuels.

The final set of expenditure categories includes toiletry and cosmetics, bedding charges, towels/linen, pan/beedis/cigarettes, intoxicants, newspapers/periodicals, medical expenses for all household members, education expenses, entertainment expenses, expenses in hotels/restaurants, house rent paid, repairs to rented house, repairs to consumer durables, payments to domestic servants, payments to barber/laundry/priest/sweeper, travel expenses, other regular expenses, expenditure on marriage ceremonies (including gifts), expenditure on other social ceremonies, and expenditure on religious ceremonies.

Inherited Land: This variable is directly acquired from respondents, distinct from land currently owned, and is measured in acres. The question asked is: "What is the amount of land inherited prior to recent period?"

Parents' Land: This variable is directly acquired from respondents and is measured in acres. The question asked is: "What is the amount of land owned by head's parents?"

Land Improvement: This variable sums the costs of hired labor, the imputed value of family labor, and any material costs—valued at market rates—incurred in improving the quality of land through terracing, bunding, leveling, fencing, and reclamation in the last ten years.

Land Increase: This variable is constructed for all siblings of the household head and himself. It is coded as one if the respondent's current landholdings are greater than their inherited landholdings, and zero otherwise.
Net Dowry: The household head is asked the value of dowry payments paid and received by his parents for each of his siblings. Net dowry is the difference between the value of all payments received minus all payments paid. These values have been adjusted for inflation using the CPI (constant at 2015 prices) from OECD.stat (https://stats.oecd.org/Index.aspx?DataSetCode=PRICES_CPI, accessed August 25, 2021)
Nonagricultural Occupation: The question asked in the survey used to define this variable is the household head's response to their "Primary Activity Status." The options for this question include 1. self-employed farming, 2. self-employed non-farming, 3. salaried, 4. agricultural wages, 5. nonagricultural wages, 6. agricultural family worker, 7. nonagricultural family worker, 8. pensioner, or 9. other. "Non-agricultural occupation" was coded as zero if the head responded with 1, 4, 6, or 7, and one otherwise.
Predicted Share: This instrument is constructed using the total number of brothers reported by a respondent who reached the age of ten. These data are contained in a section enumerating all siblings of the head of the household
Rural to Urban Migration: The household head is asked where each sibling "lives now," with the options: 1. same village, 2. town in same district, 3. village in same district, 4. town in other district of same state, 5. village in other district of same state, 6. town of other state, 7. village of other state, or 8. village/town of other country. The variable is coded as one if head responded with 2, 4, 6, or 8, and zero otherwise.
Total Man Days of Agricultural Labor: This variable aggregates self-reported information on the number of days in the past year the household head worked in agricultural labor by aggregating the number of man days reported for preparatory tillage, sowing and transplanting, manuring and fertilizing, weeding and interculture, irrigation, harvesting, threshing and winnowing, and "other operations."
Total Value of Loans: This variable sums the total amount repaid and the total amount outstanding for loans taken out in the last five years. This includes both cash loans and the rupees value of in-kind loans.

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