

Long-Run Impacts of Land Regulation: Evidence from Tenancy Reform in India ^{*}

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Abstract

Land reform policies have been widely enacted across the developing world. However, despite the central importance of land as an asset in low-income economies, evidence about the long-run impact of such policies remains limited. In this paper, we provide evidence about these long-run effects by combining the quasi-random assignment of linguistically similar areas to South Indian states that subsequently pursued different tenancy regulation policies with cross-caste variation in landownership. Roughly thirty years after the bulk of land reform occurred, land inequality is lower in more regulated areas, but the impact differs by caste group. Tenancy reforms increase own-cultivation among middle caste households, but render low caste households more likely to work as daily agricultural laborers. At the same time, an increase in agricultural wages is observed. These results are consistent with credit markets playing a central role in determining the long-run impact of land reform: tenancy regulations increased land sales to the relatively richer and more productive middle caste tenants but reduced land access for poorer low caste tenants.

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1 Introduction

The institutional arrangements that shape access to land are central to the functioning of an agricultural economy. Given that a large fraction of the world's poor remain dependent on agriculture, production relations in this sector have a first-order impact on aggregate poverty. Moreover, there is a classic view, formalized in Matsuyama (1992), that contends that productivity improvements in agriculture are a spur to industrial development because they increase the demand for industrial goods. Accordingly, promoting the transfer of land to its highest-return use has the potential to have a major impact on economic growth in developing countries.

In much of the developing world, institutions introduced or strengthened by colonial powers left a legacy of significant concentration of land ownership and insecure tenure for tenants. In conjunction with imperfections in other key markets (e.g., the market for credit), these inequalities continue to constrain long-run economic growth and, in particular, the transfer of land towards high return activities.¹ As increasing demand for land from the industrial sector has clashed with often inefficient inherited institutions in many countries, most notably India and China, intense debates have emerged around whether and how governments should regulate the terms on which land can be acquired from landowners and tenants (Ghatak & Mookherjee 2011).

Given the potential mismatch between relatively stagnant institutions and rapidly evolving demand, government regulation of land transactions is, unsurprisingly, common. However, there is no guarantee that such regulation produces gains for all groups even if there is greater overall efficiency. The complexity of designing partial reform in a second-best world is a longstanding theme in the development literature (Stiglitz 1988). But in large part due to data constraints, there is little solid empirical evidence on the long-run impact of regulated land markets. This, in turn, limits our understanding of whether and how economic actors use land markets to reduce or amplify the intended impact of regulation.

This paper explores the long-run effects of tenancy reforms using a unique natural experiment in India. Following Independence, the country witnessed a wave of state-level reforms (Appu 1996). In the four Southern Indian states examined here (Andhra Pradesh, Karnataka, Kerala and Tamil Nadu), the major period of reform began shortly after Independence and continued until the early 1970s. We employ village- and household-level data to trace the impact of reforms which took place more than 30 years prior to our survey, allowing us to examine a number of dimensions in which we could expect tenancy

¹See for example Pande & Udry (2006), Banerjee & Iyer (2005), Acemoglu, Johnson & Robinson (2001) and Binswanger, Deininger & Feder (1995). Banerjee (2003) provides an overview of the importance of credit market imperfections in development.

reform to have a long-run impact.

Theoretically, landlords can choose between different ways of exploiting their land to generate a return, including selling the land and investing in other assets. The attractiveness of operating land when tenants have stronger rights depends on the extent to which landlords can extract returns from doing so, while the ability to sell land depends on the capital market opportunities of potential owner-cultivators. Tenancy reforms lower the returns of renting land for landlords; thus it is logical to expect less use of tenancy and more land sales, particularly to those with access to the credit market. This will lead, in turn, to a change in the distribution of land ownership. If frictions in the land market allow landowners to extract only part of the surplus created in a land sale, sales will occur only to relatively high productivity individuals. Thus, by enabling more efficient land use, land sales will increase labor demand and hence the agricultural wage.

Tracing through these equilibrium effects complicates the overall welfare impact. Cultivators who remain as tenants will gain, but marginal tenants will lose out as they become landless laborers. However, their opportunities in the labor market should improve. Households with better capital market opportunities are more likely to end up as owner-cultivators. These are the predictions that we bring to the data.

Our identification strategy exploits the 1956 reorganization of state boundaries in Southern India, designed to transform the state units inherited from the British into linguistically coherent states. The reorganization allocated sub-district administrative units called blocks to states, on the basis of the population's linguistic composition. However, the need to form states with contiguous territory sometimes led to blocks with similar linguistic and cultural characteristics being assigned to different neighboring states. These blocks were analogous both in historical experience and social structure – two factors which, as we describe in Section 2, were significant determinants of the landownership distribution. The blocks, however, subsequently experienced significantly different programs of land reform.

We undertook a multi-stage sampling and survey procedure to construct our sample. We identified nine neighboring district pairs in the four southern states of interest. For each pair, blocks were matched using a linguistic index based on census data on the proportion population speaking each one of the eighteen languages reported spoken in the region. The 18 best matched pairs were chosen, and in 2002 we conducted household surveys in a random sample of 259 villages spread across these blocks. In Section 4 we use 1951 data on village-level landlessness to demonstrate similarity in initial landlessness across blocks in matched pairs.

Our analysis, therefore, exploits variation in land reform across block pairs matched on linguistic characteristics to evaluate the impact of land reform. Accordingly, the key

identifying assumptions require that the assignment of different blocks to different states along the border is quasi-random conditional on observable characteristics, and that the channel through which state assignment affects rural land distribution is land reform. If these assumptions hold, estimating the impact of land reform within block pairs allows for an unbiased estimate of the causal effect of such reform on economic outcomes.

Second, we interact variation in land reform with households' presumed land ownership prior to the reform, proxied by their caste status. This interaction both tests the key theoretical predictions about the differential impact of land reform on households with different baseline characteristics, and allows for the identification of the causal effect of land reform under the weaker identification assumption of no systematic variation in between-caste group differences across state borders.

The results suggest that tenancy reform reduced land inequality within villages, predominantly by transferring land from upper caste landowners to middle caste tenants. However, in line with the theory, tenancy reform also increased the number of landless Scheduled Caste and Scheduled Tribe (SC/ST) households, a group that presumably had poorer access to credit. Consistent with our model, we also observe higher agricultural wages after tenancy reform.

Our findings contribute to a large literature on institutional persistence (Acemoglu, Johnson & Robinson 2001, Banerjee & Iyer 2005). While the relationship between institutional patterns and economic outcomes has been widely analyzed, the focus on aggregate outcomes often makes it difficult to explore specific mechanisms through which the two are linked. Detailed household survey data allows us to examine changes in household landholdings and labor market behavior that are generated by reforms.

Our paper also employs an innovative empirical strategy. While several recent papers have exploited the random assignment of borders for institutional variation (Michalopoulos & Papaioannou 2011), sampling blocks that are linguistically similar but not immediately geographically adjacent allows us to use an innovative empirical strategy to address the concern raised by Bubb (2011) that there is little *de facto* variation in property rights across state borders, even if there is *de jure* variation.

This paper is organized as follows: Section 2 provides an institutional overview of tenancy reform, a brief review of the literature on the economic impact of land reform, and a description of the natural experiment. Section 3 presents a theoretical framework used to generate predictions about tenancy reform. Section 4 introduces the data and discusses the empirical strategy. Section 5 provides the empirical results and Section 6 concludes.

2 Background

In this section we provide background on key points relevant to the analysis. First, we describe land relations in India at Independence and the subsequent tenancy reforms that we analyze. Next, we consider existing evidence on the effects of land reform. Finally, we describe the language-based state reorganization that we exploit in this analysis.

2.1 Land Relations in India

The social and economic structure of village India is intrinsically tied to the caste system. Hindus, who make up over 80% of India’s population, are born into a caste. Castes are endogamous groups defined by closed marriage and kinship circles.

Historically, the caste system also defined household occupation with landownership restricted among lower castes. Prior to British rule in India, inheritance determined land rights and land sales were extremely rare. While the British introduced new forms of land taxation, these changes did not disrupt the caste-land relationship, and rather worked to strengthen the correlation between landlessness and a low position in the caste hierarchy.

Two main forms of land taxation were introduced by British administrators. The first was the zamindari system, under which revenue liability for a given jurisdiction was assigned to a landlord who was empowered to collect revenue and enforce the payment of taxes. Zamindars were essentially awarded property rights for a village or group of villages (Banerjee & Iyer 2005). The second system was ryotwari, in which every registered landholder was recognized as a proprietor with the right to sell or transfer the land, and assured of permanent tenure as long as land revenue was paid. However, land taxes were high, and over time there were a significant number of both distress land sales and land appropriations by moneylenders when debt repayments were not made.

At Independence, India’s large landowners were typically drawn from the upper castes. There were two main categories of tenants. First, there were *occupancy tenants* who enjoyed permanent heritable rights on land, security of tenure and could claim compensation from landlords for any improvement on the land. These were typically the middle and lower castes (often grouped as Other Backward Castes or OBCs). Second, *tenants at will* did not have security of tenure and could be evicted at the will of the landlord. This class generally consisted of the lowest castes and tribal households (grouped as Scheduled Castes and Tribes or SC/ST).

Quantitative and qualitative evidence collected in the early post-independence period emphasized that lower castes were largely landless laborers, servants, or tenants for the upper castes: e.g., in Tamil Nadu, 59% of the members of one upper caste were reported to be either landlords or rich peasants, while only 4% of the untouchable caste were

landlords (Srinivas 1966, Sharma 1984). This translated into widespread landlessness – by 1956 estimates suggest that roughly one in every three rural household was landless, with the prevalence much higher among lower castes (Kumar 1962, Shah 2004).

