Latifundia Economics

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Abstract

This paper proposes a simple general equilibrium theory of agrarian production organization to explain the emergence and persistence of latifundia - minifundia type patterns of agrarian production organization such as have prevailed historically in many parts of Latin America. When land ownership is concentrated, the exercise of market power over land can facilitate the exercise of control over labor, as labor supply to landlord estates is affected by peasant access to land. Equilibria may emerge where landlords, behaving as multi-market Cournot oligopolists, inefficiently hoard land to drive up land rentals and corral cheaper labor into their expanding estates. Labor-service tenancy arrangements, similar to those used in practice, emerge as landlords try to price discriminate. These contracts help to restore allocative inefficiency but lead to lower equilibrium peasant wages and welfare. Population growth, differential technical progress on landlord and peasant farms, and other changes in the physical and economic environment are shown to transform equilibrium patterns of agrarian production organization in ways that are consistent with agrarian trajectories observed in late nineteenth century Chile and several other regions and periods. The model also clarifies how agents' incentives to challenge property rights change along with equilibrium agrarian structures.

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1 Introduction

Although the regions of North and Latin America were both established as European colonies with similarly abundant natural resources and high land to labor ratios, they soon embarked on divergent development paths. Economists otherwise fond of emphasizing the role of factor endowments and population growth in shaping the path of economic growth and structural transformation have had to fall back on explanations that emphasize the different nature and quality of the institutions and cultures of the regions to explain this divergence. Yet such explanations are not entirely convincing, and remain incomplete until they can clarify how these institutions and cultures change, or fail to change, over time. They also fail to account for the substantial divergence of outcomes within Latin America amongst countries that share common colonial heritage, culture and religion.

A more compelling story, emphasized in recent scholarship by Engerman and Sokoloff (2000), attributes much of the divergence to Latin America's much higher initial inequality. For example, while the Spanish crown granted vast tracts of land and substantial control over indigenous labor to a small number of original colonizers, the settlers to the North American colonies arrived to no such privileges (the slave-owning US South merits a separate discussion). According to Engerman and Sokoloff the highly skewed distribution of resources in Latin America led to slower growth by contributing to "the evolution of political, legal, and economic institutions that were less favorable toward full participation in the commercial economy by a broad spectrum of the population." This in turn shaped the evolution of land policy itself. Whereas the political process in the United States led to the recognition of property rights to thousands of squatters and small settlers (de Soto, 2000) and to the opening of vast frontier regions to successive waves of immigrant settlers, landowning elites in Latin America influenced the political process to limit and curtail the ability of independent small farmers to establish or maintain lasting property rights in newly opened frontier regions (Bulmer-Thomas, 1994).

While the large haciendas of New Spain initially relied upon compulsory Indian labor drafts, most such practices were abolished by the crown as early as 1632, and

landlords had to find other ways to secure labor for production under conditions of labor scarcity. This gave rise to the numerous institutional adaptations such as labor-service tenancy, and shaped the pattern of agrarian organization for decades and centuries to come. As late as the mid twentieth century, agrarian production organization in many parts of Latin America was still marked by the predominance of large landlord estates, or latifundia. Labor on the estates was provided by attached workers and labor-service tenants living within the estates, or by temporary workers drawn from surrounding communities of very small peasant farms, or minifundia, that often co-existed nearby.[1] In North America similar crops were instead produced by a large number of independent family farms.

Engerman and Sokoloff and others have argued that the more egalitarian pattern of land ownership and production organization in North America led to faster growth by creating better incentives for work and innovation, as well as by engendering more competition and broader credit markets, and more effective governance structures for local taxation and investments in public education.

The story sounds persuasive, but a number of problems appear as one attempts to formalize such arguments. Most fundamental is the question: Why should initial land inequality have led to persistently inefficient allocations and slower growth? Why couldn't the issues of efficiency have been separated from the problems of distribution? If the pattern of farm production organization in the United States was more efficient and generated faster skill accumulation because of the better work incentives facing independent farm operators, then why did not Latin America's landlords choose to sell their lands, or fill up their estates with tenancies, to cash in on the higher land values that such a more efficient pattern of production organization would have engendered?

Historically Latin America has in fact cultivated a much *smaller* fraction of its agricultural land under tenancy than counterpart regions in Europe, Asia, or the United States and Canada.[2] Why would such an apparently inefficient pattern of production organization persist for so very long? Most commonly advanced answers to this question fail to adequately or completely explain the facts. Several of such

[1] For descriptions of agrarian production organization in Latin America and their evolution over time see for example Bauer (1975), Bulmer-Thomas (1994), Chevalier (1963), Binswanger and Deinenger(1995) and Pearse (1975).

[2] Hayami and Otsuka (1993), Binswanger and Deinenger (1995), and Conning and Robinson (2001) provide comparative statistics and discussion on this topic.

alternative arguments – such as economies of scale, landlord myopia, landlords more concerned about status rents than profits, credit market imperfections, differential skills and management ability, etc. – are discussed in more detail below.

One argument that might plausibly account for the absence of more active tenancy and land sale markets in many parts of Latin America is that landlords have chosen to organize production, and manipulate politics in the ways that they did because it helped them to extract monopoly rents over land, and by extension, monopsony rents over labor. Henry George expressed this monopoly-cum-monopsony succinctly, if crudely, more than a century ago in this famous passage:

> Place one hundred men on an island from which there is no escape, and whether you make one of these men the absolute owner of the other ninety-nine, or the absolute owner of the soil of the island, will make no difference either to him or to them ... In the one case, as the other, the one will be the absolute master of the ninety-nine–his power extending even to life and death, for simply to refuse them permission to live upon the island would be to force them into the sea. (Henry George, *Progress and Poverty*, 1879: 347-348).

While George's example is clearly extreme, it captures the essential idea that landlords might be able to take advantage of market power in the land market to also exercise market power over labor. In practice landlords' could exercise such market power by limiting peasant households' access to land via tenancies or land sales, although their ability to do so will naturally be limited by the extent of competition with other landlords and by other constraints derived from the economic environment.

The purpose of this paper is precisely to explore how factor endowments, the initial distribution of property rights, the nature of production technologies, the distribution of skills in the population, the extent of competition between landlords, and other elements in the economic environment might affect equilibrium patterns of agrarian production organization via their impact on landlords' endogenously determined ability to exercise market power. The model also helps to clarify the historical circumstances under which elites might want to block or enable peasant access to frontier land or redefine property rights over land in other ways via political or extra-legal

means.[3]

To understand the argument, consider the simplest case of a single landlord surrounded by a fringe of landless or small-landowning peasant households. When initial land inequality is high, the landlord naturally owns a large fraction of this economy's land endowment. As the standard partial-equilibrium analysis of non-price discriminating monopoly tells us, this landlord would attempt to drive up the rental price of land by withholding land from the lease market. In a general equilibrium setting there is another effect, however. By restricting peasants' access to land, landlords may also lower the marginal product of labor on peasant farms, and therefore affect the peasant sectors' willingness to supply labor to the landlord estate at any given wage.

Landlords' optimal markup pricing decisions must consider the interaction between these land monopoly and labor monopsony market power effects – henceforth labeled 'monopsoly' effects for short – leading to equilibria where landlords increase the size of their production estates and use overly land-intensive production techniques in comparison to the competitive equilibrium. Peasant producers will in turn be lead by distorted equilibrium factor prices to employ overly labor-intensive techniques on inefficiently small farms. The resulting economy will therefore display the characteristic inverse farm size - productivity relationship that has been empirically noted in several contexts (Berry and Cline, 1979; Bardhan and Udry, 1999; Cornia, 1985; Kevane, 1996). These arguments are readily extended to the case of competing landlords in a multi-market Cournot oligopoly (or 'oligopsoly') game, with the expected result. When the distribution of initial property rights becomes more egalitarian, and/or where competition amongst landlords is more intense, the usual neo-classical efficient competitive market equilibrium re-emerges.

