

Property Rights and the Political Organization of Agriculture*

Jonathan H. Conning[†] James A. Robinson[‡]

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Abstract

The modern theory of agrarian organization has studied how the economic environment determines organizational form under the assumption of stable property rights to land. The political economy literature has modelled the endogenous determination of property rights. In this paper we propose a model in which the economic organization of agriculture and the political equilibrium determining the distribution of property rights are jointly determined. In particular, because the form of organization may affect the probability and distribution of benefits from agrarian reform, it may be determined in anticipation of this impact. The model offers a reason for why tenancy, despite its economic advantages, has been so little used in countries where agrarian reform is a salient political issue. We test the implications of the model using a five-decade panel of data from Indian states and discuss how it may help explain cross-national variations in the incidence of tenancy.

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[†]Department of Economics, Hunter College and the Graduate Center, City University of New York, 695 Park Ave, NY 10021; e-mail: jconning@hunter.cuny.edu

[‡]Department of Government, Harvard University, 1033 Massachusetts Avenue, Cambridge, MA 02138; e-mail: jrobinson@gov.harvard.edu.

1 Introduction

The study of the nature and determinants of agrarian organization is one of the oldest topics in economics and the system of *metayage*, or sharecropping, was discussed by Adam Smith, J.S. Mill and Alfred Marshall. A dominant theme in this literature¹ is that contractual arrangements and equilibrium ownership patterns are shaped by the incentive problems that arise when labor effort or other relevant production actions are difficult to observe, or costly to monitor. Theory tells us that a whole class of such incentive problems may be solved, or at least ameliorated, by renting or selling the firm to the agent since residual claimant status better aligns the agent's objectives with those of the production enterprise.

A successful theory of agrarian organization ought to be able to account for the large differences in patterns across countries and continents, and its evolution over time. For example, in the absence of scale economies, this theory predicts that, all else equal, total land area under tenancy should be higher in areas where land is more unequally distributed, as land lease markets ought to reallocate land from relatively land abundant households. While actual comparisons of aggregate tenancy patterns across regions are complicated by agro-climate and technological considerations, we nonetheless should expect a relatively lower incidence of tenancy in regions like Asia where land inequality has been historically low (particularly after mid 20th century land reforms in China, Japan, South Korea and Taiwan). Contrariwise, we would expect a relatively high fraction of cultivated land to be organized under tenancy in Latin America where land inequality has been extremely high.

That this is evidently not the case can be seen clearly in Tables 1 and 2. Table 1, which is adapted from Hayami and Otsuka's (1993; Table 1.1) survey of agricultural contracts, indicates important differences in the use of tenancy across regions. In a sample of twelve European countries for which comparable data was available over 40 percent of cultivated land in 1970 was farmed under pure tenancy on land cultivated by owners who also leased land. In the United States and Canada the comparable figure was over 60 percent.² For a sample of ten Asian countries, approximately 16 percent of land was under

¹Cheung (1969) and Stiglitz (1974) are early examples of the modern approach. Literature surveys include Bardhan (1989), Bardhan and Udry (1999), Basu (1997) and Hayami and Otsuka (1993).

²These figures somewhat overestimate the actual extent of tenancy because they cannot distinguish between owned and leased land operated by owner-cum-tenants. Recent figures from the 1997 US Agri-

tenancy. Table 2 indicates however that prior to experiencing far-reaching redistributive land reforms, countries such as Korea, Japan and Taiwan had tenancy rates close to or above 50 percent. Latin America stands out in sharp contrast to these other regions: despite having by far the most concentrated land ownership pattern, and fewer laws to regulate tenancy contracts, less than 12 percent of cultivated land was under tenancy in 1970. In the case of some countries such as India, described in Table 3 and in more detail below, the share of cultivated land reported under tenancy has collapsed in many states since independence.

To account for such differences across regions, or for such dramatic changes in a given region over time, existing theories would have to assume fundamental differences in information and market structures have removed the advantages of tenancy in certain cases but not others.³ Another potential explanation is that agro-climate or technological considerations dictate for instance that crops in Latin America are subject to greater scale economies. But this too seems to short of a complete explanation for several reasons. First, the fraction of cultivable land under plantation agriculture subject to technological economies of scale is not large enough to explain the magnitude of the observed differences, except for certain countries and regions (Sokoloff and Engerman, 2000). More importantly, comparisons of agrarian organization on a crop by crop basis also reveal the relative paucity of tenancy arrangements in Latin America and Asia compared to other parts. Finally, arguing that economies of scale explains the difference seems to lead down the wrong path because the highest extent of tenancy is found in North America where heavy mechanization might be expected to make economies of scale important.

In this paper we present a political economy theory of agrarian organization which presents a complementary approach to explaining these facts. The modern literature has stressed the economic environment as the key determinant of agrarian structure. In doing so, however, it has assumed that property rights to land are secure. Yet, property rights over land have been contested and redefined in almost all agrarian societies, and agrarian reform has been one of the burning political issues of the past century (Binswanger et. al, 1995). Although agrarian reforms have at times taken place in revolutionary and

cultural Census help clarify this distinction however, by indicating that approximately 53 percent of land operated by owner-cum-tenants was leased land. This leads to an estimate that approximately 49% of harvested cropland in the United States was cultivated under leased land. Assuming the same ratio held for the data of Table 1, then approximately 40 percent of cultivated land in North America was under tenancy in 1970.

³Theories that appeal to credit market imperfections (e.g. Eswaran and Kotwal, 1986, Banerjee and Newman, 1993, Legros and Newman, 1996), or to the uneven distribution of non-traded skills may also account for why fixed rent tenancy may not be more prevalent amongst the poor.

military occupation contexts, for example in South Korea, Taiwan, Mexico, China, or Cuba, an even larger number of reforms have been implemented or attempted in the context, or anticipation of, normal electoral competition. In Latin America important attempts at land reforms followed democratization in Bolivia, Chile, Colombia, Costa Rica, Guatemala, Dominican Republic, and Venezuela (Lapp, 2004), but reforms have also been implemented by military regimes in Peru and El Salvador in an attempt to build popular support. Political reforms that extended voting rights to tenants and small farmers also led to significant changes in tenancy regulation and land taxation in a large number of West European countries (Swinnen, 2000). In South Asia similar pressures have arisen, particularly in India (Besley and Burgess, 2000).

Property rights are the endogenous outcome of collective political choices and a striking difference between regions of the world is the extent to which property rights have been perceived to be stable and secure in the rural sector. These facts suggest that agrarian structure could itself be affected, not just by the economic environment, but also by the way in which property rights are determined and sustained. We propose a model in which the economic organization of agriculture and the political equilibrium determining the distribution of property rights might be jointly determined. To fix ideas we examine reforms which are ‘to the tiller’ where farmers acquire *de facto* property rights over land they already occupy as tenants. Reforms may be either simple tenancy reforms, as frequently used in India, or in the limit land reform where the land rented by tenants becomes their own property. In such circumstances, landlords who rent land to tenants increase the feasible scope of agrarian reform and this tends to increase its extent through the political system when tenants have sufficient political power. In anticipation of this, however, and despite possible economic benefits of tenancy, landlords may choose to limit the extent of tenancy in order to increase the stability of their property rights.

It has been recognized in the literature that the anticipation of exogenous tenancy reforms may naturally limit the extent of tenancy (Palacios, 1979, de Janvry, 1981, Zamosc, 1986, Binswanger et. al., 1995, and particularly Ray, 1998, p. 418, and Jodha, 1981). It has also been recognized by several scholars (e.g., Besley, 1995, Hoy and Jimenez, 1991, Turnbull, 2004) that individuals with insecure property rights may take actions (invest) to influence how secure their property rights claims will be in the future. What our model does is to bring together these ideas into a general equilibrium model and extend them in several ways. Besley (1995) analyzed how private decisions to enforce or secure property rights affected the likely outcome of property rights conflicts in a setting that took factor prices and overall property rights insecurity as given. We build our analysis around a

standard general equilibrium Specific Factors model where land and labor markets clear and equilibrium agrarian structures are predicted alongside with the overall level of property rights insecurity.⁴ There are several interesting payoffs from this, one being that it illustrates how landlords may be able to use markets to resolve property rights conflicts that are by assumption insurmountable in partial equilibrium models. For example, in some conditions the anticipation of tenancy reform may not lead landlords to reduce the extent of land leasing because landlords may be prepared to sell the squatter rights associated with tenancy.

Our formal analysis also leads to a number of interesting comparative static results that may help to explain the extent of tenancy and across regions in terms of differences in factor endowments, the nature of crop technologies and the distribution of non-traded farming skills, as well as pre-reform inequality in land, and factors which influence the political power of peasants, including the balance of rural and urban workers in the electorate. The model also yields a number of realistic predictions about equilibrium patterns of land and labor use across farms within a region, and rural to urban migration.

In section 3 we present panel data evidence from India which provides tentative support for several of these results. India's 1949 Constitution left the adoption and implementation of land and tenancy reforms to the democratically constituted state legislatures rather than to the central government. The result has been a great deal of heterogeneity in the timing and depth of tenancy and property rights reforms across states. We exploit this observed heterogeneity to empirically study the joint evolution of tenancy rates and property rights reforms across states over a five-decade period. In particular we provide evidence that tenancy reforms, despite being designed to protect tenants rights, actually reduced the extent of reported tenancy. We also find, in line with our model, that after controlling other variables including state and year fixed effects, the likelihood of reform increases when land inequality is higher, when the urban sector is smaller, and when the political power of peasants, proxied in various ways, is greater.