Such statistics provided a significant impetus to land reform efforts in India post-Independence, to which we now turn.²

2.2 Land Reform: Policy and Existing Evidence

In India, the constitution decreed that land policy was a state subject, and soon after Independence states began enacting such reforms, largely passed between 1950 and 1972. This wave of legislative activity included several major initiatives: the abolition of intermediaries, the imposition of land ceilings, and tenancy reforms.

The first type of reform, abolition reforms, abolished the zamindari system. Following the reforms, former tenants were now in a direct relationship with the state, rather than with a feudal lord, but this afforded relatively few immediate benefits. Even worse, abolition reforms often led to large-scale evictions of “tenants-at-will, undertenants and sharecroppers.” Since the laws abolishing zamindari allowed for retention of land for personal cultivation, many landholders responded by expelling tenants in order to increase this exempted area (Appu 1996).

The second class of reform included legislation that placed a ceiling on legal landholdings. However, these so-called “ceiling reforms” were typically weakened by provisions that set a high ceiling, established a large number of exceptions to the stated limit on landholdings, and offered no clear process by which to identify holders of surplus land or proceed against them (Rajan 1986, Radhakrishnan 1990).³ Moreover, land that was redistributed was often in small plots and of poor quality, requiring substantial (and likely unaffordable) investments prior to cultivation (Herring 1991).

The final set of reforms – tenancy provisions that regulate relationships between tenants and landlords or, in some cases, render tenancy illegal – are widely identified as the best implemented reforms, characterized by less manipulation and fewer administrative bottlenecks (Eashvaraiah 1985, Herring 1991). However, even in this case, several

²The design of land reform in developing countries has long been a major preoccupation of policy-makers and academics. A 1975 World Bank policy paper strongly supported redistributive land reform, with an emphasis on transferring land to more productive users and promoting owner-operated farms. However, implementation of these reforms has varied widely over the post-World War II period. While land reform was relatively successful in much of Asia where land relations were characterized by tenants cultivating landlord estates, in areas dominated by the hacienda system — in which tenants work on the landlord’s farm and in turn receive a small plot of their own — it was largely stymied (Deininger & Binswanger 1999).

³Mearns (1999) argues that ceiling reforms achieved little because of the prevalence of loopholes and the bribing of record keepers or falsification of land records; see also Herring (1970) and Bandyopadhyay (1986).

authors note that larger tenants are the primary beneficiaries of tenancy provisions and differential eviction of informal tenants is common (Appu 1996).

The historical literature has elaborated extensively on the challenges encountered in implementing tenancy reform. Eashvaraiah (1985) in his analysis of Andhra Pradesh argues that the 1950 tenancy reform in effect created two classes of tenants, since those who were already evicted to avoid previous reforms were not reinstated and remain landless. Similarly, Pani (1983) finds that the implementation of land reform in Karnataka led to a large number of former tenants becoming agricultural laborers. Das (2000) contends that land reform resulted in tenants with substantial rights obtaining freehold occupation, while “inferior tillers,” defined as inferior tenants, sharecroppers, contract farmers or paid laborers, lose access to cultivable land entirely.

Thus there are several reasons to focus on tenancy reform in this analysis. First, the previous literature generally suggests this was the only successful type of land reform, though certainly not without challenges. Second, this emphasis is consistent with the recent re-orientation of the broader land reform agenda towards a focus on the potential of land rental markets, appropriately regulated, as a means to provide the poor with some access to land (Deininger & Binswanger 1999).

Third, the design of tenancy laws implied that their impact would systematically vary with a household’s initial tenurial security and access to credit. In almost every state, tenancy laws granted landowners rights of resumption for “personal cultivation”, while tenants who remained on non-resumable tenanted land were eligible for ownership rights. In setting the land price, states either directly established a price or on occasion subsidized the market price. The design of the legislation thus ensures that the impact of land reform will be highly heterogeneous across pre-reform landownership status, which is closely linked to the historic caste structure.

We conclude with a review of quantitative studies on land reform in India. Banerjee, Gertler & Ghatak (2002) analyze Operation Barga, a program that encouraged tenancy registration in West Bengal and find that it lead to significant increases in agricultural productivity. However, Bardhan, Luca, Mookherjee & Pino (2011) find no clear evidence of reductions in inequality. A broader literature uses state-level variation in land reform to estimate its effect. Using cross-state evidence, Besley & Burgess (2000) find significant correlations between land reform and poverty reduction, while Conning & Robinson (2007) show that tenancy rates did fall as a result of land reform. Finally, Ghatak & Roy (2007) find no significant impact of land reform on land inequality as measured by the Gini coefficient.

There is also widespread evidence that, as we argue here, capital market imperfections play an important role in determining the structure of land markets and the impact of

policy reforms on that structure. A basic empirical regularity indicative of the prevalence of these imperfections is the persistence of large land plots despite the well-documented negative land size-productivity relationship (Ray 1998).⁴ Other evidence supporting this hypothesis includes the fact that the average land sale is a distress sale, thus creating a “market for lemons” problem that inhibits efficient sales (Rosenzweig & Binswanger 1993). Finally, land sale price often excludes the collateral value of land as buyers may have to mortgage land in order to purchase it (Binswanger, Deininger & Feder 1993, Deininger & Binswanger 1999). This leads potential buyers to undervalue the land, rendering the land market even thinner.

Finally, several recent studies examine the political economy of land reform. Mookherjee & Bardhan (2010) find evidence at the local level in West Bengal that the intensity of political competition (rather than party ideology) drives the incidence of land reform. Anderson, Francois & Kotwal (2011) present evidence that even post-land reform, landowners benefit from clientelist structures that they use to maintain political power and limit the implementation of policies that would redistribute income away from them. Similarly, for Mexico, de Janvry, Gonzalez-Navarro & Sadoulet (2011) argue that the left-wing party favored partial land reform over full land reform as it helped maintain a sufficiently large voter base of relatively poor voters. By documenting the pattern of gainers and losers, our study provides evidence that is useful in analyzing these political economy questions.

Against this background, we describe the institutional factors that we exploit in our analysis.

2.3 State Reorganization and Tenancy Reform in South India

At the time of the nation’s founding in 1947, India’s administrative structure reflected the history of the expansion of the British East India Company and subsequently the British colonial government. Southern India was comprised of five states. Hyderabad and Mysore had been princely states under British rule, governed by local rulers with indirect colonial control via a British resident.⁵ Travancore and Cochin were progressive princely states located on the southwest coast. The remainder of South India was directly ruled under the Madras presidency. The land tenure system in these states was a mix of Zamindari and Ryotwari, but the sub-district administrative unit of a block typically had a single land tenure system. Our unit of analysis is the block.

⁴ This suggests that capital market frictions prevent landowners from extracting the full surplus from the sale of their land and thus inhibit sales that would otherwise be optimal.

⁵Hyderabad had originated as the territory of a Mughal governor who established control over part of the empire’s territory in the Deccan plateau. Mysore emerged out of the defeat of the kingdom of Tipu Sultan in the early 19th century.

In the post-independence period, a movement grew to redraw state borders along linguistic lines. Based on the recommendations of a national commission, South India was divided into four linguistically unified states in 1956: Andhra Pradesh (AP), a largely Telugu-speaking state, was created from Hyderabad and the Telugu-majority areas of the Madras presidency. Karnataka (KA), intended to be predominantly Kannada-speaking, was created by the merger of Mysore and Kannada-speaking areas of Hyderabad and the Madras and Bombay presidencies. Kerala (KE), predominantly Mayalayam-speaking, encompassed the princely states of Travancore and Cochin and parts of the Madras presidency. Tamil-majority areas of the Madras presidency constituted the new state of Tamil Nadu (TN).

Districts were assigned to states primarily on the basis of the majority language spoken, but also in order to fairly assign valuable cities and ports, reasoning that was explained in great detail in the report produced by the commission (Government of India 1955). Figure 1 shows the borders of the new South Indian states overlaid on the previous state borders.

The state reorganization commission largely kept the sub-state administrative units of districts and blocks unchanged, identifying configurations of linguistically similar and geographically contiguous districts that would form a state. In some cases, however, blocks were reassigned across districts. Inevitably, on the borders of the new states, there were a number of cases in which two blocks with similar climate, geography and linguistic composition were separated into different states. Typically, these block pairs were previously part of the same state and possessed a shared political and administrative history.

Our identification strategy exploits the presence of such block pairs, under the assumption that shared history and linguistic (and caste) structure renders one block within the pair an appropriate control group for the other. On the latter point, it is relevant that in South India kinship structures and caste groups are defined within linguistic groups (Trautman 1981). Accordingly, blocks with similar linguistic composition may plausibly be considered to have similar caste structures. Thus our sampling and survey strategy sought to ensure that the two key features that determined pre-reform land distribution, caste structure in the village and political and administrative history, are held constant across the two blocks that are matched into a pair (on this, also see Section 4).

Next, data on tenancy reform in Southern India before and after the states' reorganization report is assembled from a variety of historical sources. Appendix Table 7 provides a summary of the number of tenancy reforms before (Pre) and after the states' reorganization (Post) in 1956 in the sampled districts, broken down by the number of each type of reform (abolition, ceiling and tenancy). Appendix Table 8 lists the dates and

provisions of tenancy reforms by state. In general, tenancy reforms include measures that seek to enhance and codify tenants' rights to use their lands in specific ways; measures to prohibit eviction or the resumption of land use by the landlord; and in some states, legislation that grants full ownership rights to tenants. As we discuss in Section 4, a count measure of tenancy reforms will be employed as the primary independent variable.