The model also yields interesting predictions regarding how equilibrium agrarian structures would be transformed over time in response to population growth, differential rates of technical progress on landlord and peasant farms, property rights reforms, and other changes. These predictions make sense of important historical transformations in agrarian production organization that appear puzzling within standard neo-classical economic analyses. For example, I show that under certain conditions

[3]On this last point, see Nugent and Robinson's (1998) interesting account of the comparative political economy of coffee production organization and land policy in different countries of Latin America.

skill accumulation, technical advancements, or increases in the profitability of production that increase labor demand on landlord farms relative to the peasant sector may actually lead to lower equilibrium wages by increasing landlords' ability to exercise market power. I review historical evidence to suggest that such an outcome may have occurred during the wheat export boom that helped consolidate Chilean landlord estates in the late nineteenth century (Bauer, 1975) or in the consolidation of coffee export estates in Central America.

This leads us to the question of politics. If initial land concentration is sufficiently high, and/or the productivity on landlord estates is raised relative to peasant farms the monopsony rents that landlords stand to capture by affecting peasant labor supply may become sufficiently large that landlords decide not only to withhold land from the lease market but to encroach on peasant land. Where peasant property rights over land are secure, this process would be mediated by transactions on the land market as landlords bought or leased-in peasant land. But where property rights enforcement is an endogenous outcome, landlords may prefer instead to limit peasant access to land by using political influence or extra-legal coercion. Thus although the focus of the model is primarily on equilibrium allocations under secure property rights, this paper derives results that point to predictions about the likelihood and timing of land grabs, enclosures, squatting, land reform and violence.[4]

As is well understood, in a constant returns production environment, more than one market distortion must be present if inefficient equilibrium outcomes are to emerge. In our model the market-power distortion arises because of landlords inability to perfectly price-discriminate.[5] Interestingly, the contracts that price discriminating landlords would employ closely resemble the type of labor-service tenancy arrangements that were widely prevalent well into the twentieth century in Chile, Bolivia, Peru and several other countries of Central and South America. These arrangements, in which tenants went by names such as *inquilinos*, *yanaconas*, *peones encasillados*, or *huasipungueros* depending on the region, required tenants to provide labor service

[4] A related paper by Conning and Robinson (2001) presents a model with political-economic equilibria that determine both the extent of property rights security and the pattern of agrarian production organization. Their model however uses a less general linear production technology and makes fewer predictions about production organization within landlord estates.

[5] See Kevane (1996) for an extended discussion of this issue. Banerjee, Gertler and Ghatak (2000) show why to be effective tenancy market reforms must simultaneously regulate more than one dimension of the contract.

to the landlords's estate as a condition for obtaining access to a small plot of land.[6] The model shows that efforts to regulate such contracts, for example by requiring that landlords pay a uniform daily wage, can lead landlords inefficiently to further reduce the area under tenancy and/or to expel tenants. Such a pattern is consistent with the historical experience of several countries (de Janvry, 1981). Interestingly, the general equilibrium impact of such regulations may be to raise peasant household wages and welfare even though it may result in a more inefficient pattern of production organization.

The rest of the paper is organized as follows. After a brief literature review, five scenarios are analyzed to compare the impact of initial land inequality on equilibrium resource allocation and household welfare: (1) a Chayanovian economy characterized by complete factor market autarky, (2) the efficient competitive factor markets equilibrium, (3) an economy under the assumption that landlords can exercise full market power via perfect collusion and price discrimination, (4) Monopoly-cum-monopsony (or 'monopsoly') equilibria where a single landlord exercises market power but is limited to charging a uniform wage and rental rate to the market, and (5) an extension to a multi-market oligopoly Cournot game between competing landlords. Several properties of these equilibria are illustrated using a Cobb-Douglas parameterization. The remaining sections of the paper explore how the equilibrium pattern of agrarian organization responds to changes in the underlying economic environment, and in particular to changes in the initial assignment of property rights, population growth, and technological change and skill accumulation. I also discuss why land sales markets fail and discuss agents'incentives to challenge or protect property rights via political or extra-legal means. A final section concludes.

1.1 Literature Review

The idea that landlords understood that they could affect peasants' willingness to supply cheap labor by limiting their access to land and other productive opportunities has been widely discussed by economists and historians in many contexts. Binswanger, Deininger and Feder (1995) catalog many historical episodes in Africa, Latin America,

[6] Sadoulet (1992) analyzed a model of labor service tenancies in Chile based on moral hazard and limited liability. I argue in this paper however that labor service contracts could have arisen in conditions similar to those analyzed by Sadoulet even in the absence of moral hazard or credit market imperfections.

Europe and Asia where similar processes appear to have been at work. Even in the United States, following abolition, many southern states enacted 'Black codes' that featured strict anti-vagrancy laws, hunting regulations, and limits on freed slaves' access to land and credit. There is little doubt that the primary purpose of these laws was to restrict black laborers' ability to establish new independent production opportunities and hence to help maintain their supply of labor to plantation fields (Hahn, 1982; Moore, 1965).

Although these issues are historically important, few formal analyses of the topic exist. Koo (1982), responding to Griffin (1974) posed the question of whether and how monopoly power in the land market might facilitate monopsony power over the labor market, but his was a partial-equilibrium analysis and therefore remained speculative and inconclusive in many of its results. Anderson Schaffner (1995) analyzed a model that showed how landlords could increase their market power by encouraging a culture of servility and limited time horizons amongst their attached labor force. More recent work by Robinson and Baland (2000) and Conning and Robinson (2000), examined how high levels of land inequality and inefficient production organization might persist as political-economic equilibria, but these papers focus on simpler production environments and hence do not capture all the essential micro-level tradeoffs. The contribution of the present paper is to explain why inefficient production organization patterns might arise and persist as equilibrium outcomes in a much more general production environment, without appealing to information asymmetries, credit market imperfections, politics or special preferences.

In a formal sense this paper is most closely related to a small literature on general equilibrium trade models with a monopsony distortions (Feenstra, 1981; Markusen and Robson, 1980; and McCulloch and Yellen, 1980).[7] The present analysis differs from this earlier analysis however, not only in application, but also because it extends these earlier analyses in several new directions. Most significantly, the introduction of non-traded factors suggesting a relaxation of the assumption of constant returns to scale leading to a determinate pattern of operational farm sizes opens the door to analyzing how the initial allocation of traded and non-traded assets and elements of the economic environment, including very importantly the nature of the production

[7]Robert Feenstra wrote a first draft of his well-cited 1981 paper in the Journal of International Economics as part of an undergraduate thesis.

technology, affects equilibrium agrarian structures as well as agents incentives to protect or transform property rights.

This paper is also related to Eswaran and Kotwal's seminal 1986 general equilibrium model of agrarian production organization. In that paper the authors posited a trade-off between a labor market imperfection which favored small farm producers, and fixed production costs and a credit market imperfection which favored larger farms. The initial distribution of land property rights matters in their competitive markets model because at high levels of inequality, larger farms are favored on the credit market and small farm production is squeezed out. The trade-off in our model is between what can be interpreted as a labor market imperfection (e.g. non-traded labor supervision abilities or farming skills) which favors small and medium farm production, and the exercise of market power which naturally favors larger farms.

Although Eswaran and Kotwal's account complementary to our own, the production organization patterns are arguably more robust and persistent. One can argue that "time and markets" ought to eventually help small farm households overcome many of the trading frictions they face in Eswaran and Kotwal's static setting. If, for example, peasant households cannot borrow to lease in land, they might instead save over time to purchase or lease land. A recent paper by Carter and Zimmerman (2000) showed that time and markets did indeed help an Eswaran and Kotwal type economy inch toward a more efficient allocation, although they showed that the transition could be slow.

In our model, time and credit markets need not repair the distorted economy. The land sale market continues to fail over time for precisely the same reason that it fails in a one period setting: because landlords will not undercut their own market power by leasing out a more efficient level of land and entry is limited by the fact that land is a non-reproducible factor. Arguably, a longer time horizon might even further limit transactions on the land market, by facilitating collusive behavior amongst landlords. It could also, as analyzed below, lead to a skewed pattern of skill accumulation and technological change that further reinforces monopsoly power effects.