Our paper is related to several other literatures, in addition to the work of scholars noted above who have discussed both how the anticipation of exogenous agrarian reform may reduce tenancy, and how actions can be taken to alter the stability of property rights. First, it builds on the existing work by scholars who have shown how market imperfections are crucial for explaining agrarian organization. Tenancy arises in our model because of

⁴Our work is therefore related to de Meza and Gould (1992) who studied how any given landlords' decision to enclose an individual property influenced the relative profitability of enclosure decisions by other landlords'. Our model also gives rise to pecuniary externalities of the sort that they studied alongside with non-pecuniary externalities via the political system.

imperfections in the market for non-traded farming skills. The nature of these imperfections determine not only the extent and benefits of tenancy under secure property rights, as in the standard models, but also the size of the economic costs of endogenous property rights insecurity in our model. Several models, for example Grossman (1993), Horowitz (1993), and Acemoglu and Robinson (2001), have examined the incentive to redistribute land as a way of forestalling social conflict or revolution.⁵ Our model differs in focusing on non-revolutionary politics and studying the joint determination of land reform and the organization of production in a setting with more general and standard assumptions about production technologies and the (distorted) operation of markets for land and labor. Finally, our research is related to a large political economy literature which has stressed how inefficient decisions may arise to manipulate future political equilibria. This research includes Persson and Svensson (1989), Alesina and Tabellini (1990), Aghion and Bolton (1990), and Besley and Coate (1998) in the context of democratic politics, and Robinson (1998) and Bourguignon and Verdier (2000) in non-democratic polities. Apart from the different focus and motivation of our analysis, the fundamental theoretical difference is that in our model it is private agents and not political decisionmakers who take actions that affect subsequent political outcomes.

The rest of the paper is organized as follows. The next section presents the basic model and analyses comparative static results of the political-economic equilibrium that it implies. Section 3 discusses our empirical evidence from India. Section 4 discusses a number of historical episodes that appear to be consistent with the interpretations given here and Section 5 concludes.

2 The Model

2.1 Fundamentals

We consider a two-period society starting in a pre-reform state. At the end of the pre-reform period there is an ‘election’ in which two office-motivated political parties compete for power by offering tenancy or agrarian reform.⁶ The outcome of this electoral competi-

⁵This view has evidently also influenced policymakers and military strategists who have often placed land reform at the center of counterinsurgency plans in countries from Vietnam to El Salvador (Prosterman and Reidinger, 1987).

⁶Our political model is closely related to the probabilistic voting model of Lindbeck and Weibull (1987), Dixit and Londregan (1996) and Persson and Tabellini (2000). For the sake of tangibility we talk only of elections. However, the model can also be interpreted in terms of a ‘political contest’ which is not democratic. As we noted in the introduction, dictatorships have implemented land reforms and dictatorships require popular support in the same way as democracies do.

tion determines the probability (possibly zero) that a land-to-the-tiller or tenancy-reform will be implemented. In the event that such a reform takes place all sitting tenants are given strengthened rights to the land they occupy and its output. In the case of land reform this can be interpreted as the transfer of property title, with or without compensation to landlords. In the case of a tenancy reform we can interpret this as protection from eviction and a reduction of land rents. Both types of reform can be analyzed within the same framework.

The production side is modeled as a variant of a classic two-sector general equilibrium Ricardo-Viner, or Specific Factors model. There are two production sectors, rural and urban which for simplicity we assume produce the same numeraire consumption good.⁷ Homogenous labor is perfectly mobile across the two sectors. The urban sector produces output using a simple constant returns production technology $H(\bar{K}, L_u)$ where L_u is labor and \bar{K} is a fixed stock of capital specific to that sector.

In the rural sector the good can be produced either on landlord or peasant farms. We assume that rural production requires an essential non-traded factor S , such as farming ability or skill. The production function $\hat{F}(T, L, S)$ is subject to constant returns to scale, but since the non-traded factor \bar{S} is fixed in the short run, the restricted production $F(T, L) = \hat{F}(T, L, \bar{S})$ will be subject to decreasing returns to scale.⁸ Farm production will be organized around households that possess some of the essential non-traded asset, and an efficient equilibrium should match operational farm size to the household's holding of the non-traded asset. This provides a simple and tractable way to model the idea that, for incentive reasons, control rights and residual claimancy status should be offered to those inputs that are most difficult to measure and monitor in the production process, such as farm management. This is widely accepted as the main explanation for the widespread prevalence of tenancy and the historical persistence of family-owned farms in many regions of the world (Hayami and Otsuka, 1993; Binswanger et al., 1995). Skoufias (1991) provides an empirical measure of the central importance of such non-traded factors in determining tenancy patterns within localities in India.

We assume that landlords and peasants both have access to the same production technology \hat{F} , and that, for the benchmark case only, landlords and peasants both have access to the same amount of non-traded assets which we normalize to $\bar{S}_p = \bar{S}_l = 1$,

⁷Alternatively, the relative price of agricultural goods in terms of urban goods is fixed on world markets and is assumed constant during the analysis.

⁸Consider the Cobb-Douglas example $\hat{F}(T, L, S) = T^{\rho_T} L^{\rho_L} S^{1-\rho_T-\rho_L}$. With $S = 1$ across all households. Then $F(T, L) = \hat{F}(T, L, 1) = T^{\rho_T} L^{\rho_L}$ is homogenous of degree $h = \rho_T + \rho_L < 1$.

where the subscripts p and l indicate peasant and landlord. For notational convenience we indicate landlords' (restricted) production technology by $G(T, L)$, even though for this benchmark setting, $G(T, L) = F(T, L)$. The analysis will later allow landlords to have a larger holding of the non-traded asset.⁹

The degree of homogeneity h of the restricted production functions F and G will be an important parameter in what follows. The lower the degree of homogeneity, the more pronounced are decreasing returns to scale in the two traded factors T and L , and the larger the efficiency gain to organizing production around households that own the non-traded production factor S . With $h < 1$, efficient production organization will require tenancy (and/or land ownership patterns) adapted to match the distribution of the non-traded factor across households.

There are \bar{L} households in the economy with 1 unit of labor each. This will also be the total number of voters. Of these, $n^p \bar{L}$ are peasant households and $n^l \bar{L}$ are landlord households, where $n^p + n^l < 1$ and $n^p > n^l$. The remaining households will be urban laborers or landless agricultural workers who do not possess any of the non-traded skills necessary to become direct producers.¹⁰ The available land endowment \bar{T} is allocated between peasant and landlord farm production

$$n^p \bar{L} T_p + n^l \bar{L} T_l = \bar{T}$$

The \bar{L} labor force is allocated between urban employment L_u and labor use on peasant and landlord farms in the agricultural sector:

$$n^p \bar{L} L_p + n^l \bar{L} L_l + L_u = \bar{L}$$

Dividing through by \bar{L} these factor market equilibrium conditions can be written

$$n^p T_p + n^l T_l = \bar{t} \tag{1}$$

$$n^p L_p + n^l L_l = 1 - L_u/\bar{L} \tag{2}$$

where $\bar{t} = \bar{T}/\bar{L}$ is the economywide land to labor ratio.

⁹If landlords and peasants have the same production technology and differ only in that landlords have a higher endowment of non-traded S , then landlords' restricted production function can be written as a homothetic expansion of the peasants' technology, or $G(T, L) = AF(T, L)$. For example in the Cobb-Douglas case of the earlier footnote $A = \bar{S}_l^{1-\rho_T-\rho_L}$ where \bar{S}_l is the landlords' holding of the non-traded asset and the peasants' holdings is normalized to $\bar{S}_p = 1$. All of the key comparative static results that follow below for the benchmark case will hold in this more general setting, the only difference would be proportionately larger equilibrium landlord farm (and hence lower equilibrium level of tenancy).

¹⁰Hence in equilibrium there will always be $(n^p + n^l)\bar{L}$ farm units, although not necessarily that many laborers in the farm sector, since fractions of the farm household can migrate to the urban sector.

Landlords as a class own fraction θ of the land endowment, or $\theta\bar{t}/n^l$ per landlord household. That leaves $(1 - \theta)\bar{t}/n^p$ units of land per peasant household. By definition a ‘landlord’ owns more land than a peasant, so $\theta > n^l/(n^p + n^l)$.

On a competitive market farm producers, whether they be peasants or landlords (indexed by $g = p, l$) each chose T_g and L_g to maximize the sum of farm profits plus factor sales

$$\begin{aligned} & [F(T_g, L_g) - wL_g - vT_g] + w + v\bar{t}_g \\ = & \Pi^g(T_g, L_g) + w + v\bar{t}_g \end{aligned}$$

where each group’s factor endowments are respectively $\bar{t}_l = \theta\bar{t}/n^l$ and $\bar{t}_p = (1 - \theta)\bar{t}/n^p$ and both households own one unit of labor. Here v and w are equilibrium factor prices. Note that in the standard Ricardo-Viner model the assumption of constant returns to scale means that given initial factor endowments, factor prices and real allocations are determined by how the mobile labor endowment is allocated between the rural and urban sectors and factor prices are independent of the distribution of operational farm sizes. The size distribution of farms matters for real allocations however when non-traded farming skills are important in production. In either case the first-order conditions for a competitive equilibrium can be written

$$F_T = G_T = v, \tag{3}$$

$$F_L = G_L = w. \tag{4}$$

This system can be solved for L_l , L_u and T_l . From these solutions and the factor balance equations (1)-(2) we can then calculate T_p , L_p and v . Since by assumption all farm producers have the same technology in the benchmark case they will operate farms of equal efficient scale, i.e. $T_e = \frac{\bar{t}}{n^p+n^l}$ and $L_e = \frac{\bar{L}-L_{ue}}{(n^p+n^l)\bar{L}}$, and the equilibrium level of labor allocated to the urban sector L_{ue} is then given implicitly by

$$F_L \left(\frac{\bar{t}}{(n^p + n^l)}, \frac{\bar{L} - L_{ue}}{(n^p + n^l)\bar{L}} \right) = H_L(\bar{K}, L_{ue}) = w$$

Under secure property rights the same efficient equilibrium obtains regardless of the initial distribution of land ownership θ . Since all farms choose the same operational farm size T_e each landlord will lease out all land in excess of this amount, and the *share* of cultivated land under tenancy, or the ‘tenancy rate’ τ will be given by

$$\tau = \frac{\theta\bar{T} - n^l\bar{L}T_l}{\bar{T}}$$

Substituting in the equilibrium farm scale $T_l = T_e = \frac{\bar{t}}{n^p + n^l}$ yields the efficient tenancy rate

$$\tau_e = \theta - \frac{n^l}{(n^p + n^l)}$$

which is increasing in θ . A rise in urban capital stock investment \bar{K} draws labor away from the agricultural sector, lowering the market rental rate on land $v = F_T$. This would lead to less labor-intensive cultivation, but the size distribution of farms (how \bar{T} is allocated across farms) remains unchanged under secure property rights. An increase in the non-traded factor S on landlord farms relative to peasant farms would lead to higher equilibrium landlord farm sizes and less leasing. Land-labor ratios would however remain the same across all farms.