The tables show that Kerala undertook the most land reform, and by the end of the period had prohibited tenancy. Andhra Pradesh and Tamil Nadu both experienced intermediate levels of land reform, and districts in Karnataka experienced the lowest cumulative levels of land reform. In all four states, provisions on maximum rent and tenants' rights to purchase land disincentivized tenancy arrangements (Appu 1996). In order for our identification strategy to generate accurate estimates of the impact of land reform on economic outcomes, we need to impose the assumption that other policies generating large shifts in rural landownership patterns do not meaningfully differ across states. Further discussion of the identification assumptions for the primary analysis can be found in Section 4.2.

3 Conceptual Framework

Tenancy reforms can best be conceptualized as strengthening the rights of tenants. To capture the impact of this in theory, we develop a model in which landowners lack skill to farm land directly and thus choose whether to sell or rent their land. We consider the impact of a reform that allows tenants to capture a larger fraction of the surplus generated by land. While this makes tenants better off, landowners may choose to sell more land, thus altering patterns of land ownership, labor demand and wages.

3.1 Basics

There are three groups comprising a population: a measure π of landlords who owns all of the land and two groups of potential cultivators. The landlords own a measure $L < 1$ of land which we assume cannot be farmed directly, and land ownership is uniform among the landlord class. The technology matches one unit of land to one cultivator. We normalize the size of the group of cultivators to one.

The first group of cultivators, a fraction γ , have access to the capital market or some other form of wealth so that they can offer to buy land. In our data, this group will mainly comprise OBC households, but it could include some SC/ST households. The second group of cultivators, a fraction of $(1 - \gamma)$, cannot buy land but can be taken on as tenants.

Whether as a tenant or an owner, a cultivator can employ labor on the land to generate output:

$$\theta \frac{1}{\eta} \ell^\eta$$

where $\eta < 1$ and $\theta \in [\underline{\theta}, \bar{\theta}]$ is an idiosyncratic productivity parameter which can be thought of as a cultivator's ability or access to relevant human capital. For simplicity, we assume that the distribution of ability is the same in each farmer group and denote this by $G(\theta)$.

Labor can be hired in a competitive labor market at a wage of w . It is supplied by cultivators who are neither tenants nor owners; there is always such a group since we have assumed that $L < 1$.

Let:

$$\pi(\theta, w) = \arg \max_{\ell} \left\{ \theta \frac{1}{\eta} \ell^\eta - w\ell \right\} = \frac{1}{\eta} \theta^{\frac{1}{1-\eta}} w^{-\frac{\eta}{1-\eta}}.$$

be the surplus generated by the land. Note that labor demand for a type θ cultivator is $(w/\theta)^{-\frac{1}{1-\eta}}$.

We will suppose that the same surplus is generated by either landlords or tenants and that the main issue is how institutions affect the distribution of this. In the event of selling the land, we suppose that the tenant can raise sufficient capital to pledge a fraction β of the surplus to the owner. Under tenancy, we suppose that the landlord can set the rent to earn a fraction α of the surplus. A key ratio affecting the analysis is α/β , i.e. the relative attractiveness of tenancy and selling. In an economy with highly imperfect capital markets and where the landlord has power over tenants, we would expect $\alpha/\beta > 1$.

3.2 Equilibrium

We are interested in two equilibrium decisions. First, the landlord decides how to divide his land between parcels to sell and parcels to rent out. Second, the labor market equilibrium generates the wage given this decision.

The landlord will decide how much land to rent out and how much to sell based on the ability of the farmer. Let

$$\hat{\theta}(x) = \left(\frac{\alpha}{\beta} \right)^{\frac{1}{1-\eta}} x \equiv \phi x$$

as the level of productivity that makes a landlord indifferent between selling and renting

to a tenant of productivity level x .⁶ If $\alpha/\beta > 1$, then $\hat{\theta}(x) > x$ which implies that the marginal cultivator who buys land will be more productive than the marginal tenant. So policies which encourage land sales will tend to drive up overall agricultural productivity.

The landlord will sell some land and rent some land. Since he is assumed to be unable to directly farm any land, the least productive tenant who farms land, x , is defined from:

$$L = [1 - G(\phi x)] \gamma + (1 - \gamma) [1 - G(x)]. \quad (1)$$

The first expression here is the land that is sold while the second is land that is rented. All the most productive cultivators farm land and the least productive are laborers. Note that:

$$\frac{\partial x}{\partial \phi} = - \frac{g(\phi x) x \gamma}{[\gamma g(\phi x) \phi + (1 - \gamma) g(x)]} < 0. \quad (2)$$

Observe also using (2) that $\partial(\phi x)/\partial \phi > 0$. This says that the more that can be extracted from tenants relative to sellers, the lower the productivity of the marginal tenant that is given land. The productivity gap between the marginal tenant and marginal owner cultivator also increases. This is because there is a switch towards tenants and away from selling the land.

The equilibrium wage solves:

$$1 - L = \gamma \int_{\phi x}^{\bar{\theta}} -\pi_w(\theta, w) dG(\theta) + (1 - \gamma) \int_x^{\bar{\theta}} -\pi_w(\theta, w) dG(\theta) \quad (3)$$

$$= w^{-\frac{1}{1-\eta}} \tilde{\theta}(\phi, x), \quad (4)$$

where $\tilde{\theta}(\phi, x) = \left[\gamma \int_{\phi x}^{\bar{\theta}} \theta^{\frac{1}{1-\eta}} dG(\theta) + (1 - \gamma) \int_x^{\bar{\theta}} \theta^{\frac{1}{1-\eta}} dG(\theta) \right]$ be a measure of the average productivity of landlords and tenants. For future reference, observe that

$$\begin{aligned} \frac{d\tilde{\theta}(\phi, x)}{d\phi} &= \frac{\partial \tilde{\theta}(\phi, x)}{\partial \phi} + \frac{\partial \tilde{\theta}(\phi, x)}{\partial x} \cdot \frac{\partial x}{\partial \phi} \\ &= - \frac{g(\phi x) g(x) \gamma (1 - \gamma)}{[\gamma g(\phi x) \phi + (1 - \gamma) g(x)]} x^{(1+\frac{1}{1-\eta})} [\phi - 1] \underset{<}{>} 0 \text{ as } \phi \underset{<}{>} 1. \end{aligned} \quad (5)$$

Whether average productivity rises or falls depends on whether the marginal tenant is more or less productive than the marginal owner of land.

An equilibrium in the land and labor market is a pair $(x^*(\phi), w^*(\phi))$ which solves (1) and (3). To explore the effects of tenancy reform, we are interested in how these depend on ϕ .

⁶It is derived from

$$\beta \pi(\hat{\theta}(x), w) = \alpha \pi(x, w).$$

3.3 Tenancy Reform

We now consider what happens when there is a reform that makes tenancy less attractive. We model this as a reduction in ϕ due to α having fallen. In other words, tenancy reform makes surplus extraction from tenants more difficult.

The model makes a number of predictions about the impact of this shift on landholding and wages, summarized as follows.

Model Predictions: *Suppose that tenancy reform reduces ϕ . The model predicts the following equilibrium responses:*

1. *An increase in landholding among the sub-group of the population with better capital market opportunities.*
2. *A reduction in tenancy.*
3. *An increase (decrease) in the agricultural wage if $\phi > (< 1)$.*

All of these effects of tenancy reform follow intuitively from the analysis above. By making tenancy less attractive, landlords sell more land to the group of cultivators who have the resources to purchase land.

The impact on wages is ambiguous a priori and depends on the initial conditions. In cases where the extractive power of landlords is strong then there will be a preference for tenancy even when the marginal tenant is fairly unproductive. In such cases wages will tend to rise with tenancy reform which reduces the power of landlords and encourages them to sell land which finds its way into the hands of relatively more productive farmers. This increases labor demand and hence wages. However, in cases where landlords are initially weak then the opposite would be the case.

The model can be used to explore the impact of tenancy reform on land inequality. A fraction

$$\beta_L(\phi) \equiv \frac{[(1 - \gamma) + \gamma G(\phi x^*(\phi))]}{1 + \pi}$$

are landless among whom $\frac{(1-\gamma)[1-G(x^*(\phi))]}{1+\pi}$ are tenants. A fraction $\frac{\pi + \gamma(1-G(\phi x^*(\phi)))}{1+\pi}$ of the population owns land. This can be decomposed into a fraction of owner-cultivators:

$$\beta_C(\phi) \equiv \frac{\gamma(1 - G(\phi x^*(\phi)))}{1 + \pi}$$

which is decreasing in ϕ . The size of the landlord group remains fixed at π and, assuming that they sell land in equal numbers, their share of the land is:

$$\frac{[1 - \gamma[1 - G(\phi x^*(\phi))]]}{\pi}$$

which is increasing in ϕ .

Putting this together, it is straightforward to see that a reduction in ϕ leads to a new land distribution which Lorenz dominates the initial distribution. Hence, a wide variety of inequality measures, such as the Gini coefficient, should show a reduction in land inequality after tenancy reform.