2 The Model

2.1 Preliminaries

The economy has $\overline{T}$ units of cultivable land and there are $\overline{L}$ households with one unit of labor each. The economy-wide land to labor ratio is therefore $\overline{t} = \overline{T}/\overline{L}$. There are $\lambda\overline{L}$ landlord and $(1-\lambda)\overline{L}$ peasant households. Without loss of generality assume that $\overline{L}$ is large and λ is small and $\lambda\overline{L}$ is always an integer number of households.

The $\lambda\overline{L}$ landlord households own $\theta\overline{T}$ units of land while peasant households own the remaining $(1-\theta)\overline{T}$ units. The average peasant household therefore owns $\frac{(1-\theta)\overline{t}}{(1-\lambda)}$ units, and for the moment all peasant households will be assumed to have the same initial land endowment. The land Gini coefficient for this stylized economy can then be calculated easily to be $[\theta - \lambda]$.

A single tradable good such as wheat or rice is produced and consumed in the economy at a price fixed at unity by trade with the world market.[8] Households maximize utility from consumption subject to their budget constraints, with household income derived from farm profits and factor sales. To keep the model simple, leisure time is excluded from the household utility function, so households will inelastically supply their entire labor endowment to either own farm production or to the labor market. This last assumption can be relaxed readily without substantially altering the results to follow.

Both landlord and peasant households have access to the same production technology represented by the production function $\widehat{F}(T, L, S)$ which is assumed to be linearly homogenous in its three arguments: land T,labor L, and farming skill or labor supervision ability S. $\widehat{F}$ is a standard concave production function with $F_{TL} > 0$, $F_{TS} > 0, F_{LS} > 0$. Factor S is assumed to be non-traded, and for the moment each household is assumed to have the same endowment, $S = 1$. This assumption, which actually penalizes the exercise of market power because it makes large scale farm production inefficient, will later be relaxed.

Given these assumptions, it is notationally convenient to work with the restricted

[8] This assumption is not an unreasonable assumption. Latifundia flourished in several Latin American countries under liberal trading regimes and exported agricultural products for much of the nineteenth and early part of the 20th century (de Janvry, 1981). Bauer (1971) argues that the Chilean system of labor-service tenancy or *inquilinaje* became firmly rooted during the wheat export boom of the 1860's.

production function $F(T,L) = \widehat{F}(T,L,1)$ which is clearly homogenous of degree $k \leq 1$ in its arguments T and L. The function F satisfies the Inada end-point conditions $F(T,0) = F(0,L) = 0$, $F_T(0,L) = F_L(T,0)$ for all T and L. For notational clarity, we will sometimes indicate the landlord's production function by $G(T,L)$ so as to distinguish it from the peasant's $F(T,L)$, even though we maintain that $G(T,L) = F(T,L)$ for several sections to come.

When $k < 1$ the production function $F(T,L)$ is decreasing returns to scale in land and labor inputs. Since all households have access to the same production function, as described below, efficiency will require equal operational farm sizes and the same land and labor use across farms.

2.2 Autarkic and competitive equilibria benchmarks

Consider first how equilibrium allocations change with the initial land distribution parameter θ under the assumption of complete factor market autarchy. Since each peasant farm owns one unit labor and $(1-\theta)\overline{t}/(1-\lambda)$ units of land, output on each peasant farm is $F((1-\theta)\overline{t}/(1-\lambda),1)$ and $F(\theta\overline{t}/\lambda,1)$ on each landlord farm. Economy-wide output will be at an efficient maximum level only under full land equality, or when $\theta = \lambda$ since only then can land to labor ratios, and hence shadow factor prices, equalize across farms. By the assumption of diminishing returns, landlord income will be increasing, and peasant income falling, with θ. For inegalitarian land holdings ($\theta > \lambda$), deadweight-loss rises with θ because greater land inequality can only widen the gap between shadow factor prices and hence allocative inefficiency. Chayanovian (autarchy) payoffs to landlord and peasant households (V_R^a and V_P^a respectively) are given simply by:

$$\begin{aligned} V_R^a(\overline{t},\theta) &= F(\theta\overline{t}/\lambda,1) \\ V_P^a(\overline{t},\theta) &= F((1-\theta)\overline{t}/(1-\lambda),1) \end{aligned}$$

In a competitive equilibrium, by contrast, both landlord and peasant maximize profits and income by setting the marginal product of each factor of production on their farm equal to that equilibrium market price for that factor. Production organization will be efficient as marginal products equalize across farms. If we denote each

peasant household's competitive net supply of each factor by T^c and L^c respectively, then the equilibrium allocation is characterized by:

$$G_T\left(\frac{\theta\overline{t}}{\lambda}+\frac{(1-\lambda)T^c}{\lambda},1+\frac{(1-\lambda)L^c}{\lambda}\right)=r=F_T\left(\frac{(1-\theta)\overline{t}}{(1-\lambda)}-T^c,1-L^c\right)$$

on the land market, and an analogous condition $G_L(\cdot,\cdot)=w=F_L(\cdot,\cdot)$ holds on the labor market, where r and w are equilibrium market land rental and wage labor rates respectively. When the production technology is homogenous of degree $k<1$ and S is the same across households, and because all households face the same factor prices, both landlords and peasants will choose to operate at the same efficient operational farm size, denoted by $T^*(r,w)$ and $L^*(r,w)$. Every farm will therefore also earn the same positive farm profit $\Pi(r,w;S)$. Farm profit corresponds in effect to the rental rate on the non-traded factor S.

Since economy-wide demand for land is $\overline{L}T^*(w,r)$ and the economy-wide supply of land is $\overline{T}$, the equilibrium level of land use which clears the market is simply $T^*(r,w)=\overline{t}$, which is just the economy-wide land to labor ratio. Similarly, a labor market equilibrium is given by $\overline{L}L^*(r,w)=\overline{L}$ so $L^*=1$, and each household supplies as much labor as it demands.[9] Equilibrium factor prices are therefore given simply by $r=F_T(\overline{t},1)$ and $w=F_L(\overline{t},1)$.

Each peasant household's net *supply* of land is therefore $T^c=\overline{t}(1-\theta)/(1-\lambda)-\overline{t}$, or $T^c=\frac{(\lambda-\theta)}{(1-\lambda)}\overline{t}$. The entire peasant sector's net *demand* for land, $(\theta-\lambda)\overline{t}$, is obviously equal to the landlord sectors' net supply of land. As long as $\theta>\lambda$,which is just a statement that a landlord owns more land than the economy-wide average level of land per capita, the landlord sector's supply of land to the market will be a linear increasing function of θ.

Economy-wide income is simply $\overline{L}F(\overline{t},1)$, the combined value of production on all $\overline{L}$ farms. Landlord income is given by farm profits plus the market value of their factor endowment, or equivalently, by the value of farm production plus net factor sales priced at market prices. Landlord and peasant household incomes can thus be

[9] This would obviously change if household labor endowment varied in the population, if households had different holdings of S, or access to different production technologies.

written as linear functions of θ:

$$\begin{aligned} V_R^c(\overline{t},\theta) &= F(\overline{t},1) + F_T(\overline{t},1)\left(\frac{\theta-\lambda}{\lambda}\right)\overline{t} \\ V_P^c(\overline{t},\theta) &= F(\overline{t},1) + F_T(\overline{t},1)\left(\frac{\lambda-\theta}{1-\lambda}\right)\overline{t} \end{aligned} \tag{1}$$

2.3 Market power equilibria with price discrimination

Suppose that landlords can collude perfectly as a group to maximize their total income, as would a single large landowner who can price discriminate. To maximize their income from profits and factor sales, landlords will organize production efficiently and then extract the gains to trade with peasants by separately offering take-it-or-leave-it contracts to each peasant household.