Allocations with exogenously insecure property rights We now extend the setting to allow for a pre-reform and post-reform period. In the pre-reform period farms in group $g \in \{p, l\}$ choose factor inputs as before except now under the threat that a tenancy reform may occur with probability α . For the moment α is taken to be exogenous and known. If a reform takes place all sitting tenants obtain protection from eviction from fraction $(1 - \kappa)$ of the land that they had leased in the pre-reform period and have only to pay a new capped rental rate \bar{v} for those leases, where \bar{v} will generally be set below the new market equilibrium rental rate v^e .

Agrarian reforms of different type and depth can be examined by varying the three parameters α , κ , and \bar{v} . One can think of $\bar{v} = 0$ as expropriation without compensation. Whereas $\bar{v} > 0$ could be thought of either as a tenancy reform, or as a partially compensated land reform. Parameter κ is a measure of how much of the reformed land ‘leaks’ to groups other than the original tenant or landlord. In many agrarian reforms governments assign reformed land to a previously non-tenant class, such as landless workers or to politically connected party militants or other insiders. In this case κ would be the fraction of the previously leased land that now goes to a third party who now also gets to pay only the reduced rental rate \bar{v} . Parameter α measures how likely a threatened agrarian reform is actually implemented.

To a landlord an agrarian reform means facing the prospect of being forced to continue to lease out the $\theta\bar{t}/n^l - T_l$ units of land that had been under lease in the pre-reform phase at below market rates in the post-reform period. The landlord will now choose L_l and T_l (and hence also how much land to lease out) in a preemptive manner, anticipating the risk that tenants may turn into squatters or agrarian reform beneficiaries.

By assumption no further alteration of property rights is possible after the beginning of the second period. This implies that following reform, second period resource allocation will be the efficient allocation (T_e, L_e, L_{ue}) at factor prices $v^e = F_T(T_e, L_e)$ and $w = F_L(T_e, L_e)$, except that now reform beneficiaries earn additional rents now from the transfer of property rights they received. Marginal calculations are not affected because agents continue to transact land and labor at market rates.

The landlord now chooses T_l and L_l to maximize the expected discounted value of farm profits plus factor sales taking into account that property rights over land leased out may be challenged in the event of reform. We denote this payoff V^l and this is

$$\begin{aligned} V^l &= \Pi^l(T_l, L_l) + w + v\theta\bar{t}/n^l \\ &\quad + \beta^l \alpha [\Pi^l(T_e, L_e) + w + v^e \theta \bar{t}/n^l - (v^e - \bar{v})[\theta \bar{t}/n^l - T_l]] \\ &\quad + \beta^l (1 - \alpha) [\Pi^l(T_e, L_e) + w^u + v^e \theta \bar{t}/n^l], \end{aligned}$$

where β^l is the time discount factor of a landlord and $\Pi^l(T_e, L_e)$ are profits per farm in the post-reform period. More compactly:

$$\begin{aligned} V^l &= \Pi^l(T_l, L_l) + w + v\theta\bar{t}/n^l + \beta^l [\Pi^l(T_e, L_e) + w + v_e \theta \bar{t}/n^l] \\ &\quad - \beta^l \alpha [(v^e - \bar{v})(\theta \bar{t}/n^l - T_l)]. \end{aligned} \tag{5}$$

The last line equals the expected loss of income from loss of property rights to a squatter or reform beneficiary.

The peasant household now chooses T_p and L_p to maximize earnings from farm profits plus factor sales taking into account the prospect that they may acquire squatter rights over land leased in. Denoting this payoff V^p we find

$$\begin{aligned} V^p &= \Pi^p(T_p, L_p) + w + v(1 - \theta)\bar{t}/n^p + \beta^p [\Pi^p(T_e, L_e) + w + v^e(1 - \theta)\bar{t}/n^p] \\ &\quad + \beta^p \alpha [(1 - \kappa)(v^e - \bar{v})(T_p - (1 - \theta)\bar{t}/n^p)]. \end{aligned} \tag{6}$$

If $\kappa > 0$ a fraction of land under tenancy is transferred to a third-party beneficiary. We assume they pay the regulated rate \bar{v} but then lease that land back out onto the market, to earn a windfall rent of $(v^e - \bar{v})$ per unit land.

The first-order conditions for a competitive equilibrium with respect to first period land input choices are now given by:

$$G_T + \beta^l \alpha (v^e - \bar{v}) = v = F_T + \beta^p \alpha (1 - \kappa) (v^e - \bar{v}) \tag{7}$$

A landlord will lease out land until its marginal benefit v equals its marginal opportunity costs, measured as the sum of foregone first-period output on the landlord farm G_T plus the discounted expected cost of losing that land to a squatter the following period, $\beta^l \alpha (v^e - \bar{v})$. A peasant will lease in land until its marginal benefit, measured as the increased value of first-period output plus the discounted expected gain of property rights in the next period equal the cost of leasing v . In other words both landlord and peasant increase their demand for land.

Re-arranging (7) and now also reporting the first-order necessary conditions for labor, a new equilibrium will be characterized by:

$$G_T = F_T - \alpha(v^e - \bar{v})[\beta^l - (1 - \kappa)\beta^p] \quad (8)$$

$$G_L = F_L = H_L \quad (9)$$

The first thing to note is that when $\kappa = 0$ and $\beta^l = \beta^p$ – i.e. when there is no leakage of benefits to third parties and landlords and peasants discount the future at the same rate – the first-order conditions become exactly those for the efficient equilibrium (3)-(4). That is, even though there may be a positive probability of reform ($\alpha > 0$) in which landlords will be obliged to yield property rights to tenant-squatters, the equilibrium remains efficient. The reason is that conditions have been met for the emergence of a market in which the landlord can in effect sell squatter rights to tenants. Landlords are willing to lease out land to tenants who may become squatters if those tenants are willing and able to pay an up-front premium to compensate the landlord for the expected loss of property rights. In the limiting efficient case, the tenant simply ‘buys’ the land in the first period rather than rent period by period. The announcement of a certain reform then forces landlords to sell land now rather than lose it later, but does not affect the efficiency of allocation.¹¹

Few analyses of squatting and expropriation risk have considered the possibility of the emergence of a market for informal squatter rights where landlords could charge a tenant for first claim to squatter rights access,¹² yet important examples of such markets taking form are not too difficult to find. de Soto (1989) and Lanjouw and Levy (2002) point out for instance that most land invasions in urban settings in developing countries are highly organized affairs and document cases where prospective squatters paid to secure

¹¹Remember that by assumption landlords fully control access to their lands in the first period and there is no illegal squatting. Landlords are therefore in a position to perfectly determine which tenant obtains a tenancy and any squatter rights in the event of a reform.

¹²A recent exception is Turnbull (2004) who independently analyzes the effect of allowing monetary transfers between landlord and squatter in a somewhat different partial equilibrium strategic game setting.

prospective property rights in yet to be formed squatter communities in advance. In some cases the land owners themselves received payoffs to allow ‘squatter invasions’ to take place without serious resistance. The South Korean agrarian reform experience discussed below provides a yet more relevant and striking example as more land was transferred via ‘voluntary’ land sales from landlords to tenants on the eve of, and in full expectation of, a radical agrarian reform, than was transferred during the actual reform process itself.

In many circumstances however landlords will not be in a position to easily define and sell ‘squatter rights’ unless they are in a position to auction those rights between several would-be squatters before reforms are enacted. Even if they could do this, as we shall assume here, capital market imperfections and other frictions may still make it hard for a would-be buyer to commit to purchasing land at a price equal to the landlords expected loss of property in the event of a reform. In this case a positive wedge between the tenants’ and landlords’ marginal valuations in (7) remains, giving rise to defensive suppression of tenancy by landlords:

Proposition 1 *If rural production requires some amount of the non-traded input S , then when $\kappa > 0$ and/or when $\beta^l > \beta^p$ the expectation of reform ($\alpha > 0$) leads landlords to defensively suppress tenancy leading them to operate farms that are larger and more land-intensive than the first best efficient scale. Peasant farms become smaller and more labor-intensive and rural to urban migration increases.*

To see this note that when $\kappa > 0$ and/or when $\beta^l > \beta^p$ we have $(\beta^l - \beta^p)\alpha(1 - \kappa)(v^e - \bar{v}) > 0$ in expression (7) and hence $F_T > G_T$. Since labor mobility keeps $F_L = G_L = H_L$, we must then have $F_T/F_L > G_T/G_L$ in a new equilibrium. Given our assumption about technologies, this implies landlords must employ a higher land-labor ratio, or $T_l/L_l > T_p/L_p$.¹³ Since landlords withhold land defensively landlord farms expand to inefficiently large scales and $T_l > T_e > T_p$. Since land use has fallen in the peasant sector, the marginal product of labor on peasant farms falls and peasants increase their off-farm labor supply. Labor migrates to the urban sector as the average marginal product of labor falls in the now more inefficiently organized rural sector.