To map the model further onto the data, note that we expect caste membership to map crudely onto our two cultivator sub-groups. Specifically, suppose that $\gamma = \gamma_{SC/ST} + \gamma_{OBC}$, then we would expect that $\gamma_{OBC} > \gamma_{SC/ST}$. While land ownership should rise in both groups, we expect this to be a larger effect for OBCs. Moreover, reductions in tenancy should be larger for the SC/ST group with a greater increase in participation as agricultural laborers. Land inequality between castes may increase as result of tenancy reform since OBC households will benefit disproportionately. Average income among the cultivator group J is:

$$\begin{aligned} \mu_J(\phi) = & w^*(\phi) [\gamma_J G(\phi x^*(\phi)) + (1 - \gamma_J) G(x^*(\phi))] \\ & + \frac{\beta}{\eta} [w^*(\phi)]^{-\frac{\eta}{1-\eta}} \left[\gamma_J \int_{\phi x^*(\phi)}^{\bar{\theta}} \theta^{\frac{1}{1-\eta}} dG(\theta) + \phi (1 - \gamma_J) \int_{x^*(\phi)}^{\bar{\theta}} \theta^{\frac{1}{1-\eta}} dG(\theta) \right]. \end{aligned}$$

The effect of a reduction in ϕ is ambiguous in sign for each group when groups differ in γ_J .

4 Data and Empirical Strategy

Our analysis makes use of multiple datasets. This section begins by describing the data and then outlines and justifies the empirical strategy employed.

4.1 Data

4.1.1 Tenancy Reform Data

Section 2.3 provided background on tenancy reform in the states of interest. A complete index of specific provisions enacted as part of tenancy reforms includes minimum terms of lease; the right of purchase of nonresumable lands; the right to mortgage land for credit; mandatory recording of tenant names; limitations on the landlord's right of resumption; caps on rent; temporary protection against eviction or prohibition of eviction; prohibition of eviction for public trusts; the establishment of a system of processing land titles; the extension of formal tenancy to more classes of tenants; and the extension of full ownership rights to tenants.

Our primary definition of land reform follows Besley & Burgess (2000) and assumes that each piece of legislation represents a separate land reform event, and therefore is presumed to have an additional, cumulative impact on the distribution of land. We term this measure *Tenancy Index A*. The assumption underlying construction of this index may be violated if passage of additional legislation reflects simply the fact that earlier legislation was incomplete or ineffective, or if some states enact land reform incrementally while others enact only a few broad pieces of legislation.

To address this concern, we also report results for a second measure of tenancy reform denoted *Tenancy Index B*. This measure directly indexes the provisions enacted within the broad set enumerated above. Each district is assigned a dummy variable equal to one if the district experienced this type of reform, and the total score for tenancy is equal to the sum of these dummy variables.

4.1.2 Household and Village Survey

Our sample includes nine boundary districts in the four Southern Indian states. Three sets of two adjacent districts constituted three separate pairs, and three adjacent districts (Kolar, Chittoor and Dharmapur) are compared pairwise, generating three additional pairs. Thus in total, there are six pairs of districts with four in the same princely state prior to 1956. Within each district pair, blocks were matched on linguistic similarity using a linguistic index based on 1991 census data on the proportion of the population speaking each one of the 18 languages reported spoken in the region (for further details, see Appendix).

The language match index sought to identify block pairs separated by the post-1956 state boundaries where the difference across blocks in proportion population speaking each language is minimized. Within a district pair, the three independent (i.e., non-overlapping) pairs of blocks that were the best linguistic matches were selected, yielding 18 matched pairs of blocks (three pairs of blocks for each of six pairs of districts). The match quality indices for these block pairs are, on average, one and a half standard deviations lower (i.e., a closer match) than the mean.

The outcome variables were measured in a series of interlinked surveys conducted in the sampled villages in 2002. In each of a randomly selected 259 villages, 20 household surveys were conducted, yielding a sample of 5180 households. Households were randomly selected, with the requirement that at least four households were SC/ST households. The survey collects data on familial structure, occupation, landholdings, and assets, as well as political knowledge and participation.

The second data set comprises data collected in 522 villages at a village-wide participatory rural appraisal (PRA) meeting at which attendees were asked to provide information

about the caste and land structure in their villages, including the name of all castes represented and whether they were SC/ST, the number of households that belong to each caste, and the number of households falling into each one of a number of landowning categories. The same meeting was also used to obtain information from villagers about prevailing agricultural and construction wages (on use of this methodology, see Duflo & Chattopadhyay (2004) and Duflo, Chattopadhyay, Pande, Beaman & Topalova (2009)).

The sampled villages are then linked to landholding data at the block and village level drawn from the 1951 census. The 1951 census reported the number of households in several land-owning/occupational categories (landlords, independent cultivators, tenants and landless laborers) by village, as well as data about literacy and the male and female population in the village. We are able to match 302 of the 522 villages in our sample to this census.

4.2 Identification Strategy

To examine the impact of tenancy reform we estimate two main specifications:

$$Y_{vp} = \beta_1 R_{vp} + \beta_2 X_{vp} + \gamma_p + \epsilon_{vp} \quad (6)$$

$$Y_{ivp} = \beta_1 R_{vp} + \beta_2 R_{vp} O_{ivp} + \beta_3 R_{vp} S_{ivp} + \beta_4 O_{ivp} + \beta_5 S_{ivp} + \beta_6 X_{vp} + \gamma_p + \epsilon_{ivp} \quad (7)$$

Y_{vp} denotes a inequality measure for village v in pair p and Y_{ivp} denotes an economic outcome for household i in village v and block pair p . R_{vp} is an index of land reform for village v in block pair p . O_{ivp} and S_{ivp} are indicators for the household being OBC or SC/ST, respectively, and X_{vp} denotes village-level controls. All regressions include a block pair fixed effect γ_p .

For village-level regressions the standard errors would ideally be clustered at the level of the state and the princely state, comprising seven clusters. As inference employing clustered standard errors with a low number of clusters can be even more unreliable than inference using standard heteroskedasticity-robust standard errors, we estimate the specifications of interest without clustering and then re-estimate employing a wild bootstrap to bootstrap the T-statistics within each state-princely state cluster, following Cameron, Gelbach & Miller (2008).

The key identifying assumption is that, conditional on block pair fixed effects, state assignment affects landowning and cultivation via tenancy reform. The second specification (7) requires a somewhat weaker identifying assumption, namely that state assignment affects variation in landownership patterns across caste groups only via tenancy reform.

In Table 1 we present two checks on this identification strategy. First, we examine whether blocks that are matched according to linguistic closeness are more similar in

pre-reform land structure.⁷ To test this hypothesis, we employ the following procedure using the 1951 census data on village-level land structure: first, all possible matches between the sampled villages are created. Matches between villages in the same state are dropped, leaving only pairings across state lines. Some village pairs lie within the actual block pairs matched along linguistic lines, and some do not. To test whether the average difference in the percentage landless between villages in the matched block pairs is less than the average difference across all possible pairs of villages we estimate:

$$Dif_{j,k} = \beta Same_{j,k} + \mu_{s_j, s_k} \quad (8)$$

where $Same_{j,k}$ is an indicator variable equal to one when the villages are in a matched block pair and zero otherwise, and μ_{s_j, s_k} is a dummy variable for matches between the states of village j and village k.

Column (1) of Table 1 shows the results. On average, village pairs within matched blocked pairs are more similar than those not in matched pairs, with the difference in landless proportions about 11% less than the mean. Thus the matching process identifies block pairs that are more similar in both language and land structure.

Second, we examine whether assignment to different regimes of post-1956 land reform is uncorrelated with pre-period village characteristics within block pairs: i.e., whether conditioning on linguistic similarity, village assignment to states was quasi-random. Here, we estimate

$$R_{vp} = \beta x_{1951, vp} + \gamma_p + \epsilon_{vp} \quad (9)$$

where $x_{1951, vp}$ denotes covariates measured at the village level prior to the reorganization in the 1951 census. R_{vp} denotes the number of tenancy reforms in village v of pair p post-1956 and we include block pair fixed effects, denoted γ_p .

The 1951 census provides data on the number of households in the village in specified livelihood classes, the number of literate men and women, and total population. Accordingly, equation (9) is estimated employing as independent variables the proportion of agricultural households that are tenants; the proportion of the population that is literate; and the proportion of the population that is engaged in agriculture.

The results are reported in Columns (2) through (7) of Table 1, employing both Tenancy Indices A and B as the independent variable. The wild bootstrap p-values are reported in brackets below the conventional standard errors. Columns (2) and (3) show no significant correlation between the 1951 literacy rate and post-1956 reform history. In Columns (4) and (5), there is some evidence of a negative correlation between the pro-

⁷In addition to land similarity we are also interested in caste structure similarity. However, due to the absence of micro-level caste data prior to the state reorganization, the test is restricted to land structure.

portion of the population working in agriculture and subsequent land reform, significant using Tenancy Index B.

Given the nature of land reform, whether this correlation holds for the proportion of the agricultural population who are tenants is of most concern. However, Columns (5) and (6) suggest that 1951 tenancy patterns in a village are not predictive of assignment to states with different subsequent land reform histories.⁸ This suggests that the assignment of blocks to states was not intended to create a state more amenable to any particular land reform agenda, and within block pairs matched on the basis of linguistic and land structure, village assignment across states can be considered quasi-random. That said, throughout we report regressions with the 1951 demographic variable as controls.

Finally, in all regressions estimated the pair fixed effects have significant explanatory power (we report the p-value for their joint significance in the tables), demonstrating that within-pair comparisons do help to control for unobserved heterogeneity across blocks.