Formally the landlord's contract design problem can be seen as that of choosing each peasant household's factor supplies T^d and L^d and a lump-sum rental R payment level to maximize the value of production on the hacienda plus lump-sum rentals, subject only to the constraint that each peasant household be willing to participate and earn at least as much as their autarchy payoff:

$$\begin{aligned} \max_{T^d,L^d,R} & F\left(\tfrac{\theta}{\lambda}\overline{t} + \tfrac{(1-\lambda)}{\lambda}T^d, 1 + \tfrac{(1-\lambda)}{\lambda}L^d\right) + \tfrac{(1-\lambda)}{\lambda}R \\ \text{s.t.} \quad & F\left(\tfrac{(1-\theta)}{(1-\lambda)}\overline{t} - T^d, 1 - L^d\right) - R \geq F\left(\tfrac{(1-\theta)}{(1-\lambda)}\overline{t}, 1\right) \end{aligned}$$

Each landlord can be thought of as contracting with $(1-\lambda)/\lambda$ peasants. The participation constraint must bind, as otherwise landlords could increase the objective function by raising R while still satisfying the constraint. This binding constraint yields an expression for R. Substituting this into the objective function, and then differentiating with respect to T^d and L^d leads to a new set of first order conditions that exactly match the first-order conditions for the efficient competitive case (1) analyzed above. Production will therefore be organized as efficiently as before, but payoffs now favor the landlord:

$$\begin{aligned} V_R^d(\overline{t},\theta) &= F(\overline{t},1) + \frac{(1-\lambda)}{\lambda}\left[F(\overline{t},1) - F\left(\frac{(1-\theta)}{(1-\lambda)}\overline{t},1\right)\right] \\ V_p^d(\overline{t},\theta) &= F\left(\frac{(1-\theta)}{(1-\lambda)}\overline{t},1\right) \end{aligned} \tag{2}$$

Each landlord receives the value of production on his own farm plus rental income from subtenancies. Rental income from each of the $(1-\lambda)/\lambda$ tenants is set to $R =$

$F(\overline{t},1) - F\left((1-\theta)\overline{t}/(1-\lambda),1\right)$, or the value of peasant production less that tenant's autarchy reservation payoff.

Note that efficient price discrimination will in general require non-linear tariffs with landlords setting a different level of R matched to the endowment and characteristics of each peasant household. This is obscured slightly here by the assumption that all peasant households have identical endowments. To see this, suppose that the $(1-\lambda)\overline{L}$ peasant households were instead now divided into small landowning households with $\frac{2(1-\theta)}{(1-\lambda)}\overline{t} < \overline{t}$ units of land each and an equal number of landless households. Landlords would require landless peasant households to pay $R_0 = F(\overline{t},1) - F(0,1)$ for access to $\overline{t}$ units of land while requiring landowning peasants to pay $R_1 = F(\overline{t},1) - F\left(2(1-\theta)\overline{t}/(1-\lambda),1\right)$ for access to $\overline{t} - 2(1-\theta)\overline{t}/(1-\lambda) = -T^d$ units of land. The payment rate is tied to the peasant household's factor endowment in a non-linear way: landless peasants are charged higher rentals per unit land because they have less attractive fall-back options.

These contracts can be interpreted as interlinked *labor-service tenancy* contracts such as those that have been noted historically in Latin America and other parts of the world. Under a labor service tenancy landlords require peasant households to supply labor services as a condition of access to land leases. To see this more clearly, suppose that as in the previous paragraph, there are landowning and landless peasants but that landlord households now start with a larger stock of farming skill S. Efficiency requires landlords to farm at a larger operational scale than peasants in equilibrium, and landlords will therefore now have a positive net demand for labor. As above, landlords maximize their profits by offering take-it-or-leave-it 'package deal' contracts: in exchange for access to T_i^d units of land, peasant households must pay R_i in rent *and* promise to deliver L_i^d units of labor to the landlord estate, where $i = 0, 1$ corresponds to landless and small landowner peasant households respectively.

Requiring tenants or serfs to provide labor services in return for access to land and other services was a widespread institutional practice for centuries in Europe and elsewhere. In their classic account, *The Rise of the Western World,* North and Thomas (1973) ask, "Why did the lord require labor services rather than simply take a share of the serf's output?" Their simple answer is that "there was no organized market for goods and services. (p.20)" This explanation seems implausible, however, as it suggests that labor service tenancy would dissappear as monetization proceeded.

Yet labor service tenancy arrangements survived in many parts of Europe until well into the nineteenth century, and in Latin America in countries such as Chile until well into the middle part of the twentieth century (de Janvry, 1981). Ironically, North and Thomas themselves provide evidence that the labor service obligations might have been related to landlords' ability to exercise economic (and political) power a few sentences later when they write: "The key to the contractual arrangement was labor services in return for the lord's protection ... the classic manor persisted as long as the initial conditions of chaos, abundant land, differential military endowments, and scarce labor prevailed."

Sadoulet (1992) argues that labor service tenancy emerges where landlords find it difficult to monitor peasant labor effort yet peasants' wealth does not allow credible commitments to fixed rent lease payments in the event of crop failure. This seems a plausible element of the story, but once again, "time and markets" ought to have helped to relax what is in effect a binding credit constraint, and would expand the set of feasible contracts to get around the problem. The analysis of this paper suggests that labor service would have been a feature of an optimal contract even in a fully monetized economy and with or without credit market imperfections.

2.4 Monopoly cum Monopsony equilibria (with no price discrimination)

Landlords cannot always tailor the terms of their contracts to each peasant household's outside opportunities. This might be because they are limited from doing so by law or by competition from other sectors, or because they cannot easily condition on peasant's outside opportunities. For example, de Janvry (1981) notes how over a number of years landlords were led to transform their labor-service *inquilinos* into wage laborers by new laws that required landlords to pay uniform minimum agricultural daily wages in cash.

So suppose that landlords now must hire in all labor and lease out all land at uniform wage or rental rates w and r. As in the classic partial equilibrium analysis of monopoly power, landlords may strategically choose to withhold land from the lease market in an effort to drive up the land rental rate. By virtue of his concentrated landholdings, a large landlord, however, also exercises monopsony power over labor because limiting the supply of land to the peasant sector can affect the marginal prod-

uct of peasant farm labor and hence labor supply to the market. As landlords must consider both monopoly and monopsony effects, we label what follows the analysis of 'monopsoly' power. A subsequent section extends the model to the 'oligopsoly' power.

To find the landlord's optimum, we first must derive an expression for peasant household net factor supply to the market as a function of offered factor prices. Let T^u and L^u indicate the peasant household's optimal use of land and labor on its own production project for given factor prices w and r. Because peasants take factor prices r and w as exogenously given, a peasant household profits plus factor income is written:

$$\max_{T^u\ ,L^u} F(T^u, L^u) - wL^u - rT^u + w + r\frac{(1-\theta)}{(1-\lambda)}\overline{t} \tag{3}$$

The first order conditions for a peasant optimum are $F_T = r$ and $F_L = w$. This set of equations can in turn be solved to yield expressions $L^*(w,r)$ and $T^*(w,r)$ for optimal factor use as a function of the wage and rental rate. The net-supply of each factor to off-farm activities is therefore:

$$T^m(r,w) = \frac{(1-\theta)}{(1-\lambda)}\overline{t} - T^*(r,w) \tag{4}$$

$$L^m(r,w) = 1 - L^*(r,w) \tag{5}$$

In what follows it will be more convenient to work with inverse off-farm net factor supply functions $w(T^m, L^m)$ and $r(T^m, L^m)$. These summarize the wage and rental rate at which a given pair of factor net supplies T^m, L^m will be offered by the peasant household. Using the first order conditions and (4)-(5) these inverse supply functions can be written:

$$w(T^m, L^m) = F_L\left(\frac{(1-\theta)}{(1-\lambda)}\overline{t} - T^m, 1 - L^m\right) \tag{6}$$

$$r(T^m, L^m) = F_T\left(\frac{(1-\theta)}{(1-\lambda)}\overline{t} - T^m, 1 - L^m\right) \tag{7}$$

In equilibrium, total net supply of each factor from the $(1-\lambda)\overline{L}$ peasant households will equal the landlord's net demand for the same factor. Each landlord's land and labor use can thus be written as $T^u = \frac{\theta}{\lambda}\overline{t} + \frac{(1-\lambda)}{\lambda}T^m$ and $L^u = 1 + \frac{(1-\lambda)}{\lambda}L^m$ respectively.