¹³Macours et al. (2004) provide a recent direct test of this implication by demonstrating empirically that the gap between land-to-labor ratios on landlord farms compared to peasant farms was much higher in communities with a history of land conflicts compared to communities with less insecure property rights.

Chapter 25 of Bhagwati et al. (1998) provides a detailed survey of the related literature on the effect of wedges or ‘wage differentials’ on general equilibrium trade models. A key difference with this earlier literature is our interest in understanding the equilibrium distribution of firm sizes within a sector and also, later in the paper, explaining the size of the ‘wedge’ as an endogenous outcome.

Note that the extent to which tenancy falls in response to anticipated reform, and the efficiency cost to the economy, depends crucially on the nature of the production technology. If non-traded factor S played an insignificant economic role, production functions F and G would be approximately constant returns to scale. There would then be relatively little cost to organizing production on large farms so tenancy would fall very rapidly in response to even a small amount of property rights insecurity with little efficiency consequence. If however S plays a more essential role, then landlords will pay a much higher first-period cost for expanding the size of their farms beyond efficient scale.

As the earlier discussion suggests, the anticipation of reform need not lead to economic inefficiency if the land owner is in a position to assign and sell access to the rights to accession to the benefits of reform. Allocative inefficiency will arise however if landowners are unable to auction those prospective squatter rights, for example if reform benefits might ‘leak’ out to third parties and/or if capital market imperfections or other problems make tenants unwilling or unable to offer to pay for the full value of those squatter rights.

The following comparative static results are straightforward to obtain:

Proposition 2 *Anything that increases $(\beta^l - \beta^p)\alpha(1 - \kappa)(v^e - \bar{v})$ will strengthen tenancy suppression and the results of Proposition 1.*

$$\begin{array}{rccccc}
 i = & \frac{\partial T_l}{\partial i} & \frac{\partial T_p}{\partial i} & \frac{\partial \tau}{\partial i} & \frac{\partial L_u}{\partial i} & \frac{\partial L_p}{\partial i} \\
 \alpha, \kappa, \beta^l, v_e & + & - & - & + & + \\
 \bar{v}, \beta^p & - & + & + & - & -
 \end{array}$$

Next we turn to the determination of a political-economic equilibrium in which α and production allocations are jointly determined.

2.2 Political institutions

Potential agrarian reforms are mediated through the political process. We shall model society’s choice regarding the possibility and extent of reform as being the outcome of democratic electoral competition. As we noted in the introduction however, the same forces will be at work in non-democratic polities. To fix ideas, we first analyze the case of electoral competition within the context of a probabilistic voting model, but then explain how the essential trade-offs of the model would be adapted to other models of political competition.

Assume that there is one vote per-agent in the society. Two political parties, which we denote A and B compete for these votes. We assume that both parties have the sole objective of maximizing the probability of winning the election. There is a single policy

issue or instrument which is $\alpha \in [0, 1]$, the probability of reform. We assume, however, that it is costly to do reforms and that to choose a probability α imposes costs $C(\alpha)$ on each agent. Here C is strictly increasing and convex with $C(0) = 0$, $C' > 0$, $C'' > 0$ and $C''' \leq 0$.¹⁴ Clearly, since neither landlords nor urban voters benefit from reform, but both bear costs, they strictly prefer $\alpha = 0$.¹⁵ Peasants however potentially prefer $\alpha > 0$. The equilibrium extent of reform therefore depends on how the political system aggregates the preferences of different agents.

Let $V^g(\alpha_x)$ be the indirect utility of an agent of group $g \in \{l, p, u\}$ as a function of the extent of reform offered by party $x \in \{A, B\}$. We assume that each agent receives an aggregate ideological bias in favor of party B of δ and also has an individual specific bias of σ^{ig} . Thus an agent of group g votes for party A if the indirect utility he gets from the policy platform of party A is greater than the indirect utility from the policy of party B plus the ideological biases. This implies,

$$V^g(\alpha_A) - C(\alpha_A) > V^g(\alpha_B) - C(\alpha_B) + \sigma^{ig} + \delta.$$

We assume that σ^{ig} is distributed uniformly on the interval $\left[-\frac{1}{2\phi^g}, \frac{1}{2\phi^g}\right]$, and that δ is uniformly distributed on the interval $\left[-\frac{1}{2\psi}, \frac{1}{2\psi}\right]$. We can therefore calculate the critical value of the idiosyncratic bias which leaves an agent indifferent between the parties. This is,

$$\hat{\sigma}^{ig} = V^g(\alpha_A) - C(\alpha_A) - (V^g(\alpha_B) - C(\alpha_B)) - \delta.$$

All agents of group g with $\sigma^{ig} \leq \hat{\sigma}^{ig}$ vote for party A . The total number of agents in group g that vote for party A is therefore,

$$\begin{aligned} & n^g \bar{L} \int_{-\frac{1}{2\phi^g}}^{V^g(\alpha_A) - C(\alpha_A) - (V^g(\alpha_B) - C(\alpha_B)) - \delta} \phi^g di \\ &= n^g \bar{L} \left(V^g(\alpha_A) - C(\alpha_A) - (V^g(\alpha_B) - C(\alpha_B)) - \delta + \frac{1}{2\phi^g} \right) \phi^g \end{aligned}$$

This follows because, for given δ , A gets the votes of all the agents of a group who have low values of σ^{ig} . The probability that party A wins the election, denoted $\chi(\alpha_A, \alpha_B)$, is

¹⁴The assumption that urban agents incur costs from land reform captures the idea that the costs of agrarian reform spill over into the cities. This could be because the government raises taxes to finance reforms, because reform induces higher food prices, or perhaps because focusing policy on the rural sector has opportunity costs in terms of spending in the urban sector.

¹⁵We are ruling out the case of $\alpha < 0$ or 'land grabs' where landlords seize peasant land, although there is nothing in principle to rule this out. For example, late 19th century Liberal privatization of communal lands in several Latin American republics led in several cases to large scale transfers of land to large landlords.

therefore the probability that the total number of votes it gets is at least one half of the population, or,

$$\chi(\alpha_A, \alpha_B) = \Pr \left\{ \sum_g n^g \phi^g \bar{L} \left(V^g(\alpha_A) - C(\alpha_A) - (V^g(\alpha_B) - C(\alpha_B)) - \delta + \frac{1}{2\phi^g} \right) \geq \frac{\bar{L}}{2} \right\}$$

Integrating out over the support of δ and using standard calculations we find,

$$\chi(\alpha_A, \alpha_B) = \frac{1}{2} + \frac{\psi}{\phi} \sum_g n^g \phi^g (V^g(\alpha_A) - C(\alpha_A) - (V^g(\alpha_B) - C(\alpha_B))),$$

where $\phi = \sum n^g \phi^g$. The probability of winning is a simple weighted sum of the utility differences that the policy platforms of the parties induce.

A pure strategy Nash equilibrium between the parties is a pair of platforms $(\tilde{\alpha}_A, \tilde{\alpha}_B)$, such that

$$\tilde{\alpha}_A = \arg \max_{\alpha_A \in [0,1]} \chi(\alpha_A, \tilde{\alpha}_B),$$

while

$$\tilde{\alpha}_B = \arg \max_{\alpha_B \in [0,1]} 1 - \chi(\tilde{\alpha}_A, \alpha_B).$$

By symmetry, a Nash equilibrium between the parties involves $\tilde{\alpha}_A = \tilde{\alpha}_B = \tilde{\alpha}$, where $\tilde{\alpha}$ satisfies the first-order condition,

$$\sum_g \eta^g (V_\alpha^g(\tilde{\alpha}) - C'(\tilde{\alpha})) = 0. \quad (10)$$

where $\eta^g = n^g \phi^g$ and where we use the subscript α to denote the partial derivative with respect to α . This first order condition can be easily seen to be a weighted average of the first-order conditions that determine the preferred policy of each group. The weight η^g given to each group's preferences is proportional to that group's population share of the vote, but is also affected by ϕ^g , which is the density of the ideological shocks σ^{ig} . Groups with relatively larger ϕ^g will have more influence in determining the equilibrium policy put forward by political parties because such groups will contain more 'swing voters.'

Many other models of political competition boil down to an equilibrium condition such as (10). For example, the simplest median voter model assigns $\eta^g = 1$ to the group which contains the median voter and $\eta^g = 0$ to all other groups. As discussed below interesting equilibria with a positive probability of agrarian reform will arise within the context of this model only when the peasant group can achieve sufficient 'political clout' to attract the attention of political candidates. More generally, reform will emerge within any political system that gives sufficient political weight to the peasant sector's preferences.

2.3 Political determination of reform α

The timing of the game is as follows

- Landlords determine the extent of tenancy.
- The political parties simultaneously and non-cooperatively determine their platforms.
- First period production, consumption and voting take place.
- The outcome of the election is determined and agrarian reform is implemented¹⁶ with probability α .