5 Results

5.1 Land ownership by caste group

We start by using household data to examine the impact of land reform on differential land ownership by caste group. We estimate regressions of the form given by equation (7). The primary coefficients of interest are β_2 and β_3 , capturing the heterogeneity of the effect of land reform across caste groups; upper caste households are the omitted base category. Standard errors are clustered at the level of state-princely state-caste group, which is the level at which the interaction terms $R_{vp}O_{ivp}$ and $R_{vp}S_{ivp}$ vary. The outcome variables of interest are dummy variables for whether a household owns or leases land, and dummy variables capturing whether the primary source of income for the household is own-cultivation or agricultural labor.

Column (1) in Table 2 indicates that OBC households experience a significant increase in the probability that they own land as a result of tenancy reform, while SC/ST households show a significant decrease. Using the Panel A estimates, at the mean of tenancy reform, the relative increase in the probability of OBC households owning land would be around 13 percentage points on a base probability of 60%. (The implied magnitude of the effect using Panel B estimates is nearly twice as large, though noisily estimated.) The relative decrease in the probability SC/ST households own land is around 20 percentage points on a base probability of 45%. Column (2) suggests no significant impact on the

⁸Similarly, we observe no significant correlation for the other categories reported for the agricultural population (e.g., landlords, own-cultivators and landless laborers).

level of land leased, though the point estimate is, as predicted by theory, negative.

The coefficients on the dummy variables for the primary source of household income reported in Columns (3) and (4) reinforce the finding of reduced tenancy for all social groups but differential impacts on land ownership. Column (3) shows that tenancy reform leads to relatively greater owner-cultivation among OBC households; using Panel A estimates we observe an increase in probability of 9 points on a base probability of 31%. In contrast, owner-cultivation among upper caste and SC/ST households declines.

Column (4) shows that while OBC households are less likely to be dependent on agricultural labor after a tenancy reform, the probability that SC/ST households are dependent on agricultural labor increases by 15 percentage points on a base probability of 72%, for a proportional effect of 21% (Panel A estimates). There is a strong correlation between landlessness and dependence on agricultural labor as primary occupation; thus these coefficients capture the same underlying phenomenon of shifts in landlessness for SC/ST households, while employing different data.

Panel B employs Tenancy Index B (calculated by indexing the number of separate provisions implemented) as the independent variable, and we observe a consistent pattern of coefficients. The absence of significant differences between the coefficients estimated in the two sets of regressions suggests that the observed pattern is not an artifact of the construction of the tenancy reform variable.

These results reinforce the importance of examining the heterogeneous impact of tenancy reform at the household level, and suggest the effects plausibly depend on the extent to which potential cultivators can benefit from the possibility of becoming landowners as reform reduces the attractiveness of tenancy to landlords.

5.2 Labor demand and wages

Our conceptual model predicts that tenancy reform may transfer land to more productive farmers. This will lead to an increase in overall labor demand and wages, especially where landlords initially have strong bargaining power. We now examine these two predictions.

Our first measure of labor demand is the propensity of a household to engage in any paid agricultural labor. Households that do not report agricultural labor as their principal occupation may still provide agricultural labor if labor demand, and wages, are sufficiently high. In column (5) we see that tenancy reform increased participation in paid agricultural labor for all households, with the impacts largest for SC/ST households. (The impact on upper caste and OBC households is similar.) At the mean level of tenancy reform, the relative increase in the probability of SC/ST participation is around 17 percentage points on a base probability of 31%, a proportional effect of slightly over 50%. While larger in magnitude, this effect is consistent with the prior results and suggests that even

households that did not report agricultural labor as their primary occupation were more likely to participate in the agricultural labor market post-reform.

In Columns (6) and (7) we directly examine the impact on village agricultural wages. We report specifications with and without trimming of the wage variable. The specification of interest is equation (6), and we report bootstrapped p-value in brackets below the conventional standard error.

The results show that the censored measure of the daily agricultural wage increases with tenancy reform by about 6% with each episode of land reform, or 42% at the mean level of land reform. An increase in the wage is consistent with the predictions of the model if $\phi > 1$, and also consistent with the results reported by Besley & Burgess (2000). In addition, the sizeable magnitude of the effect is in line with previous literature: Banerjee, Gertler & Ghatak (2002) estimate a positive effect of land reform on productivity of between 50% and 60%, implying an increase of comparable magnitude in the agricultural wage if the rural labor market is efficient.⁹

5.3 Overall land inequality

Next we examine whether, as predicted by the model, tenancy reform reduced overall land inequality. To do so, we make use of data on land distribution collected in participatory rural appraisal (PRA) meetings. These data are potentially noisier than household data but provide a valuable, supplementary account of shifts in overall land distribution.

In the PRA meeting assembled villagers were asked to name for each caste the number of households that held no land, between 0 and 1 acres of land, 1 to 5 acres, 5 to 10 acres, 10 to 25 acres, and 25 or more acres. To calculate measures of inequality in landholdings we assume that each household in a given category possessed the mean amount of land (e.g., a household holding between 1 and 5 acres is assumed to hold 3 acres).¹⁰ The measures we examine include the proportion of landless households, the Gini coefficient, the generalized entropy measure of inequality with α equal to 1, the ratios of total land held by percentiles 90/10 and percentiles 75/25, and the general entropy measure for between-caste inequality.

Equation (6) is estimated again with both conventional heteroskedasticity-robust standard errors and wild bootstrap p-values reported in brackets. The results in Table 3 show

⁹As an additional robustness check, we estimate the coefficient on the interaction of tenancy reform and the pre-reform proportion of the population who are tenants, a proxy for the relative extractive power of landlords. Theory predicts that the wage effect should be larger where the extractive power of landlords is greater. The estimated interaction effect is positive, as predicted, and close to significant employing the wild bootstrap p-value. Results are not reported but available by request.

¹⁰As our variables assume no dispersion within landholding categories they likely represent a lower bound on the true level of inequality. See Appendix for definitions of all measures.

that tenancy reform generally reduces overall inequality in land distribution, and the impact is substantial in magnitude.¹¹ First and most important, there is a significant decline in the proportion of landless households that corresponds to a relative effect of around 10% at the mean level of tenancy reform. In addition, the Panel A estimates show a significant decline in the Gini coefficient of around 12%; a decrease of this magnitude would move a village from the median level of inequality across all villages to the 25th percentile.

We observe even larger, though noisily estimated, reductions in the GE(1) measure of land inequality, around 20% at the mean level of tenancy in Panel A. A decline in the 90/10 ratio of around 20% at the mean level of tenancy is close to significant, and the decline in the 75/25 ratio is larger (40%) and statistically significant. We observe no significant decline in between caste-group inequality.

Taken together, these results suggest an impact of tenancy reform which is consistent with the theoretical model laid out in the last section. There is a fall in overall inequality, with land ownership increasing among OBC households and landlessness among SC/ST households. On the productivity front, we observe increases in wages and overall labor supply, with the increases in labor much higher for SC/ST households.

5.4 Robustness checks

Placebo tests A key challenge for the identification strategy is that tenancy reform may proxy for other state-level policies, and particularly for policies that differentially affect caste groups, benefiting middle castes at the expense of SC/ST households. Undeniably, the four states of interest did implement a variety of other different policies in this period. To provide some evidence about this variation, two regressions are estimated measuring the effect of assignment to a state with higher or lower levels of land reform on various measures of village- and household-level provision of public goods, and the interaction between land reform and caste dummies. For expositional ease, we only report results for Tenancy Index A.¹²

We start by examining village-level public good provision:

$$G_{vp} = \beta_1 R_{vp} + \beta_2 R_{vp} \times Pr_{vp} + \beta_3 Pr_{vp} + \gamma_p + \epsilon_{vp} \quad (10)$$

where G_{vp} is a dummy for whether the local government, denoted the gram panchayat or GP, provides a certain public good in the village and $R_{vp} \times Pr_{vp}$ is an interaction term

¹¹Estimating all the major results presented here with total reform as the independent variable results in coefficients of roughly equal magnitude, suggesting that abolition and ceiling reforms had no additional impact on village-level measures of inequality.

¹²The results are similar for Tenancy Index B.

with the proportion of SC/ST households in the village, denoted Pr_{vp} . Block pair fixed effects γ_p are again employed, and standard errors are heteroskedasticity-robust.¹³

The results are shown in Columns (1) through (4) of Table 4. We observe no significant coefficient on either total reform or the interaction between reform and the proportion SC/ST, with the exception of a positive and marginally significant coefficient on the probability that the panchayat provides funds for repairs of the village school. This suggests that differential provision of public goods to villages with a higher or lower proportion of SC/ST households in states with more or less land reform is not a source of bias.

Next, we estimate at the household level:

$$G_{ivp} = \beta_1 R_{vp} + \beta_2 R_{ip} \times O_{ivp} + \beta_3 R_{vp} \times S_{ivp} + \beta_4 O_{ivp} + \beta_5 S_{ivp} + \gamma_p + \epsilon_{ivp} \quad (11)$$

where G_{ivp} is a dummy for the provision of governmental assistance to that household or the colony in which the household resides. Analogous to the main specifications, this equation is estimated with block pair fixed effects and interaction terms for caste group. Standard errors are clustered at the state-princely state-caste group level.

The results are shown in Columns (5) through (7), using as the dependent variable a dummy for whether the household received government aid for construction or electricity, whether the colony in which the household resides received infrastructure provided by the government, and whether the household is eligible for a BPL card. The results show a coefficient on the interaction between SC/ST and total reform that is positive and sometimes significant: in other words, SC/ST households are more likely to receive government assistance in states that have more land reform.