Substituting these into (3), the landlord cartel can be thought of as choosing L^m and T^m to maximize farm profits plus net factor sales for each landlord:

$$\begin{aligned} V_R^m(\overline{t},\theta) &= \max_{L^m,T^m} G\left(\frac{\theta}{\lambda}\overline{t}+\frac{(1-\lambda)}{\lambda}T^m, 1+\frac{(1-\lambda)}{\lambda}L^m\right) \\ &\quad -r(T^m,L^m)\frac{(1-\lambda)}{\lambda}T^m - w(T^m,L^m)\frac{(1-\lambda)}{\lambda}L^m \end{aligned} \tag{8}$$

First order necessary conditions for a maximum can be written:

$$\frac{\partial G(\cdot,\cdot)}{\partial T^m} = r(T^m,L^m)+T^m\frac{\partial r(T^m,L^m)}{\partial T^m}+L^m\frac{\partial w(T^m,L^m)}{\partial T^m} \tag{9}$$

$$\frac{\partial G(\cdot,\cdot)}{\partial L^m} = w(T^m,L^m)+L^m\frac{\partial w(T^m,L^m)}{\partial L^m}+T^m\frac{\partial r(T^m,L^m)}{\partial L^m} \tag{10}$$

The first condition is just a modified version of the standard land monopolist's rule for hiring out land until marginal revenue equals marginal cost. The direct marginal cost of leasing out an additional unit in terms of foregone output on the landlord estate is $\frac{\delta G(\cdot,\cdot)}{\delta T^m}$. The marginal revenue is the rental rate r at which that unit is hired out plus the marginal negative effect on rental earnings from inframarginal leases due to the fact that the rental rate must be lowered to get the peasant sector to demand this extra land. The final term captures the marginal impact on the hacienda's cost of hiring labor that results from giving peasants access to more land. The second condition is an analogously modified version of the labor monoponist's pricing rule. The production technology assumptions guarantee that equations (9)-(10) can be solved for a unique set of equilibrium peasant sector off-farm labor and labor factor supplies T^m and L^m.[10]

A more compact statement of the landlord's first-order conditions (9) and (10) is:

$$\begin{aligned} G_T &= F_T - T^m F_{TT} - L^m F_{TL} \\ G_L &= F_L - L^m F_{LL} - T^m F_{LT} \end{aligned}$$

where function arguments have been suppressed and we've used (6) and (7) to find $\frac{\partial w(T^m,L^m)}{\partial L^m} = -F_{LL}(\cdot,\cdot) > 0$, $\frac{\partial r(T^m,L^m)}{\partial T^m} = -F_{TT}(\cdot,\cdot) > 0$, and $\frac{\partial w(T^m,L^m)}{\partial T^m} = \frac{\partial r(T^m,L^m)}{\partial L^m} = -F_{TL}(\cdot,\cdot) < 0$.

[10]Recall that F and G are homogenous of degree $k < 1$. If $k = 1$ then only T^m/L^m can be determined.

This system of equations will in general be highly non-linear and closed form solutions for T^m and L^m cannot be obtained even for fairly standard production functional forms. Comparative static results for T^m and L^m with respect to the model's underlying parameters can be derived in the usual manner, but these too will be non-linear and possibly non-monotone functions, and will in general depend on assumptions about the third cross partial derivatives of the production function. To gain further insight, rather than derive messy expressions for the general case, we turn instead to numeric simulations of the well known Cobb-Douglas production function. Some further more general results follow below.

2.5 A Cobb-Douglas example

Consider the standard Cobb-Douglas production technology $\widehat{F}(T, L, S) = T^{\alpha} L^{\beta} S^{1-\alpha-\beta}$. Farm skill or labor supervision ability S is assumed to be non-traded and $S = 1$ across all households. The restricted production function of interest becomes $G(T, L) = F(T, L) = T^{\alpha} L^{\beta}$, where $\alpha + \beta < 1$. Using some algebra, the first order conditions (9) and (10) can be rearranged to obtain:

$$G_T(\cdot,\cdot) = F_T(\cdot,\cdot)\left[1 + (1-\alpha)\frac{T^m}{(1-\theta)\overline{t}/(1-\lambda) - T^m} - \beta\frac{L^m}{1-L^m}\right] \quad (11)$$

$$G_L(\cdot,\cdot) = F_L(\cdot,\cdot)\left[1 + (1-\beta)\frac{L^m}{1-L^m} - \alpha\frac{T^m}{(1-\theta)\overline{t}/(1-\lambda) - T^m}\right] \quad (12)$$

To get to these expressions we've used the fact that $w(T^m, L^m) = F_L((1-\theta)\overline{t}/(1-\lambda) - T^m, 1-L^m)$ is the marginal product of labor on peasant farms and the wage rate at which the hacienda hires labor, and $r(T^m, L^m) = F_T((1-\theta)\overline{t}/(1-\lambda) - T^m, 1-L^m)$ is the marginal product of land on peasant farms and also the rental rate at which the hacienda leases out land.

Unless the expressions in square brackets in (11) - (12) are unity, marginal factor products will diverge across landlord and peasant farms. Further manipulation reveals that the condition for $F_L/F_T < G_L/G_T$ – or equivalently that the land to labor be larger on landlord farms – can also be stated as $T^m/L^m < \frac{(1-\theta)}{(1-\lambda)}\overline{t}$.[11] This condition is met automatically so long as the peasant sector hires land and sells labor ($T^m < 0, L^m > 0$) yet leaves room for situations where the latifundia sector expands

[11] Take the ratio of the two terms in square brackets. This term must be larger than one for $F_L/G_L < G_L/G_T$. Rearranging terms leads to the desired result.

to such an extent that the peasant sector actually begins to supply both labor *and* land to landlords ($T^m > 0$). This last scenario is not as improbable as it may seem. As demonstrated in the simulations below, at high levels of land inequality, and so long as labor supervision S is not too important a factor in production, landlords may decide to squeeze out peasant tenancy entirely in an all-out effort to depress the wages at which it hires labor.

Figures 1-4 illustrate how equilibrium allocations change at different levels of initial land inequality θ. The simulations are for an economy with $\lambda\overline{L} = 1$ landlord and $(1-\lambda)\overline{L} = 99$ peasant households. The land to labor ratio is $\overline{t} = 1$. Production is assumed to be close to constant returns to scale, with $\alpha = 0.49$ and $\beta = 0.49$ (i.e. $F(T, L)$ is homogenous of degree $k = 0.98$). This last assumption assures that the cost to the landlord of using less-efficient large-scale wage labor production is positive, but not too large. Smaller values of $k = \alpha + \beta$ and the non-tradability of S constrain the landlord's ability to exercise market power by raising the opportunity cost of large scale wage-labor production relative to more efficient production on subtenancies.

As discussed in detail in the section on technological change below, the assumption of approximately constant returns to scale is not as important as it now may seem. Much lower degrees of production homogeneity in F (lower values of α and β in the Cobb-Douglas case) are consistent with strong market power effects once we move away from the unrealistic assumption that landlords have exactly the same skill, technology and access to credit as peasants.

2.6 Landlords as multi-market oligopolists

> "The scarcity of labor improved the bargaining strength of the worker. Leases were lengthened, and the villein began to acquire exclusive rights to his land. Only where the lords could effectively collude rather than compete for labor, as in Eastern Europe, could they thwart the changing status (and income) of their former vassals... To the extent that lords avoided competition for labor, they could prevent a rise in real wages, but collusion over an area large enough to be effective would require centralized political coercion." (North and Thomas, *The Rise of the Western World,* 1973: 24).