There are three groups $g = p, l, u$. Since the urban population is determined endogenously we have to specify how people who migrated from the countryside vote. At any given moment there are L_u urban workers and $(\bar{L} - L_u)$ in the agricultural sector. Hence at any moment in time we have three political blocks with the following population weights:

Voting Shares			
$g =$	(p)easants	(l)andlords	(u)rban
n_g	$\frac{(\bar{L}-L_u)}{\bar{L}} \frac{n^p}{(n^p+n^l)}$	$\frac{(\bar{L}-L_u)}{\bar{L}} \frac{n^l}{(n^p+n^l)}$	$\frac{L_u}{\bar{L}}$

This assumes that the size of the peasant and landlord blocs both adjust down by the same proportion as the urban population increases. It also assumes that those that move to the urban sector vote like city dwellers. This is an arbitrary rule, but one that will fix ideas for now. The payoff to a voter in group g is $V^g(\alpha, T_g, L_g) - C(\alpha)$ where $V^g(\alpha, T_g, L_g)$ is defined in (5) and (6) for landlords and peasants respectively. For urban workers $V^u(\alpha) - C(\alpha) = [1 + \beta^u]w - C(\alpha)$. Using the fact that the area leased per peasant $T_p - (1 - \theta)\bar{t}/n^p$ in (6) can also be written $\theta\bar{t}/n^p - n^l T_l/n^p$, and appealing to the envelope theorem, expressions for V_α^p and V_α^l can be obtained as follows

$$\begin{aligned}
 V_\alpha^p(\alpha) &= \beta^p(1 - \kappa)(v^e - \bar{v}) \left(\frac{\theta\bar{t}}{n^p} - \frac{n^l T_l}{n^p} \right) \\
 V_\alpha^l(\alpha) &= -\beta^l(v^e - \bar{v}) \left(\frac{\theta\bar{t}}{n^l} - T_l \right) \\
 V_\alpha^u(\alpha) &= 0
 \end{aligned} \tag{11}$$

¹⁶Since the political parties only care about the probability of winning and not the actual policy they adopt it is weakly optimal for them to actually choose the α they promised. We therefore abstract from issues of commitment to policy now. In an earlier version of this paper we showed how this assumption could be relaxed.

We can now use (10) to calculate the equilibrium policy adopted by the political parties for a given level of tenancy (as captured by T_l) and other parameters, denoted $\alpha(T_l, L_u, \theta, \boldsymbol{\eta})$, where $\boldsymbol{\eta} = (\eta^L, \eta^P, \eta^U)$. Substituting for each of the V_α^g into (10) we can re-arrange to obtain:

$$(\phi^p \beta^p (1 - \kappa) - \phi^l \beta^l) (\theta \bar{t} - n^l (\bar{L} - L_u) T_l) (v^e - \bar{v}) = C'(\alpha). \quad (12)$$

This equation shows that the equilibrium amount of land reform, $\alpha(T_l, \theta, \boldsymbol{\eta})$, will be a weighted function of the marginal effects of land reform on the utilities of different voters. For there to be any agrarian reform at all requires

$$\phi^p \beta^p (1 - \kappa) > \phi^l \beta^l \quad (13)$$

which will only occur if ϕ^p is sufficiently larger than ϕ^l . This condition requires that the peasant sector have more political clout than the landlord sector, a condition that is not always likely to be met, even though peasants are a larger proportion of the electorate than landlords.

Ceteris paribus, anything that raises the left hand side of (12) will lead to an increase in the equilibrium level of α chosen by the political system (these inequalities will be strict when (13) holds)

$$\begin{aligned} \frac{\partial \alpha}{\partial T_l} &\leq 0 && \text{Reform rises the larger the total area under tenancy} \\ \frac{\partial \alpha}{\partial \theta} &\geq 0 && \text{Reform rises the more unequal the initial distribution} \\ \frac{\partial \alpha}{\partial \kappa} &\leq 0 && \text{Reform falls the higher the leakage} \\ \frac{\partial \alpha}{\partial \phi^p} &\geq 0 && \text{Reform rises the more organized are peasants} \\ \frac{\partial \alpha}{\partial (v^e - \bar{v})} &\geq 0 && \text{Reform rises with the expected value of the rent cap} \\ &&& \text{(i.e. higher } v^e \text{ and/or lower } \bar{v} \text{)} \end{aligned} \quad (14)$$

2.4 Political-economic equilibrium

Having solved for both the political determinants of reform and the allocation of resources in the second period, it remains to determine the equilibrium amount of first-period tenancy. Noting the dependence of α on past organization decisions via the political process, landlord returns can now be written

$$\max_{T_l, L_l} V^l(\alpha(T_l, L_l, \theta, \boldsymbol{\eta}), T_l, L_l) - C(\alpha(T_l, L_l, \theta, \boldsymbol{\eta})) \quad (15)$$

Two polar-opposite cases of landlord behavior will be distinguished: (a) an atomistic or ‘free-riding’ equilibria where landlords take the value of α (or their conjecture of it)

as given and not subject to their individual control ($\partial\alpha(\cdot)/\partial T_l = 0$), and (b) ‘collusive’ equilibria where landlords are assumed to be able to internalize the effect of each landlords’ choice of T_l on the equilibrium α and therefore act to maximize total landlord returns. Other intermediate situations where landlords choose T_l in non-cooperative fashion on imperfectly competitive markets could also be analyzed, but their equilibrium choices will always be bracketed by these two polar cases.

Differentiating (15) with respect to T_l the colluding-landlords’ first-order condition can be written:

$$V_{T_l}^l + \alpha_{T_l}(V_\alpha^l - C') = 0 \quad (16)$$

The first term $V_{T_l}^l = [G_T - v] + \beta^l \alpha(v^e - \bar{v})$ can be decomposed into two sub-components. The term in square brackets is the first period direct production cost of increasing land under own cultivation (i.e. suppressing tenancy) under the assumption that the probability of reform remains unchanged. This effect will be more pronounced, the more important is the role of the non-traded factor (or decreasing returns to scale), since this determines the cost of expanding landlord production beyond the efficient scale. The next sub-component measures the expected future value landlords stand to protect from a small increase in the amount of land withheld from tenants also under the assumption that the probability of reform remains unchanged. The next term $\alpha_{T_l}(V_\alpha^l - C')$ in (16) measures the effect of increased property rights security if all landlords were to raise T_l simultaneously. This term is non-negative since by an earlier result, the equilibrium amount of reform is non-increasing in T_l (i.e. $\alpha_{T_l} \leq 0$) and because landlords always want less reform than a political equilibrium that gives any weight to peasant demands, so $(V_\alpha^l - C') \leq 0$. We denote the collusive solution to (16) by (T_l^c, L_l^c) .

When each landlord acts atomistically, not internalizing the negative externality that increased tenancy has on property rights security, we would set $\alpha_{T_l} = 0$ and first order condition (16) becomes $V_{T_l}^l = 0$ or simply

$$[G_T - v] + \beta^l \alpha^a(v^e - \bar{v}) = 0.$$

where α^a are landlords’ conjectures about the probability of reform. A political-economic Nash equilibrium (T_l^a, L_l^a) also requires equilibrium in the labor market, $G_L = F_L = H_L$ and that conjectures turn out to be consistent with the political equilibrium from (10), or $\alpha^a = \alpha(T_l^a, L_l^a, \theta, \boldsymbol{\eta})$. Since $\alpha^a \geq 0$, and if the conditions for Proposition 1 hold, then $T_l^a \geq T_e$. Landlords restrict tenancy when they expect a positive probability of reform and squatter rights cannot be perfectly traded in a parallel market.

To see what happens instead when landlords can collude to restrict tenancy we have to also make an assumption about the behavior of peasants. The simplest and most plausible is that peasants are more widely dispersed and therefore treat α as given (although the results also carry through if peasants can collude in their decisions). When peasants treat α as parametric, their first order condition for T_p and L_p are identical to the ones with exogenously insecure property rights. The equilibrium is now characterized by the equations

$$\begin{aligned} G_T &= F_T - \alpha(v^e - \bar{v})[\beta^l - (1 - \kappa)\beta^p] - \alpha_{T_l}(V_\alpha^l - C') \\ G_L &= F_L = H_L = w \end{aligned} \tag{17}$$

which are conditions very similar to (8) and (9) except for the new term on the right of (17). It follows immediately that $T_l^c > T_l^a$ and landlords suppress more tenancy when they can coordinate their actions. To see this note that (17) can be written compactly as $G_T = F_T - X$ and anything that increases X increases equilibrium T_l .¹⁷ Since as argued earlier $\alpha_{T_l}(V_\alpha^l - C') \geq 0$ in the collusive case and zero in the atomistic case, X and T_l must be larger when landlords collude. When a landlord decreases T_l he is imposing a negative externality on landlords as a whole which is ignored in the free-riding case. However, when landlords can collude, they take into account this externality and thus increase T_l further above the free-riding case.

The comparative statics of the collusive equilibrium are also interesting and follow in a straightforward way from those derived in the corollary to Proposition 1 when we take into account that α is now a function, not a parameter and thus we must take into account the results captured in (14).

The main conclusions of this analysis is that the anticipation of reform by landlords can lead them to reduce the extent of tenancy below that which would result from the presence of exogenously given reforms. Even though tenancy is efficient from an economic point of view, the anticipation of agrarian reforms limits its scope. This effect is greater, (1) the less are the efficiency losses from reducing tenancy, (2) the greater is initial land inequality, (3) the more political power peasants have. We can now take these comparative statics to the data. Of particular interest is the effect of greater land inequality θ on the equilibrium extent of tenancy. There are two effects. The first direct effect that under secure property rights higher land inequality θ leads to a higher level of area under tenancy.

¹⁷Suppose otherwise, so T_l falls. Land market equilibrium would then require T_p to rise, but then $G_L = F_L$ can only be maintained if L_p falls relative to L_l . But that would lead F_T to fall relative to G_T , an obvious contradiction since the gap between F_T and G_T needed to expand to accommodate the rise in X .

This is the dominant effect. The second is the indirect political effect of higher θ on the likelihood of political reform α when condition (13) is met. By (11) a higher level of θ raises $(V_\alpha^l - C')$ in (17), so tenancy suppression rises with θ . Intuitively, larger landlords stand to lose more from tenancy reform and therefore will take more costly measures to protect their property rights. In the empirical section we seek evidence for both of these effects.