These results indicate that insofar as differential provision of public goods or governmental assistance in states with more or less reform introduces bias to our results, the bias seems to be towards finding a positive effect on the welfare for SC/ST households. This could also be interpreted as a corollary of the increased landlessness for SC/ST households rendering them eligible for such assistance.

Alternative specifications A final set of robustness checks re-estimates the primary equation of interest (7) employing an index of total land reform, rather than tenancy, as the independent variable. The objective of this regression is to evaluate whether the observed pattern of effects for tenancy reform is also evident for overall land reform.

The results are shown in Table 5, and the coefficients are entirely consistent with

¹³These standard errors should also be estimated using a wild bootstrap. However, the objective in this test is to test for the presence of a null effect; accordingly, using standard errors that are biased toward zero is a more stringent test of this assumption.

the previous results. In fact, there are no significant differences between the coefficients estimated using tenancy reform and total reform. This suggests that as indicated by the previous qualitative literature, tenancy reforms are the only measures that are effective in altering land ownership patterns. In fact, the estimated impacts of tenancy legislation and overall land reform legislation are statistically indistinguishable.

6 Conclusion

Poor rural economies are second-best in many ways. It is no surprise, therefore, that tracing the impact of a single dimension of reform can be complex. The analysis in this paper has exploited a natural experiment due to the 1956 state reorganization in India to evaluate the impact of tenancy reform at the village and household level over a long time horizon.

While tenancy reforms were implemented with the objective of strengthening the position of tenants, several equilibrium responses need to be considered. In this context, the reforms did produce significant and highly persistent shifts in land distribution. However, the benefits were lopsided and favored relatively wealthy tenants, while SC/ST households saw a decrease in access to land and generally became more reliant on agricultural labor.

On the other hand, there is evidence of a large increase in agricultural wages due to an increase in demand for hired labor. This phenomenon could be due either to large landholders no longer relying on tenant labor and/or a shift in the labor supply curve. Thus while the welfare impacts of tenancy reforms were substantial and long-lasting, their impact was heterogeneous between types of cultivators. These results can best be understood through the lens of a fairly standard model where owners are seeking the best opportunities for exploiting their land and there is a reduction in landlords' ability to extract surplus from tenants due to the reform.

The question of how best to regulate the land market is still a pressing one in many developing economies. Mexico has embarked on major experiments in rural land titling over the last decade (de Janvry, Gonzalez-Navarro & Sadoulet 2011). Rural land rights remain extremely limited in China, where the role of property rights in rural development is hotly contested and has become an increasing source of political unrest. In addition, many other developing countries face challenges in how to appropriately negotiate compensation for rural landowners when industrialization requires the purchase or expropriation of land (Bardhan 2011). In all such cases, it is essential to understand in detail, as we have done here, the equilibrium responses to reform and the way that these responses create gainers and losers. This can only be done employing a sufficiently long

time horizon over which the full effects of reform become visible.

In a broad sense, our findings offer a stark reminder of the hazards of piecemeal policy reform in a second-best world. If tenancy persists in part due to a lack of credit market opportunities to become an owner-cultivator, then increasing the power of tenants may result in some tenants being forced to become landless laborers. The ultimate welfare impact for these households will depend on the strength of factor market shifts in equilibrium, primarily the wage response. The complexity of these general equilibrium effects should contribute to a recognition by policymakers that, while short-run political imperatives may provide the impetus for reform, the long-run economic changes are what matter for development.

A Figures and Tables

Figure 1: Map of sample districts

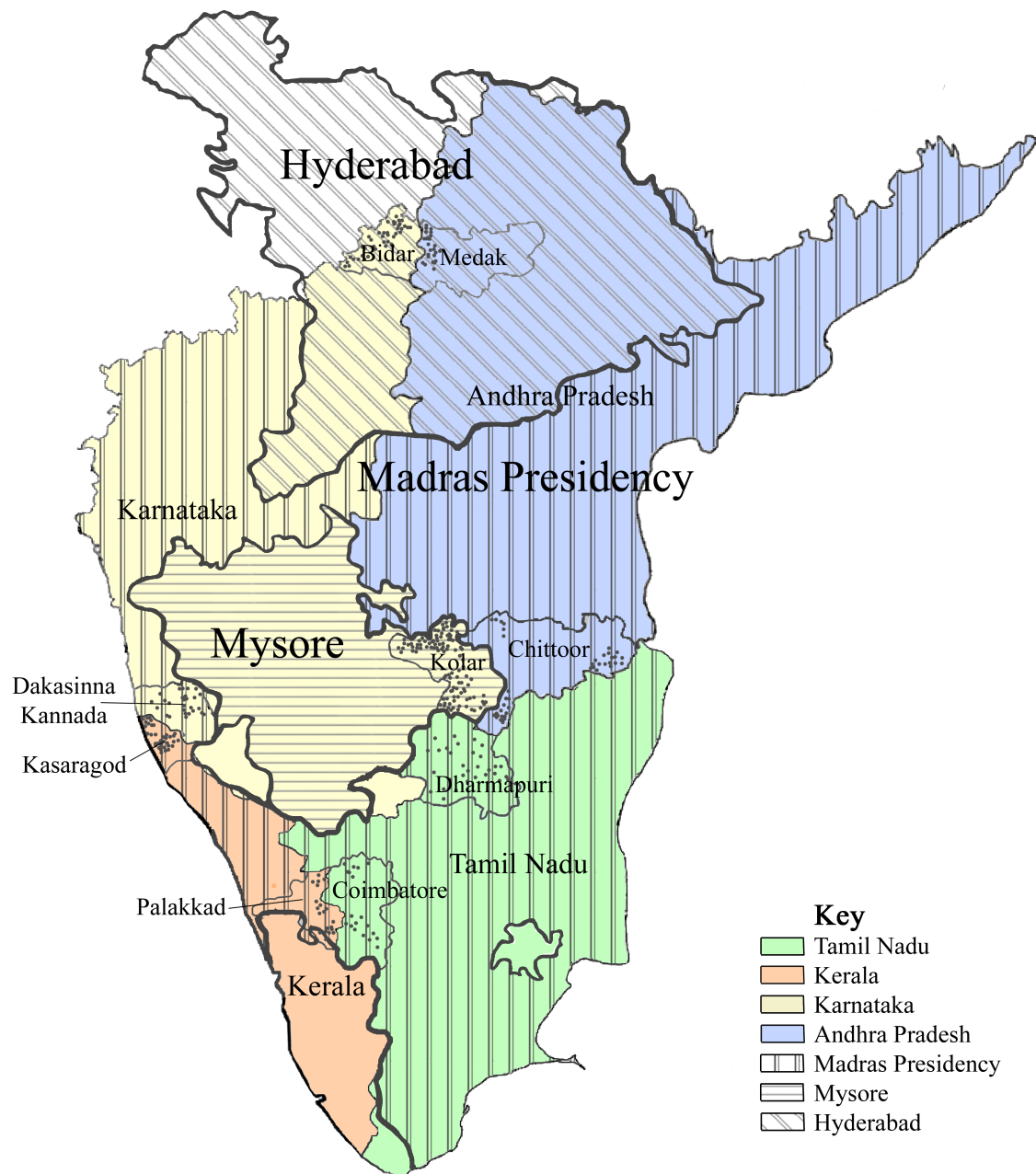


Table 1: Quasi-random assignment of villages to states

	All block pairs	Index of post-1956 tenancy reform					
		A	B	A	B	A	B
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Same pair	-.027 (.010)***						
Prop. literate		2.328 (1.369) [.933]	.883 (.581) [.724]				
Prop. agricultural				-3.267 (.655) [.170]	-1.247 (.287) [.000]***		
Prop. tenants						-3.562 (1.130) [.733]	-1.513 (.488) [.487]
Joint p-value pair FE		.000	.000	.000	.000	.000	.000
Obs.	10308	288	288	272	272	284	284

Notes: standard errors are in parentheses; asterisks indicate significance at 1, 5 and 10 percent levels. The first column tests whether block pairs matched on a measure of linguistic closeness also have similar land structures; the regression included state fixed effects, and standard errors with two-way clustering at the level of the block and the paired block. Columns (2) through (4) regress an index of tenancy reform post-independence on demographic variables reported in the 1951 census, including block pair fixed effects; heteroskedasticity-robust standard errors are reported as well as wild-bootstrap p-values reported in brackets. The independent variables are the proportion of the agricultural population that is a tenant, the proportion of the overall population that is literate and the proportion of the overall population engaged in agriculture.