The analysis has thus far assumed that landlords as a group could collude to

maximize total income. As North and Thomas suggest, without the use of political coercion (which landlords as a class have an interest in supporting), collusion will become difficult particularly as the costs of labor mobility fall, or as other sectors of the economy begin to compete with agriculture for labor. This section seeks to endogenize the degree of collusion, and show how it varies with economic fundamentals.

Strategic interaction amongst oligopolists can, of course, be modeled in a variety of ways. To fix ideas, this section models this interaction as a case of multi-market Cournot oligopolistic competition between an integer number $N = \lambda \overline{L}$ of landlords.[12] As before, each landlord owns $\frac{\theta}{\lambda}\overline{t}$ units of land and there are $(1-\lambda)\overline{L}$ peasant households. '

Let t_i^m, l_i^m now denote the net land supply and net labor supply from each peasant household to a specific landlord i, where $i = 1...N$. Then $T^m = \sum_{i=1}^N t_i^m$ and $L^m = \sum_{i=1}^N l_i^m$ respectively denote peasant household net supply of land and labor to the *entire* landlord sector. Inverse peasant net supply functions for land and labor can now be written as $r(T^m, L^m) = r(t_1^m ... t_N^m, l_1^m ... l_N^m)$ and $w(T^m, L^m) = w(t_1^m ... t_N^m, l_1^m ... l_N^m)$ where

$$r(t_1^m ... t_N^m, l_1^m ... l_N^m) = F_T\left(\frac{(1-\theta)}{(1-\lambda)}\overline{t} - \sum_{i=1}^N t_i^m, 1 - \sum_{i=1}^N l_i^m\right) \tag{13}$$

and a similar expression is used for $w(T_1^m ... T_N^m, L_1^m ... L_N^m)$. Landlord j's decision problem is to choose L_j^m, T_j^m so as to maximize profits plus factor income, taking as given other landlords' choices T_{-j}^m, L_{-j}^m, where $T_{-j}^m = (T_1^m ... T_{j-1}^m, T_{j+1}^m ... T_N^m)$ and $L_{-j}^m = (L_1^m ... L_{j-1}^m, L_{j+1}^m ... L_N^m)$. We denote landlord j's income by $\Pi_j^m(t_1^m ... t_N^m, l_1^m ... l_N^m) =$

$$\begin{aligned} \max_{L_j^m, T_{j1}^m} & G\left(\frac{\theta}{\lambda}\overline{t} + (1-\lambda)\overline{L}t_j^m, 1 + (1-\lambda)\overline{L}l_j^m\right) \\ & -r(t_1^m ... t_N^m, l_1^m ... l_N^m)(1-\lambda)\overline{L}t_j^m - w(t_1^m ... t_N^m, l_1^m ... l_N^m)(1-\lambda)\overline{L}l_j^m \end{aligned} \tag{14}$$

When there is more than one landlord ($\lambda \overline{L} \geq 2$) there will be a strategic dimension to landlords' production decisions that was not previously present. We focus on the Cournot-Nash equilibrium to this multi-market oligopoly problem. Differentiation of (14) with respect to l_j^m, l_j^m yields a set of first-order conditions that are analogous to (9)-(10) and that can be solved to obtain a pair of reaction functions $\widehat{l}_j^m(t_{-j}^m, l_{-j}^m)$ and

[12] Bulow, Geanakoplos and Klemperer (1985) provide the seminal analysis of multimarket oligopoly.

$\widehat{t}_j^m(t_{-j}^m, l_{-j}^m)$ for each landlord. As all landlords are assumed identical, a symmetric Cournot-Nash equilibrium in pure strategies is one where each landlord $j = 1...N$ chooses $(l_j^m, t_j^m) = (l^m, t^m)$ and $l^m = \widehat{l}_j^m(t^m...t^m, l^m...l^m)$ and $t^m = \widehat{t}_j^m(t^m...t^m, l^m...l^m)$ for all j.

It is instructive to compare the oligopsolist's first-order conditions to those of the single monopsolist. In the symmetric Cournot-Nash equilibrium we have $T^m = \lambda\overline{L}t^m$ and $L^m = \lambda\overline{L}l^m$, so the individual oligopsolist's first-order conditions can be written:

$$\frac{\partial G(\cdot,\cdot)}{\partial T^m} = r(T^m, L^m) + \frac{1}{\lambda\overline{L}}T^m\frac{\partial r(T^m, L^m)}{\partial T^m} + \frac{1}{\lambda\overline{L}}L^m\frac{\partial w(T^m, L^m)}{\partial T^m} \quad (15)$$

$$\frac{\partial G(\cdot,\cdot)}{\partial L^m} = w(T^m, L^m) + \frac{1}{\lambda\overline{L}}L^m\frac{\partial w(T^m, L^m)}{\partial L^m} + \frac{1}{\lambda\overline{L}}T^m\frac{\partial r(T^m, L^m)}{\partial L^m} \quad (16)$$

When $\lambda\overline{L} = 1$ the conditions collapse exactly to the conditions (9)-(10) previously derived for a single monopsolist (or a group of colluding monopsolists). When there are two or more oligopolists, each oligopolist faces a more elastic set of peasant (net) factor demands and therefore has less of an impact on wages or rentals from restricting land supply or labor demand from the market. As $\lambda\overline{L}$ rises, the two last terms on the right-hand side of each equation vanish and the first order conditions begin to approximate those of the efficient competitive solution.

Since it is evident that the perfect monopsoly and perfect competition equilibria bracket the possible outcomes of the oligopoly case, without loss of generality we focus on the simpler monopsoly case.

3 Comparative Statics

3.1 The impact of initial land inequality

> "The persistence of labor shortages throughout the 19th century provided the state with a further justification for restricting access to landownership by a majority of its citizens ... [A] scarcity of labor was perceived by the political elite as a major obstacle to economic development in general, and to export promotion in particular. Thus the idea of converting communal lands into family-sized holdings in private hands was seen as counterproductive, because the farm-labor force would have little incentive to seek outside employment." (V. Bulmer-Thomas, *The Economic History of Latin America since Independence,* 1994: 94).

Figure 1 graphs equilibrium levels of peasant income V_P^i and economy total income $V_P^i + V_R^i$ for different levels of initial land inequality θ, under competitive, price-discriminating, and monopsoly market structures ($i = c, d, m$) using the Cobb-Douglas parameterization described above. Higher initial land inequality θ translates into less land and income for peasants under any market structure, but peasant income falls off more quickly with higher levels of land inequality when landlords can exercise market power. For the chosen parameters, at low levels of initial land inequality (θ lower than 0.6) landlords are quite limited in how much market power they are able to exploit and equilibrium allocations and payoffs stay close to the competitive allocation. At higher levels of inequality θ, the potential gains to trade from leasing out a larger fraction of landlord land rise, but the landlords ability to exercise market power also increases, because peasant sector reservation autarky payoffs begin rapidly to decline. When landlords are unable to price-discriminate, they cannot lease out the efficient level of land to peasants without undermining their own pricing strategy, and so landlords drag economy-wide output $V_R^m + V_p^m$ down below the economy's potential in order to extract rents.

Figure 2 illustrates how equilibrium net factor supplies change at different levels of initial inequality. The efficient net supply of land to each peasant household under the competitive or price discriminating monopolist case ($-T^c$) rises linearly with θ (recall that $T^c < 0$). As households are all assumed to have the same labor endowment, the efficient level of net peasant labor supply is always zero. At low levels of land inequality the monopsoly equilibrium closely approximates this efficient factor allocation, but at rising levels of inequality landlords withhold greater amounts of land from the market. As peasant households have less land to use compared to the competitive allocation, peasant labor supply to the landlord sector L^m increases with θ. Figure 3 shows how the wage-rental rate faced by peasants is pushed down with higher θ, and figure 4 shows the accompanying fall in the land to labor ratio on peasant farms. As both land and wage labor use on the hacienda expand with higher θ, so does hacienda output. Over the range of θ leading up to approximately $\theta = 0.7$, land use on the hacienda has grown faster than labor use so the land to labor ratio has risen.