3 Tenancy and property rights reforms in India

India provides an important historical setting within which to explore the empirical relationships between production organization, politics, and property rights reforms. By the time of India’s independence in 1947 the demand for land and tenancy reforms had been raised to burning political and economic issue. Over the next India passed what is arguably “the largest body of land reform legislation ever to have been passed in so short a period in any country” (Besley and Burgess, 2000). What is interesting for our purposes is that the 1949 Constitution left the adoption and implementation of land and tenancy reforms to democratically elected state legislatures. This has led to a great deal of variation in the timing of reforms that can help us to identify the joint evolution of tenancy rates and property rights reforms. A few other empirical studies have tried to explain differences in the extent of tenancy across Indian states using cross-sectional data from earlier periods (Bardhan, 1976, Laxminaryan and Tyagi, 1977), ours is the first study that we are aware of to examine this question by including political variables and using panel data methods to control for state fixed effects.

Table 3 reports *tenancy* rates – the fraction of cultivated land under tenancy – in each of sixteen rural states for the years that comparable data across states was collected by India’s National Sample Survey Organization (NSSO).¹⁸ From 1954 to 1992 the reported share of cultivated land under tenancy fell sharply, but unevenly, across all states. Particularly steep declines occurred in Assam, Maharashtra, Kerala, Jammu and Kashmir, Punjab, Tamil Nadu, and West Bengal each of which experienced 50 to 90 percent declines in the measured extent of tenancy. The question to be addressed here is whether, after controlling for other factors, these changes may be systematically related to changes in

¹⁸Tenancy refers to land leasing including sharecropping, fixed rent tenancy and other forms. Tenancy data for 1954 and 1961 are from the NSSO as reported by Bardhan (1976). Later years are taken from the tables in the NSSO’s *Sarveshana* journal (various issues). We focus on the same 16 states studied by Besley and Burgess (2000) with the exception of Haryana (which split from Punjab in 1965) because of missing observations.

political and economic variables in line with the predictions of the theory.

Several observers point out that survey respondents may be under-reporting tenancy to elude tenancy regulations, in which case part of the measured decline may be due to the rise of disguised tenancy (Ray, 1998). While this is almost certainly the case, we unfortunately have no obvious method with which to consistently control for this measurement problem across states. The analysis can therefore only purport to explain movements in *reported* tenancy rates. If reported tenancy fell more rapidly than actual tenancy, the empirical relationship between tenancy reforms and area cultivated under tenancy will be likely overstated. Even so the analysis remains useful as an indication of the costs of insecure property rights because actual and reported tenancy rates are likely highly correlated and because agents who expend effort to conceal tenancy are very likely also making other costly choices to evade or adapt to actual and anticipated tenancy legislation.

Tenancy reforms in India have focused on three main areas: (a) rent ceilings; (b) granting of long-term security from eviction to tenants; and in some cases (c) the granting of ownership rights to tenants. Specific regulations and implementation have varied by state. Table 3 reports two proxy measures of cumulative property rights reform by the end of sample year 1992, both taken from Besley and Burgess (2000). The first of the two is the cumulative index of tenancy reforms (*clr1*) which aggregates the number of significant tenancy reform acts, or major revisions to tenancy law, that had occurred in a particular state up to any given date. This is an admittedly crude proxy of property rights insecurity particularly since it cannot well capture the intensity or the extent to which policy was actually implemented across states. Besley and Burgess have nonetheless demonstrated that this variable can account for significant differences in growth and poverty outcomes across states. A second broader measure of reforms (*clr*) is also reported. This adds up all major agrarian reform acts including tenancy reforms as well as reforms to impose land ownership ceilings, abolish *Zamindari* intermediaries, or consolidate lands. We have combined the state-level observations of tenancy rates by decade that we obtained from the NSS with the annual dataset of political and economic variables that Besley and Burgess (2000) constructed from NSS and other sources. Setting aside a few missing observations, we are left with a panel of fifteen states with usable tenancy observations in 1961, 1972, 1982 and 1992.¹⁹

¹⁹Tenancy rates for 1954 are also reported in the table but could not be used in the regressions due to our not having comparable data on several of the other variables going far back enough to enter the regression with lags.

There is fairly widespread agreement that agrarian reforms in India have in general done rather little to equalize the pattern of land ownership (Besley and Burgess, 2000, Mearns, 2000, Ray, 1996). This is partly because many reforms were aimed at offering tenurial security and rent regulation rather than to transfer ownership. When the reforms did have a redistributive aim, such as the case of land ceiling legislation, the laws were typically not enforced. Table 3 confirms this impression by indicating that the share of land held by the top 10 percent of households (*top10*) has changed relatively little over 30 years in most states. In fact, the four states with the highest index of agrarian reform activity West Bengal, Tamil Nadu, Orissa and Kerala actually saw inequality *rise* by this measure. This observation helps rule out the potential concern that the extent of tenancy might be declining mechanically with agrarian reform activity in the regressions below simply because reform transformed tenants into owners.

The theoretical model suggests estimating how the area under tenancy (τ_{is}) in state s in time period i responds to economic variables x_{si} that directly affect tenancy choices as well as with agents' expectation of future property rights reforms R_{si+1} (the expected probability of reform α in the earlier model). Our empirical estimation strategy closely follows the framework Besley (1995) employed to analyze the relationship between property rights over land and investment choices by rural households in Ghana using plot-level data. The key differences are that property rights insecurity is proxied here by the cumulative agrarian reform index and we study state-level tenancy choices rather than plot-level capital investment decisions. We also consider state-level political determinants of property rights. The relationships to be modeled may be represented compactly as

$$\tau_{si} = f(R_{si+1}, x_{si}, z_i) \quad (18)$$

Tenancy choices τ_{si} in state s in time period i depend on a vector of state and time dependent variables x_{si} , time-invariant state variables z_i , and agents expectations about future property rights R_{si+1} . We cannot observe agents expectations in time period i but we assume they are formed rationally conditioning on all variables in their information sets including the current state of property rights R_{si} as well as other current or past economic and political variables including x_{si} and z_i :

$$R_{si+1} = g(\tau_{si}, x_{si}, z_i, R_{si}) \quad (19)$$

With this and simplifying assumptions about linear functional forms we can arrive at the following linear specification for the tenancy equation, essentially identical to Besley's (1995) equation (19):

$$\tau_{si} = a_1x_{si} + a_2R_{si} + a_3z_i + a_4w_i + \varepsilon_{si}$$

To control for unobserved heterogeneity in the time invariant state-level variables that could bias the results we will include state fixed effects in most of the specifications. We also control for any India-wide time effects by including year (decade) dummies. To control for the endogeneity of reform we will report limited information estimates of the above equation instrumenting for R_{is} using political and population variables that are likely to be correlated with R_{is} but not with tenancy. Since estimating an instrumental variables regression with both state and year fixed effects is asking a lot of a small dataset, the results below should be interpreted with caution.

Our main hypotheses are that expected reforms should have a negative and statistically significant impact on the extent of tenancy even after controlling for the endogeneity of reform and other variables. We also expect higher land inequality should have a direct effect of leading to more tenancy, but that it may lower tenancy indirectly via its impact on a higher probability of reform. Rather than use a single measure of inequality, such as a land Gini coefficient, we employ two different measures together: *noland* which measures the fraction of the rural population that does not own land and *top10*, the fraction of landholdings held by the top ten percent of households. This allows for a more flexible range of possibilities. We would expect the coefficient on *noland* to be positive indicating net demand for land by land-poor households. We might also expect *top10* to be generally positive indicating that more land-rich households lease out land. However, as several empirical case studies have suggested is the case (Macours et. al., 2004, Lanjouw and Levy, 2002), in many contexts land-poor households are much more likely to lease in land from a known network of similar other small or medium scale owners than from very large landowners. If this is the case, then a higher concentration of land at the top of the land distribution scale might well reduce tenancy, by making less land available for this middle group. To ameliorate concerns that land distribution might itself be endogenous, we shall use decade-long lags on both variables.

Table 4 presents estimates of the equations of interest using different estimation strategies. Column 1 reports results from a standard OLS regression of (18). None of the coefficients of interest are significant, but these estimates are almost certainly biased for failing to control for unobserved heterogeneity. To control for this problem the second column presents results from a regression with state fixed effects. State fixed effects control for such time-invariant factors as differences in soil and geography characteristics which

might explain initial differences in the level of tenancy across states (Bardhan, 1976). In the new regression, tenancy now falls with expected reform activity and rises with the fraction of landless in the population. However, since we are not yet controlling for the likely endogeneity of reform, the estimates are expected to be inconsistent.