Table 2: Impact of land reform on land ownership

	Land dummy (1)	Leased dummy (2)	Own cult. (3)	Agri. labor (4)	Agri. labor (ind.) (5)	Wage (6)	Wage trim (7)
Panel A: Tenancy Index A							
Tenancy reform	-.008 (.006)	-.0006 (.004)	-.016 (.006)**	.010 (.006)	.008 (.002)***	4.050 (.414) [.075]*	2.711 (.028) [.050]**
SC/ST x Tenancy	-.028 (.015)*	-.002 (.002)	.006 (.008)	.012 (.006)*	.017 (.002)***		
OBC x Tenancy	.019 (.009)**	-.003 (.002)	.029 (.008)***	-.023 (.009)**	.001 (.002)		
SC/ST	-.060 (.077)	.007 (.007)	-.348 (.041)***	.372 (.033)***	.112 (.013)***		
OBC	-.227 (.091)**	-.012 (.025)	-.363 (.076)***	.373 (.086)***	.074 (.031)**		
Joint p-value pair FE	0	0	0	4.720e-57	1.22e-163	0	0
Panel B: Tenancy Index B							
Tenancy reform	-.023 (.011)**	.003 (.007)	-.035 (.009)***	.028 (.010)***	.015 (.004)***	5.211 (.935) [.124]	3.424 (.060) [.129]
SC/ST x Tenancy	-.068 (.021)***	-.005 (.004)	.002 (.014)	.021 (.010)**	.028 (.004)***		
OBC x Tenancy	.035 (.037)	.013 (.012)	.063 (.031)**	-.070 (.037)*	-.012 (.007)***		
SC/ST	.155 (.094)*	.023 (.016)	-.332 (.064)***	.325 (.048)***	.048 (.034)		
OBC	-.310 (.257)	-.126 (.078)	-.556 (.219)**	.649 (.254)**	.164 (.029)*		
Joint p-value pair FE	0	0	0	3.55e-11	0	5.741e-40	0
Mean	.607	.097	.377	.438	.166	60.563	55.987
Obs.	2822	1940	2822	2822	15144	2867	2867

Notes: standard errors are clustered at the state-princely state-caste group level and reported in parentheses; asterisks indicate significance at 1, 5 and 10 percent levels. Wild bootstrap p-values are reported in brackets for outcomes measured at the village level. All regressions include block pair fixed effects. The dependent variables in Columns (1) through (4) are reported at the household level: a dummy for owning land, a dummy for leasing land, a dummy for being primarily dependent on own cultivation, and a dummy for being primarily dependent on agricultural labor. A large number of households gave no response to the question on leasing, leading to a large number of missing variables in that regression. Column (5) is an individual-level dummy denoting participation in non-agricultural labor, and Column (6) and (7) report the wage. Pre-reform controls included are the proportion of the agricultural population that are tenants, the proportion of the total population that is literate, and the proportion of the total population engaged in agriculture.

Table 3: Impact of land reform on inequality in land distribution

	Prop. landless (1)	Gini (2)	GE(1) (3)	90/10 (4)	75/25 (5)	BC(1) (6)
Panel A: Tenancy Index A						
Tenancy reform	-.005 (.006) [.015]**	-.009 (.004) [.020]**	-.024 (.009) [.751]	-.686 (.953) [.203]	-.661 (.400) [.020]**	-.012 (.006) [.761]
Joint p-value pair FE	2.130e-07	4.107e-08	7.022e-07	.000	.006	3.722e-18
Panel B: Tenancy Index B						
Alternate measure	-.002 (.010) [.095]*	-.012 (.007) [.040]**	-.030 (.015) [.532]	-1.173 (1.719) [.174]	-1.439 (.688) [.219]	-.009 (.010) [.592]
Joint p-value pair FE	2.565e-06	3.840e-07	2.164e-07	.000	.015	2.463e-18
Mean	.336	.527	.620	34.493	13.048	.211
Obs.	302	302	302	302	302	302

Notes: standard errors are in parentheses; asterisks indicate significance at 1, 5 and 10 percent levels employing conventional standard errors. Wild bootstrap p-values are reported in brackets. All regressions include block pair fixed effects and controls for the pre-reform measures of the proportion of the agricultural population that are tenants, the proportion of the total population that is literate, and the proportion of the total population engaged in agriculture. Outcome variables are the Gini coefficient, GE(1) coefficient, 90-10 ratio, 75-25 ratio, and between-caste GE(1) ratio in land inequality, and the proportion of the population that is landless.

Table 4: Placebo tests

	School Repair	Center Repair	Health Salaries	Health Materials	Hh infra.	Colony infra.	BPL card
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Tenancy	-.010 (.016)	.008 (.012)	-.007 (.005)	-.005 (.005)			
Tenancy x SC/ST prop.	.030 (.041)	-.031 (.023)	.006 (.005)	.006 (.006)			
Tenancy					-.011 (.002)***	.043 (.006)***	.007 (.010)
Tenancy x SC/ST					.011 (.003)***	.009 (.006)*	.022 (.009)**
Tenancy x OBC					.007 (.005)	-.027 (.025)	.015 (.016)
SC/ST					.095 (.013)***	-.052 (.025)**	.096 (.076)
OBC					-.042 (.050)	.223 (.169)	-.126 (.150)
Obs.	302	302	302	302	2822	2426	2822

Notes: standard errors are in parentheses; regressions including clustering are at the state-princely state-caste group level. All regressions include block pair fixed effects. Asterisks indicate significance at 1, 5 and 10 percent levels. In Columns (1)-(4), the dependent variables are dummies for whether the panchayat provided any funds toward the specified educational or health public good, and Tenancy x SC/ST prop. is an interaction between the proportion of the village population that is SC/ST and the tenancy variable. Standard errors are heteroskedasticity-robust. In Columns (5)-(7), the dependent variables are dummies for whether a household received assistance in improving their home from a public assistance scheme; whether the colony in which the household lives received such assistance; and whether the household is eligible for a BPL card.

Table 5: Impact of total land reform

	Land dummy (1)	Leased dummy (2)	Own cult. (3)	Agri. labor (4)	Agri. labor (ind.) (5)	Wage (6)	Wage trim (7)
Total reform	-.009 (.005)*	-.001 (.004)	-.019 (.006)***	.012 (.006)**	.009 (.002)***	4.032 (.432) [.283]	2.665 (.029) [.269]
SC/ST x Total reform	-.037 (.015)**	-.0004 (.003)	.005 (.008)	.014 (.006)**	.017 (.002)***		
OBC x Total reform	.016 (.015)	-.007 (.004)	.031 (.013)**	-.024 (.013)*	.005 (.003)		
SC/ST	.099 (.105)	.003 (.017)	-.360 (.059)***	.322 (.047)***	.060 (.010)***		
OBC	-.255 (.179)	.037 (.047)	-.470 (.149)***	.454 (.159)***	.023 (.043)		
Joint p-value pair FE	0	0	0	5.51e-142	2.14e-137	0	0
Mean	.607	.097	.377	.438	.166	60.563	55.987
Obs.	2822	1940	2822	2822	15144	2867	2867

Notes: standard errors are clustered at the state-princely state-caste group level and reported in parentheses; asterisks indicate significance at 1, 5 and 10 percent levels. Wild bootstrap p-values are reported in brackets for outcomes measured at the village level. All regressions include block pair fixed effects. The dependent variables in Columns (1) through (4) are reported at the household level: a dummy for owning land, a dummy for leasing land, a dummy for being primarily dependent on own cultivation, and a dummy for being primarily dependent on agricultural labor. A large number of households gave no response to the question on leasing, leading to a large number of missing variables in that regression. Column (5) is an individual-level dummy denoting participation in non-agricultural labor, and Column (6) and (7) report the wage. Pre-reform controls included are the proportion of the agricultural population that are tenants, the proportion of the total population that is literate, and the proportion of the total population engaged in agriculture.

B Sampling methods

We selected four pairs of districts formerly in the same princely state that were incorporated into two different states. Bidar and Medak in Hyderabad were incorporated into Karnataka and Andhra Pradesh, respectively. In the Madras presidency, there are three such pairs: South Kanara (Karnataka) and Kasaragod (Kerala), Pallakad (Kerala) and Coimbatore (Tamil Nadu), and Dharmapuri (Tamil Nadu) and Chittoor (Andhra Pradesh).

Given that Mysore was completely incorporated into Karnataka, there are no district-pairs in which both districts were formerly part of Mysore state. However, Kolar district in Mysore / Karnataka was also surveyed, and matched on the basis of language, as detailed below, with Chittoor district in Andhra Pradesh and Dharmapuri in Tamil Nadu. All three districts form a contiguous geographic region, and they are matched pair-wise to generate three additional district pairs.

In order to select the block pairs employed in this analysis, blocks within the paired districts were matched on the basis of linguistic compatibility. For each block pair of block i and block j , a measure of linguistic compatibility $L_i(v_i, v_j)$ was constructed using the following formula. P_{li} denotes the proportion of the population in block i speaking a given language,¹⁴ and N_i denotes the population in a given block. Thus L_i equals the sum of the difference in the proportion of population speaking each language across the two blocks, each weighted by the proportion of the population that speaks that language in both blocks taken as a whole. The minimum possible value of the index of linguistic compatibility, indicating the best possible match, is zero; the maximum is one.

$$L_i(v_i, v_j) = \sum_{l=1}^{18} (P_{li} - P_{lj}) * \frac{P_{li} * N_i + P_{lj} * N_j}{N_i + N_j} \quad (12)$$

For each district pair, the set of all possible block pairs is ranked and the top three unique pairs are chosen. Table 6 shows summary statistics for the quality of match for all possible block pairs for each pair of districts. On average, block pairs show the highest degree of linguistic compatibility across Kolar and Chittoor districts, and the lowest degree of compatibility in Coimbatore and Palakkad districts. The other four district pairs have similar levels of language matching. The high quality of the matches between Kolar and Chittoor and Kolar and Dharmapuri districts indicates that despite the fact that these district pairs were not previously part of the same princely state, their ethnolinguistic composition is comparable.

¹⁴The languages reported are Assamese, Bengali, Gujarati, Hindi, Kannada, Kashmiri, Konkani, Marathi, Malayalam, Manipuri, Nepali, Oriya, Punjabi, Sanskrit, Sindhi, Tamil, Telugu, and Urdu.