An interesting regime shift occurs at about $\theta = 0.7$. At relatively low levels of land inequality landlords earned most of their rents in the form of land monopoly

rents and relatively less as monopsony rents from hiring peasant labor at below it's marginal product. But the relative profitability of these two sources of rents switches at higher levels of inequality. At about $\theta = 0.7$, landlords' supply of land has actually dropped to zero, and at higher levels of θ landlords actually begin to *lease in* peasant land. The main purpose of this strategy is of course to drive yet cheaper labor onto the hacienda, even though this is clearly socially inefficient since the marginal product of land on the hacienda is by this point well below that on a peasant farm.

It is worth highlighting again that the properties of these equilibria result in part because farming skill or labor supervision ability S plays a relatively minor role in production and hence the production technology $F(T, L)$ was close to constant returns to scale. Had the role of S been more important, the economic opportunity costs of operating a large hacienda would have mounted more rapidly, thus limiting landlords' ability and willingness to exercise market power and hence dead-weight loss to the economy. Technological change that augments the relative importance of farming skill or labor supervision ability in peasant production could therefore act to limit the exercise of market power, at least as long as peasant households retain access to these inputs. But the converse is also true: things that raise the relative profitability of large scale production can help magnify the market power effects we've isolated. As discussed below, once this realistic possibility is considered, the assumption of approximately constant returns to scale becomes inessential to the argument.

3.2 The effects of population growth

> "It follows that restrictions on the use of forest land may be imposed in periods when labour, not land, is in short supply, but such measures by which the landlord encroaches upon villagers' rights in land tend to become more frequent when increasing population pressure makes all kinds of land –arable, grazing and forest land—more scarce, and such encroachment very profitable for the landlord." (Ester Boserup, *The Conditions of Agricultural Growth,* 1965: 84).

The model thus far has identified conditions of high initial land inequality as important in the emergence and persistence of a latifundia-minifundia complex. This section analyzes how equilibrium agrarian structure might be affected by other important economic factors, such as population growth or the incorporation of new frontier

lands, which would alter the economy-wide land to labor ratio. Economic historians have hypothesized that the Latin American latifundia, and a host of colonial era institutions and regulations that compelled local populations to provide labor service to large landlord estates, were institutional responses to the conditions of relative labor scarcity that the Spanish colonizers encountered in the new world (Pearse, 1975; de Janvry, 1981). Florescano (1987) has noted for example that the "two periods of extensive land distribution [in Central Mexico], 1545-7 and 1585-95, were linked to the great epidemics of 1545-7 and 1576-80 which decimated the Indian population (p.256)."

It is important to note at the outset that an increase in the labor force can come about in several different ways, and how it comes about can make a difference. The labor force can expand through growth in the average size of each farming household, and/or because of the arrival of new households. To analyze these cases, let us change the model and notation slightly so that there are now $\overline{L}-1$ peasant households and just one landlord. Every household has H laborers. The landlord owns fraction θ of the economy's land $\overline{T}$ and the peasant households evenly divide the $(1-\theta)\overline{T}$ remaining land units. The total labor force in the economy is now $\overline{L}H$, the land to labor endowment is $\bar{t}_H = \overline{T}/\overline{L}H$, and land per household is $\bar{t} = \overline{T}/\overline{L}$.

Consider first the effect of an increase in the number of peasant households on efficient production organization, while keeping household size H constant. On the assumption that each new household brings non-traded farming skill $S = 1$, efficiency in production requires the new farm households to be producers. The economy-wide land to household ratio $\bar{t}$ has fallen. Per household demand for land falls because the equilibrium operational farm size (also $\bar{t}$) falls and with it the equilibrium competitive wage-rental ratio. The landlords' supply of land to the peasant sector, $-T^c = \theta\overline{T} - \bar{t}$, increases slightly. Total output increases but output per household and per-capita falls. Factor supplies in the discriminating market power case are identical to this efficient competitive case. Landlords however now benefit from the falling wage-rental ratio because peasant reservation payoffs fall as the average peasant household owns less land when there are more households.

The effects of population growth are quite different if we instead increase household size H while keeping the number of households constant. The efficient competitive allocation now entails the same $\overline{L}$ household farms each producing $F(\bar{t}, H)$.

The land-to-household ratio (and hence farm size) will remain unchanged with an increase in H. The equilibrium wage rental rate falls but the landlord's supply of $-T^c = \theta\overline{T} - \overline{t}$ units of land to the peasant sector remains unchanged. Since a rise in H increases the labor force without increasing the economy-wide stock of S, output per capita falls more rapidly compared to the scenario of the last paragraph. The more important the role of S in production, the more marked this difference will be.[13]

Consider next the effect of these labor growth scenarios on equilibrium allocations under monopsoly. Increasing household size H while keeping $\overline{L}$ fixed does not alter the number of farms;. nor does it affect the landlord's net supply of land to the peasant sector. Doubling household size across all farms thus leaves land use patterns unchanged while doubling labor supply to the hacienda at each level of land inequality θ. This occurs because peasant households inelastically supply to the market all labor that they cannot profitably use on their own farms.

The impact of population growth is more interesting when we instead increase $\overline{L}$ while keeping H fixed. Figure 5 shows the effect on equilibrium T^m and L^m of doubling the number of peasant households in the economy from 100 to 200, under the same Cobb-Douglas parameterization discussed above. Landlords withhold less land from the market relative to the efficient level (as indicated by T^m versus T^c in the figure), the larger is the number of peasant producers in the economy. The reason is that as each new peasant household brings non-traded factor S into production , the landlord's opportunity cost of organizing production inefficiently (withholding land) rises when there are more peasant producers. At very high levels of initial land inequality θ however (levels above 0.8 in the figure) landlords find it just as profitable to encroach on peasant land anyway, and most of the new population still end up working on the landlords' hacienda rather than as independent farm producers.

These results cast new light on several historical discussions. The model confirms the observation that landlords' incentive to withhold land from the market (and/or to encroach upon peasant land) appears to be more pronounced in conditions of labor scarcity, but clarifies that it is not so much labor scarcity per-se that favors the latifundia, as much as the paucity of potentially independent peasant producers.

[13] A closely related scenario is the case of population growth due to the arrival of new households that do not possess farming skills S. As these households would not carry out farm production they hire out all labor and any land that they may own.

3.3 Skill accumulation and technological change

> "[T]he owners of plantations have no interest in seeing knowledge of new techniques or new seeds conveyed to the peasants ... [nor will they] support proposals for land settlement, and are often instead to be found engaged in turning the peasants off their lands." (A.W. Lewis, Economic Development with Unlimited Supplies of Labour, 1954: 149)

Consider the effect of increasing a landlord's holding of factor S while holding the peasant population's fixed at $S = 1$. For example, in the Cobb-Douglas case the landlord's production function can be written $AF(T, L) = T^{\alpha}L^{\beta}S^{1-\alpha-\beta}$ where $A = S^{1-\alpha-\beta}$, while production remains $F(T, L) = T^{\alpha}L^{\beta}$ in the peasant sector where $S = 1$. An increase in the landlords' A while keeping peasant production technology unchanged may be associated with a relative increase in skill accumulation, in total factor productivity, or in the price of landlord crops relative to peasant production.

A rise in the relative profitability of landlord production such as this would naturally lead landlord farms to operate on a larger scale, even in the efficient competitive case. At constant product prices, the peasant sector ought to benefit from such changes because the equilibrium wage rate ought to rise as landlord demand for labor increases. Specifically, in a new competitive equilibrium landlords' land and labor usage will be $\tau = (\frac{1}{A})^{\frac{1}{k-1}}$ times as large than on peasant farms. Peasant factor use falls to $L^u = \frac{1}{(\tau\lambda+(1-\lambda))}$ and $T^u = \frac{1}{(\tau\lambda+(1-\lambda))}\overline{t}$ respectively and equilibrium wage and rental rates rise to $w = F_L(T^u, L^u)$ and $r = F_T(T^u, L^u)$ respectively. For reference, recall that in the earlier competitive benchmark scenario $L^u = 1$ and $T^u = \overline{t}$.