Column 3 addresses the endogeneity of reform via an instrumental variables approach. The theoretical model related tenancy to expected property rights reforms and how both of these variables responded to other political and economic variables such as initial land inequality, and the political power of peasants. In the probabilistic voting model the power of peasants is captured by the density of their ideological bias. The larger this is, the more ideologically homogenous they are, the more power they have. Other factors that influence the strength and size of the coalition in favor of reform will also be important determinants of the extent of reform. We tried to measure these things in various ways. Though ideological homogeneity cannot be directly observed we can reasonably proxy this by measures of political fragmentation, particularly how many different parties or candidates compete for seats. The more homogenous, the smaller the number of candidates we would expect and the more power peasants would have. More directly we can also use the size of the urban sector of a state as a proxy for the strength of the political coalition opposed to reform. This suggests our choice of two instruments for the cumulative reform index: *urban*, the fraction of the population in non-rural areas and *candpseat*, the number of political candidates competing per seat in the most recent state elections. To address concerns that *candpseat* might be endogenous we use a ten year lag. Both instruments are expected to influence the political outcomes that determine property rights reforms yet should not have a direct impact on farmer tenancy decisions.²⁰ The coefficient on the key variable of interest *clr1* is negative and statistically significant as expected. Since ours is arguably a one-sided hypothesis, the coefficient is significant at the 4.2 percent level on a one-tailed test. This indicates that after controlling for other effects each additional legislative act of tenancy reform reduces the tenancy rate by about 1.5 percentage points. Since the cumulative tenancy reform index ranges from 0 to 9 over this period, this accounts for up to 13.1 percentage points of decline. This likely underestimates the true impact of expected property rights reforms on reported tenancy since reform in any one

²⁰We also tried three additional instruments suggested by Besley and Burgess (2000). These are lagged values of the shares of legislative seats that went to (1) the ‘hard left’, (2) Congress Party and allied parties, and (3) ‘Hindu parties’. When these instruments were used alongside our instruments the result was to leave *clr1* largely unchanged and still significant, yet the new instruments by themselves fail the test of joint significance in explaining *clr1*.

state may influence landlords expectation of reform in another state.²¹

The bottom panel of column 3 reports on the first-stage IV regression results. The instruments easily pass tests of their validity as instruments as indicated by an F-statistic test that shows they are jointly significant at explaining the instrumented variable, and by Sargan’s test of overidentifying restrictions which demonstrates we cannot reject the null that the instruments are uncorrelated with the second stage disturbance. Unlike the tenancy regression, this is a reduced form. The signs of the coefficients correspond to those of the underlying linear structural equation, but the absolute size of the coefficients will differ. As expected, the coefficient on *urban* is negative and statistically significant, indicating that more urban electorates are less likely to vote for tenancy reforms. The coefficient on *candpseat*, is also negative and statistically significant, suggesting that states with more political party fragmentation (suggesting less ideological homogeneity in the pro-reform group) have fewer tenancy reform acts. It’s interesting to note that after controlling for other factors the time dummies have no significant direct effect on tenancy levels in this or any other specification, but do show up significantly in the reform equation. This suggests that any India-wide trend effect works to lower tenancy mainly via rising reform legislation.

We’ve focused narrowly on tenancy reform acts to capture landlords’ or peasants’ changing perceptions of property rights insecurity. The enactment of other land-related reforms could however also be viewed as a harbinger of future property rights challenges and affect tenancy decisions. To examine whether this is the case, and to check how robust the estimates are to changes in how reform is measured, column 4 presents results for the regression using Besley and Burgess’ broader measure of agrarian reform activity *clr*, which includes both *clr1* as well as other legislative acts. The results are very similar to the earlier ones, only that now we also find a significant effect of higher land inequality (as captured by *noland*) on the probability of reform. This is in line with the predictions of the probabilistic voting model. Not surprisingly tenancy is less responsive to each additional act of reform compared to when we considered only tenancy reforms.

4 Further Discussion and Evidence

A large historical literature points to a connection between the extension of the electoral franchise and the timing of agrarian reforms as well as the use of defensive patterns of agrarian organization by landlords to protect against the real or perceived threats of

²¹To properly take into account such interaction effects would be infeasible with a dataset this small.

property rights challenges. In a recent book on the topic, Lapp (2004, front flap) argues bluntly that “nearly every extension of suffrage to the rural poor [in Latin America] occurred at the same time as land reform. Politicians did not merely react to peasants’ demands; rather, they sought political power by extending the right to vote while redistributing land.” One example is the electoral reforms of 1958 in Chile which expanded the size of the rural electorate and reduced landlords’ opportunities for vote manipulation by establishing an effective secret ballot (Baland and Robinson, 2003). Within a few years new legislation had been enacted lifting the ban on rural unionization and far-reaching agrarian reforms in the 1965-1973 democratic period which led to the final demise of the large estates and the *inquilinaje* (labor-service tenancy) system. Swinnen (2000) offers evidence for a similarly indisputable connection between the extension of the franchise and the timing of tenancy reforms in many countries of Europe, where tenancy reforms were far-reaching and extensive.

de Janvry (1981) provides a classic statement of the ways that land rental and sales markets have failed to reallocate land toward family farmers in Latin America, and how land reform processes have been subverted or stopped through the political activities of landlords. He argues that the anticipation of agrarian reform led landlords in several countries to turn to mechanization and new production activities which relied on hired wage labor and machinery rather than tenants. In some instances the connection between the form of agrarian organization and the defensive protection of property rights is patently obvious. In El Salvador in the early eighties thousands of tenants were evicted shortly after it became apparent that legislation for a land-to-the-tiller agrarian reform was being proposed (Pelupussy, 1997, Prosterman and Riedinger, 1987).

In other regions conflict may have always been latent and tenancy never became firmly established. Zamosc (1986) illustrates this by describing Colombian landlords’ use of pasture-rent contracts to open up new frontier land in the north-western regions of the country. Under this system peasants would clear forest to open up new land in exchange for being allowed to grow rice, yuca, maize or other food crops. At the end of a few years however peasants were required to sow pastures and return the land to the landlord. The tenant was then typically moved onto a new plot of land in a different location. Tenants were also often required to live in hamlets on the roadsides between haciendas rather than on the land they farmed. These practices clearly limited the tenant’s ability to establish squatter rights.²²

²²The passage of national legislation in 1968 granting potential rights to tenants brought even this defensive system to an abrupt end. According to Zamosc, landlords then expelled tenants “on a massive

A central point of our model is that latent property rights conflicts may lead to defensive organization and other costly activities that may long delay the emergence of explicit national level political reform. The following excerpts from a long letter written in the early 1950s by a landlord in the Cerro de Pasco region of Peru gives a very good sense of the depth and the political dimensions of the property rights insecurity that many landlords in Latin America have perceived they face:

“Seldom does a week go by without a boundary controversy ... the ‘comunidad’ keeps pushing its livestock onto this disputed land, and often gets the Senators and Deputies of their Departamentos and Provinces to put pressure on the Government to decide in [their] favour ... These disagreements last for one to ten years, and during this time our boundary riders are constantly fighting to protect our land. On several occasions our boundary riders have been cursed, clubbed and hit with rocks by our neighbours ... There are two weaknesses that make our battles long and hard. One is the Government’s lack of firm support to the rightful private land owners who occupy the land disputed. The Government agency gives the ‘comunidades’ moral support, encouragement and confidence in these affairs, instead of reprimanding them for their unauthorized, unorthodox and illegal procedures. The other weakness is the poor description or method of designating the boundaries of our titles ... [in some cases] we have had to depend upon the ‘squatter’s right’ or physical possession to keep us put. In two early cases, the ‘comunidades’ took possession of our land and pushed us off ... we have fifteen land disputes pending [in the courts] ... one has been going on since 1914, and it is still a perennial headache (cited in Duncan et al., 1977, pp. 87).”

Under such circumstances, it is of course difficult to imagine landlords voluntarily leasing out land to any one but the most trusted of tenants out of fear of squatting. Without well functioning markets for leased land to take advantage of the non-traded farming skills of small farmers, the model predicts the emergence of a sustained gap between land-to-labor ratios on landlord and peasant farms, low overall agricultural productivity, and migration of labor from rural areas to the city, all of which have been commonly described characteristics of Latin America’s rural economy.

A natural question at this point is how did large areas of Asia and Europe manage to develop such historically extensive tenancy, and why did those regions later have far

scale, abolishing the customary patterns of access to land within a couple of years (pp.78-79).”

reaching land and tenancy reforms to benefit so many tenants? The model suggests several possibilities, although we do need to step somewhat outside of the model's simple assumptions about timing and rational anticipation. Latin America has had historically much higher levels of land inequality, less effective land registries and courts, dating back to the time of Spanish conquest (Binswanger et al, 1995; Conning, 2004). A much longer pattern of settlement in many parts of Western Europe and Asia, much less concentration of land, and the presence in many regions of strong centralized states interested in maintaining clear cadastral property records in part to facilitate tax collection, would have led to more clearly defined and secure property rights, and therefore more tenancy over time. Over centuries, tenants developed customary occupancy rights.

How agrarian reform arises as a political issue can also help to shed light on agrarian structures and the relative success of land reforms in East Asia and tenancy reforms Europe. The land reforms that affected Taiwan, Korea and Japan, each occurred in the context of actual or threatened external invasion which were unanticipated events that undermined previously dominant landlord classes whose authority had previously been relatively unchallenged. However, as soon as the political basis for these property rights was undermined, the existence of a large population of tenants assured strong political support for far reaching land reforms and later for continued support for the rural sector.

The fact that land reform arose in an unanticipated manner, and that widespread tenancy had been stable for so long, meant that landlords had not organized production to avoid this and tenants already had *de facto* possession of the land about to be redistributed.

Jeon and Kim (2000) analyze the fascinating case of land market sales in anticipation of agrarian reforms in South Korea. Tenancy under the Japanese colonial administration 1919-45 had been a widespread phenomenon as by one measure over 56 percent of farmer households were tenants and 58 percent of farmland was under tenancy in 1939. Although tenant protests demanding lower rents were not uncommon, the Japanese colonial military presence had strictly enforced landlord's property rights. Landlord political power was very seriously and abruptly undercut however when the Japanese were forced to abandon the Korean peninsula and Korea came under the US military administration in August 1945. Both the US military administration and the first democratically elected administration in 1948 almost immediately signaled plans to implement land reform legislation. The North Korean threat helped to override remaining political resistance, and far-reaching land reform legislation was passed into law in 1950. Although the reforms had the appearance of being externally imposed, Jeon and Kim point out that the 1948

land reform should be understood as “an endogenously determined governmental policy consistent with the intuition of the median voter theorem ... [as] tenants represented the largest portion of the population (pp. 257-258).” They argue that the anticipation of land reform had been evident from the moment the Japanese had begun withdrawing years before final reforms were enacted. The eventuality of reform was indeed so certain that 60 percent of landlords – mostly the larger ones – sold their land to tenants via the market at reduced prices before 1950. Remarkably, more than twice as much land was sold by landlords in anticipation of the reform than was transferred directly via the land reform process (p. 255, Table 1). This is consistent with the prediction of our model that, under the right conditions, a market for squatters rights may emerge under the specter of expected reforms.