Table 6: Linguistic compatibility across district-pairs

District pair	Mean L_i	Median L_i	Std. dev.
Bidar-Medak	0.47	0.46	0.09
Chittoor-Dharmapuri	0.58	0.65	0.20
Dakasinna-Kasaragod	0.47	0.43	0.21
Coimbatore-Palakkad	0.74	0.73	0.13
Chittoor-Kolar	0.28	0.27	0.16
Dharmapuri-Kolar	0.52	0.57	0.19

Blocks are divided into village government units or gram panchayats (GPs), consisting of one to six villages. In the states of Andhra Pradesh, Tamil Nadu, and Karnataka, six gram panchayats were randomly sampled from each block selected. Gram panchayats in Kerala are larger than those in other states, and thus three GPs were sampled in each block in Kerala. All villages in each GP were sampled in AP, TN and KA if the GP had three or fewer villages; if there were more than three villages, then the village that was the home of the president of the gram panchayat was sampled in addition to two other randomly selected villages. (For the purposes of the sampling frame, villages with a population of less than 200 were excluded; all hamlets with a population over 200 are considered independent villages.) In Kerala, villages are again much larger and thus wards, the subunit of villages, were directly sampled. Six wards in each GP were randomly selected. This generates a total sample of 527 villages.

C Inequality Measures

The Gini measure is defined as follows, where l_i denotes the land owned by household i , r_i is the ranking of household i according to land holdings among all households in the village, \bar{l} is mean land held in a village and n is the total number of households:

$$Gini = 1 + \frac{1}{n} - \frac{2}{\bar{l}n^2} \sum_{i=1}^n (n - r_i + 1)(l_i) \quad (13)$$

The general entropy measures with $a=1$ and $a=2$ are calculated using the following equations:

$$GE(a) = \frac{1}{a(a-1)} \left[\left[\frac{1}{n} \sum_{i=1}^n \left(\frac{l_i}{\bar{l}} \right)^a \right] - 1 \right] \quad (14)$$

D Land reform in Southern India

Table 7: Summary statistics on land reform

State	District	Total reform		Abolition		Ceiling		Tenancy	
		Pre	Post	Pre	Post	Pre	Post	Pre	Post
KA	Bidar	6	3	3	1	0	2	3	2
AP	Medak	6	6	3	1	0	2	3	3
AP	Chittoor	5	6	0	1	0	2	5	3
TN	Dharmapuri	5	7	0	1	0	2	5	4
KA	Dakasina Kannada	5	3	0	1	0	2	5	2
KE	Kasaragod	5	10	0	2	0	1	5	9
TN	Coimbatore	5	7	0	1	0	2	5	4
KE	Palakkad	5	10	0	2	0	1	5	9
KA	Kolar	3	3	2	1	3	2	1	2

Note: the total number of reforms for Karnataka and Kerala, all post-1956, differs from the sum of the categories given that they incorporate legislation that can be jointly categorized. For Karnataka, the 1961 and 1974 acts include both tenancy reforms and land ceilings. For Kerala, the 1969 Kerala Land Reforms Act includes all three types of provisions.

Table 8: Land reform in Southern India

State	Year	Title	Description	Type
Hyderabad	1950	Telegana Agency Tenancy and Agricultural Lands Act	Tenants received protected tenancy status; tenants to have minimum terms of lease; right of purchase of nonresumable lands; transfer of ownership to protected tenants in respect of nonresumable lands; as a result 13,611 protected tenants declared owners. ^a Also gave tenants ability to mortgage rented land for credit. ^b	Tenancy
	1954	Amendment of Telegana Agency Tenancy and Agricultural Lands Act	Limits a landlord's right of resumption. ^c	Tenancy
	1956	Tenancy Act (amended 1974)	Tenancy continues up to 2/3 of ceiling area; law does not provide for conferment of ownership right on tenants except through right to purchase; confers continuous right of resumption on landowners. ^d	Tenancy
Madras Presidency	1929	Malabar Tenancy Act	Confers a qualified fixity of tenure on cultivation Veruumpattomdars holding wetlands and a right to demand a renewal of their lease. Also proscribed rates of "fair" rent. Since this act only took effect in the Malabar region of Madras Presidency, in our sample it only applies to Palakkad district. ^e	Tenancy
	1954	The Malabar Tenancy Amendment Act	Prohibits eviction of tenants who have had land-possession for 6 years; lowered the amount of maximum rent that could be paid. ^f	Tenancy
	1955	The Madras Cultivating Tenants Protection Act	Prohibits any cultivating tenant from being evicted, except in the case of non payment, but allows for resumption of up to one-half land if land leased out to tenant. ^g	Tenancy
	1956	The Madras Cultivating Tenants (Payment of Fair Rent) Act	Abolishes usury and rack-renting; ^h Fixes the percentage of produce that can be charged as rent. ⁱ	Tenancy

^a Besley & Burgess (2000), p.396

^b Bergmann (1984), p.118-9

^c Commission (1959), p.26

^d Besley & Burgess (2000), p.396

^e Behuria (1997), p.55

^f Bergmann (1984), p.51

^g Behuria (1997), p.55

^h Behuria (1997), p.55

ⁱ Besley & Burgess (2000), p.400

Mysore	1952	Mysore Tenancy Act (Mysore Act XIII of 1952)	Restricted rent to 1/3 of crop and granted permanent tenancy right to those who had occupied the land for 12 years or more. Also provided for the eviction of tenants for non-payment of rent and for resumption for self cultivation by landlord. ^a	Tenancy
Karnataka	1961	Land Reforms Act, 1961 (10 of 1962) Amended 32 times (1965-2001)	Provides fixed tenure subject to landlord's right to resume one-half leased area; grants tenants optional right to purchase land on payment of 15-20 times the net rent; imposition of ceiling on land holders. ^b	Tenancy; Ceiling
	1974	The Mysore Land Reforms Amendment Act	Imposition of ceiling on landholdings of 4.05-21.85 hectares (after 1972); removal of all but one of the exemptions from tenancy regulations; ^c reduces the landlords right of resumption. ^d	Tenancy; Ceiling
Andhra Pradesh	1957	The Andhra Tenancy Act	A stop-gap measure to stay evictions of tenants in the Andhra area until new state-wide legislation could be drafted. ^e In our sample this act, and its amendment (listed below), only applies to Chittoor.	Tenancy
	1971	Andhra Pradesh Record of Rights in Land Act	Provides for the recording of names of all occupants and tenants. ^f	Tenancy
	1974	Amendment of Tenancy Act	Applied the 1956 tenancy laws to the whole state; reduced the maximum rent tenants paid; limits a landlord's right of resumption. ^g (In our sample this amendment only applies to Chittoor.)	Tenancy

^a Aziz & Krishna (1983), p.398

^b Besley & Burgess (2000), p.396

^c Besley & Burgess (2000), p.396

^d Bergmann (1984), p.93

^e Commission (1966), p.2

^f Behuria (1997)

^g Bergmann (1984), p.118-9

Kerala	1957	Kerala Stay of Eviction Act	Provides temporary protection to tenants, kudikidappukars and persons cultivating land on minor sub tenures. ^a	Tenancy
	1963	Kerala Land Reforms Act	Concedes tenants right to purchase land from landowners. ^b	Tenancy
	1963	Amended 9 times (1969-1989)		
	1963	Kerala Tenants and Kudikidappukars Protection Act	Provides temporary protection to tenants in the matter of eviction. ^c and recovering of arrears of rent.	Tenancy
	1966	The Kerala Prevention of Eviction Act (Kerala Act 12 of 1966)	Protected tenants against eviction; stopped recovery of rent arrears. ^d from before April 1966.	Tenancy
	1968	The Kerala Records of Rights Acts	Establishes records of land/tenancy rights. ^e	Tenancy
	1969	The Kerala Land Reforms Amendment Act (Kerala Act 35 of 1969)	Conferment of full ownership rights on tenants; 2.5 million tenants could become land owners; right of resumption expires; imposition of ceiling on land holdings of 6.07-15.18 hectares (1960-1972) and of 4.86-6.07 hectares (after 1972); abolition of intermediary rights. ^f	Tenancy, Abolition, Ceiling
	1972	The Kerala Land Reforms Amendment Act (Kerala Act 17 of 1972)	Changes the way the government processed land-titles; requires that statements be filed by large land holders. ^g	Tenancy
	1976	The Kanam Tenancy Abolition Act (Kerala Act 16 of 1976)	Abolishes a form of intermediary. ^h	Tenancy
Tamil Nadu	1989	The Kerala Land Reforms Amendment Act	Extends the benefits of tenancy and security of tenure to two more classes of tenants.	Tenancy
	1961	Madras Public Trusts Regulation of Administration of Agricultural Lands Act	Provides that no public trust can evict its cultivating tenants. ⁱ	Tenancy
	1969	Agricultural Land-Records of Tenancy Right Act	Limits the amount of land a public trust can personally cultivate. ^j	Tenancy
	1971	Occupants of Kudiiruppu Act	Provides for preparation and maintenance of complete record of tenancy rights. ^k	Tenancy
	1995	Amendment to the Tamil Nadu Act Cultivating Tenants Protection Act	Provides for acquisition and conferment of ownership right on agriculturists, agricultural laborers, and rural artisans. ^l Provides former cultivating tenants who had possession of land on Dec 1, 1953 the right to resume that land on the same term as held in 1953. ^m	Tenancy

^a Behuria (1997), p.55

^b Besley & Burgess (2000), p.396

^c Behuria (1997), p.59

^d Bergmann (1984), p.57

^e Bergmann (1984), p.62

^f Bergmann (1984), p.120-1

^g Bergmann (1984), p.62

^h Constitution of India, Schedule 9

ⁱ Behuria (1997), p.55

^j Besley & Burgess (2000), p.400

^k Behuria (1997), p.55

^l Behuria (1997), p.55

^m Behuria (1997), p.97

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