5 Conclusion

The modern theory of agrarian organization has studied how the economic environment determines organizational form under the assumption of exogenous property rights to land. The political economy literature has modelled the endogenous determination of property rights and the distribution of land ownership. In this paper we have argued that the form of agrarian organization may also be influenced by the anticipation of property rights challenges. In particular, we argued that landowners may have an incentive to limit the extent of tenancy to reduce the expected extent of agrarian reform. Despite the economic advantages that tenancy embodies, by giving tenants de facto property rights, it also raises the spectre of reforms via the political process.

Though the economic environment and market imperfections play an important role in agrarian organization, we argued that our theory can help to explain why there seems to be so little tenancy in situations where agrarian reform is a salient political issue, particularly in parts of Asia and Latin America. A simple test of the theories implications using data from Indian states provides confirmation of the importance of political variables in explaining the variation of tenancy across states and its evolution over time.

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Table 1: Distribution of farmland by land tenure status, 1970 World Census of Agriculture

	Asia	Africa	Latin America	Europe	North America	World
Number of Countries	10	4	15	12	2	46
Number of Farms (millions)	93.3	3.5	8.6	11.9	3.1	120.4
Avg. operational farm size (ha)	2.3	0.5	46.5	7.6	161.2	10.0
Percent of farmland under:						
Pure owner Cultivation	84.0	9.2	80.4	58.9	36.6	61.1
Pure Tenancy	5.9	3.0	6.2	12.5	11.9	9.0
Owner-cum-Tenancy	10.1	29.1	5.6	28.5	51.5	27.2
Communal or other	0.0	58.7	7.8	0.1	0.0	2.7

Source: Adapted from Table 1.1. in Hayami and Otsuka (1993) *The Economics of Contract Choice*, Oxford.

Notes: Farmland under owner-cum-tenancy includes both owned and leased land. *Asia*: Bahrain, India, Indonesia, Jordan, Korea, Kuwait, Pakistan, Philippines, Saudi Arabia, Singapore. *Africa*: Cameroon, Reunion, Swaziland; *Latin America*: Costa Rica, Dominican Republic, El Salvador, Guadeloupe, Honduras, Panama, Puerto Rico, St. Lucia, Virgin Islands, Brazil, Colombia, Peru, Surinam, Uruguay, Venezuela; *Europe*: Austria, Belgium, France, West Germany, Italy, Malta, Netherlands, Norway, Poland, Portugal, Sweden, UK; *North America*: Canada, USA.

Table 2: Land Inequality, land tenure status, and land reform in selected countries

ASIA	Year	Land Gini	Pure Tenant	Total ^a	Reform Years	% rural HH benefited
Bangladesh	1976	0.42	-	20.9		
India	1970	0.62	2.4	8.5		
Indonesia	1973	0.56	2.1	23.6		
Nepal	1971	0.56	1.5	13.2		
Phillipines	1971	0.51	21.4	32.8		
Thailand	1978	0.45	6	15.5		
Taiwan	1939	-	-	56.3 ^b	1949-53	47.9
	1959	-	-	14.4 ^b		
Korea	1939	-	-	58.4 ^b	1950-65	
	1955	-	-	0.5 ^b		
Japan	1938	-	26	70		
<hr/>						
UNITED STATES	1969	-	12.9	51.8	-	-
	1997	-	14.8	78.5	-	-
<hr/>						
LATIN AMERICA						
Argentina	1960	0.79	14.6	-	1940-68	0.8
Brazil	1970	0.84	6.1	10.2	1964-69	0.4
Bolivia	1950	-	7.5	-	1953-75	78.9
Costa Rica	1973	0.82	1.2	9	1961-79	13.5
Chile	1965	-	14.2	24.4	1965-75	23
Colombia	1960	0.86	5.3	11.5	1961-77	8
El Salvador	1961	0.81	7.8	-	1980-83 ^c	12
Nicaragua	1963	-	2.6	-	1979-83	30
Peru	1961	0.91	4.5	13.6	1967-79	21.3
Uruguay	1970	0.82	19.1	46.3	1948-69	0.5
Venezuela	1961	0.91	4.5	2.4	1959-75	25.4

Sources: Asian country data except for Taiwan and Korea from Table 1.2 in Hayami and Otsuka (1993) *The Economics of Contract Choice*, Oxford; Taiwan: Fei, Ranis & Kuo (1979) *Growth with Equity: the Taiwan Case*, Washington, D.C. Korea: Jeon and Kim (2000), Table A1. Japan: Kawagoe (1996), Table 4-11. Latin America and 1969 data for United States: Wilkie, J. (ed.) *Statistical Abstract of Latin*, 1996. Tables 200, 201, 206. United States: 1997 Census of Agriculture.

^a The sum of farmland under pure tenancy plus owner-cum-tenancy. Note that this overstates the true extent of tenancy because owner-cum-tenants also farm owned land.

^b Actual farmland area under tenancy, be it under pure tenancy, or the leased part of owner-cum-tenants farms.

^c Figure does not include land distributed under the 1992 peace accords.

Table 3: Data on Tenancy, Land Distribution, and Agrarian Reforms for Indian States

State Name	tenancy share of cultivated land under tenancy						top10 % area owned by top 10% of rural households			clr1 cumul. tenancy reforms	clr cumul. all reforms	urban % popn. urban	candpseat candidates per seat
	1954	1961	1972	1982	1992	% change 54-'92	(in '61)	(in '92)	% chg	(by '92)	(by '92)	(in '92)	(mean)
Andhra Pradesh	19.1	9.1	9.1	6.2	9.6	-50	61.1	56.8	-7.0	1	2	27.2	4.4
Assam	43.5	15.4	19.6	6.3	8.9	-80	41.0	36.4	-11.3	1	3	11.2	5.7
Bihar	12.4	10.3	14.5	10.3	3.9	-69	51.8	50.3	-2.9	4	7	13.2	8.4
Gujarat	6.2	5.8	4.0	11.9	3.3	-47	47.6	49.3	3.6	2	4	34.8	5.2
Jammu and Kashmir	22.2	14.1	8.0	2.4	.	-89				1	2	24.9	4.8
Karnataka	16.4	18.2	15.9	6.0	7.4	-55	36.2	34.3	-5.3	2	4	31.1	4.8
Kerala	20.0	15.3	8.4	2.0	2.9	-86	47.2	50.4	6.8	4	9	27.1	4.4
Madhya Pradesh	18.6	6.4	7.5	3.6	6.3	-66	61.7	55.4	-10.2	1	3	23.4	6.0
Maharashtra	26.8	8.7	6.1	5.2	5.5	-79	44.7	46.6	4.4	1	2	39.0	5.5
Orissa	12.6	10.8	13.4	9.9	9.5	-25	50.3	51.1	1.5	3	8	13.5	4.7
Punjab	40.4	35.4	28.1	16.1	18.8	-53	50.1	43.0	-14.2	1	1	29.7	5.3
Rajasthan	20.9	4.9	5.6	4.3	5.2	-75	54.6	52.4	-4.0	0	1	23.0	6.2
Tamil Nadu	27.5	16.5	13.2	10.9	10.9	-60	48.0	49.9	4.0	6	7	34.3	5.2
Uttar Pradesh	11.4	8.1	13.3	10.2	10.5	-8	56.7	56.0	-1.1	2	5	20.0	8.9
West Bengal	25.4	17.6	18.6	12.3	10.4	-59	44.3	45.5	2.6	9	15	27.6	4.3
Unweighted Average	21.6	13.1	12.4	7.8	8.1	-60	46.8	48.7	4.0	3	5	25.3	5.8

Sources: All Tenancy data from National Sample Survey Organization, from Bardhan (1976) and *Sarvekshana* (various years).

All other variables from Besley and Burgess' (2000) panel dataset.

Table 4: Instrumental Variables Regression explaining Tenancy rates, with fixed state and year effects

	1	2	3	4
Method	OLS	FE	IV-FE (clr1)	IV-FE (clr)
State Effects	no	yes	yes	yes
Year Effects	yes	yes	yes	yes
Instruments	no	no	yes	yes
tenancy				
cumulative reform	0.151 (0.762)	-0.942 * (0.097)	-1.458 * (0.085)	-0.952 * (0.096)
noland (lagged)	0.084 (0.490)	0.291 * (0.040)	0.335 * (0.005)	0.365 * (0.004)
top10 (lagged)	-0.015 (0.911)	-0.083 (0.743)	-0.338 (0.129)	-0.367 (0.105)
1972 dummy	0.047 (0.986)	2.925 (0.199)	3.024 (0.147)	3.224 (0.133)
1982 dummy	-4.317 (0.168)	0.297 (0.916)	0.104 (0.971)	0.665 (0.831)
1992 dummy	-3.255 (0.292)	1.417 (0.607)	0.131 (0.964)	0.709 (0.825)
overall intercept	11.638 * (0.095)	10.658 (0.411)	24.414 * (0.034)	25.875 * (0.026)
cumulative reform				
urban			-0.315 * (0.026)	-0.556 * (0.018)
candpseat (lagged)			-0.538 * (0.007)	-0.664 * (0.038)
noland (lagged)			0.047 (0.205)	0.105 * (0.086)
top10 (lagged)			-0.035 (0.631)	-0.090 (0.450)
1972 dummy			1.811 * (0.012)	3.124 * (0.008)
1982 dummy			4.537 * (0.000)	7.715 * (0.000)
1992 dummy			6.377 * (0.000)	10.475 * (0.000)
overall intercept			8.619 * (0.056)	8.619 * (0.034)
N	60	60	55	55
R-squared	0.136	0.394	0.563	0.571
R-squared (first stage)			0.592	0.602

Notes: p-values in parentheses. An * indicates significant at 10% level (two-tailed test).