When landlords exercise monopsoly power, a similar improvement on the farm of landlords' may instead result in immiserizing growth for the peasant sector. The reason is that an increase in the landlords' S lowers the efficiency cost of running a large farm and, by increasing labor demand also increases the scope for earning monopsony rents on wage labor.

This possibility is illustrated in figure 7. The lower and upper solid lines reproduce, respectively the net supply of land from the landlord to the peasant sector and the total net peasant labor supply to the landlord's estate from the earlier monopsoly analysis. The dashed lines in the figure show how each of these net factor supply curves change as a consequence of a five-fold increase in a landlord's skill level from

$S = 1$ to $S = 5$ while keeping all else equal.

A slight vertical displacement in each of these two factor supply schedules is to be expected given the rise in total factor productivity on the landlords' farm. The expected equilibrium displacement competitive is in fact rather small, as approximated in the figure by the vertical displacement at low levels of inequality (where allocations approximate their efficient competitive levels). But at intermediate to high levels of land inequality we observe a far more aggressive effort by landlords to withhold land from the lease market compared to when they are less skilled. This leads to a much larger supply of peasant labor to the landlords' estate at each level of initial inequality.

Although the efficient competitive wage will increase slightly as a result of the landlords' skill accumulation, equilibrium wage rates paid to peasants in the monopsoly case can be shown to actually fall at intermediate to high levels of inequality because of landlords' increased ability to exercise market power. Arguably, something similar to this is what happened in Chile in the historical episode described above. More of the windfall gains from new export opportunities and technical change accrued to wages in neighboring Argentina because labor there was more mobile and land markets less concentrated.

This discussion also demonstrates that the earlier assumption of approximately constant returns to scale of $F(T, L)$, was not at all essential to the emergence of strong market power effects.[14] In general, anything that helps to lower the landlords' marginal cost of being big makes the exercise of market power more likely and profitable. Credit market imperfections or agricultural policies that favor largeholders could have this effect as well.

3.4 Property rights conflicts and politics

> "So one of the hacendados' principal strategies for acquiring workers was, precisely, to seize the lands of the Indian communities." (Enrique Florescano, The Hacienda in New Spain, 1987: 267)

Thus far we have treated the initial distribution of property rights over land as

[14] The earlier assumption that landlords had absolutely no technological, political or transacting advantage over small peasant producers had in fact had strongly stacked the decks against market power effects. Yet such effects nonetheless emerged at high enough levels of land inequality.

given and secure. In practice property rights are however frequently contested, and agents in the economy have incentives to invest both in private and collective efforts to shape property rights in their favor. For example landlords have at times used violence and legal manipulations to encroach upon peasant lands via land grabs, evictions. Peasants also at times contest landlords' property rights by squatting or by mobilizing in support of land reform. In stark contrast to the United States, landlords in Latin America have shaped the evolution of land policies in their favor, denying rural lower classes access to the vast available areas of frontier lands (Huber and Safford, 1995; Bulmer-Thomas, 1994).

Without explicitly modeling property rights conflicts, the model suggests where property rights conflicts are most likely. To see this notice that a redistribution of property rights is equivalent to a change in θ. Under competitive markets no agent would be willing to pay more than the fixed market rental rate to obtain or protect another unit of land. For given factor endowments, the marginal product of land remains constant at $F_T(\overline{t}, 1)$ and is independent of θ. When landlords can exercise market power however the private marginal return to land is increasing in θ for both landlords and peasants. To see this differentiate expressions (1) and (2) to obtain:

$$\frac{\partial V_R^d}{\partial \theta} = \frac{\overline{t}}{\lambda} F_T \left(\frac{(1-\theta)}{(1-\lambda)} \overline{t}, 1 \right) > \frac{\partial V_R^c}{\partial \theta} = \frac{\overline{t}}{\lambda} F_T(\overline{t}, 1) > 0$$

The expressions above state that the marginal impact of an increase in θ on landlord income is always higher when the landlord has discriminating market power compared to the competitive allocation.[15] Furthermore, this difference is increasing in θ since

$$\frac{\partial V_R^{2d}}{\partial \theta^2} = -\frac{\overline{t}}{\lambda(1-\lambda)} F_{TT} \left(\frac{(1-\theta)}{(1-\lambda)} \overline{t}, 1 \right) > 0 = \frac{\partial V_R^{2c}}{\partial \theta^2}$$

The *marginal* incentive to challenge property rights thus rises with the initial level of land inequality in the market power case. This suggests that latent or actual property rights conflicts are much more likely to arise in economies where higher initial inequality allows landlords to exercise monopsony power. Specifically one would expect to see costly ex-ante investments to encroach upon the property rights of others, or to protect one's own property rights against the challenges of others

[15] Similarly unambiguous results cannot be derived for the general monopsoly case because the inequality $\frac{\partial V_R^m}{\partial \theta} > \frac{\partial V_R^c}{\partial \theta}$ may be reversed depending on θ. It can nonetheless be shown that the desired result holds for low enough or high enough θ.

when land inequality is high and landlords can exercise market power. More specific assumptions about how property rights conflicts arise and are resolved are needed to make more precise predictions however.[16]

The land rental market and the land sales market are essentially one and the same in this static setting. The same reasoning extends naturally to the multi-period setting: landlords who cannot price discriminate withhold land from the market because to sell or lease out any more land would only undercut their market power. The model explains why an inefficiently low volume of transactions might persist through time without having to appeal to credit market imperfections or transaction costs.

4 Conclusion

In a detailed historical account, Arnold Bauer (1971, 1975) chronicles the rise and consolidation of Chile's large landlord estates and the associated system of labor service tenancies known as *inquilinaje,* during the second half of the nineteenth century. His analysis helps put to rest the common myth of inefficient landlords more preoccupied with status than by profit, by demonstrating that estate production in fact responded very flexibly to the new opportunities created by new wheat export markets and falling transport costs. During this period agriculture and labor demand boomed, as the area under wheat cultivation more than tripled between 1850 and 1870.

In neighboring Argentina where landownership was relatively less concentrated and labor more scarce, a similar agricultural boom led to rising wages, increased mechanization and more open immigration policies, as conventional theory would have predicted. Yet, according to Bauer, in Chile the outcome was different as "the information that is available suggests that real wages stayed constant and may have decreased slightly (p.1079)" over the period. Rather than raise wages, landlords satisfied their demand for labor by "tightening of the screws on the service tenants (p. 1074)" and by restructuring their estates so as to bring in more labor service

[16] See for example Hotte ([25]) and references therein for a discussion of models that specify property rights encroachment and protection functions. Conning and Robinson (2000) analyze a linear production technology model where landlords organize production inefficiently in an effort to lower tenants' incentives to challenge property rights through the political system.

tenants[17] but reducing average tenants' plot sizes while increasing labor service obligations. Bauer reports that in some regions tenants' labor service obligations doubled or tripled.

Bauer's account of this period appears puzzling to standard economic theory, yet the observed pattern is readily reconciled to the model in this paper. In particular, I have argued that under conditions of sufficient land concentration, an increase in labor demand on landlord farms can lead to an increase in landlords' ability to exercise market power and to declining or stagnant equilibrium wages.

Several other stylized features of what has at times been dubbed the 'backward' agrarian economy (Basu, 1997) emerge as equilibrium features of this simple agrarian economy with endogenous levels of market power. Where the ability to price discriminate is limited, landlords become willing to carry out production on an inefficiently large scale and an inverse farm size-productivity relationship emerges as yield per hectare on smaller, more labor intensive farms exceeds that measured on larger landlord farms. Although landlords' ability to price discriminate helped to restore efficiency, it do so at the expense of peasant welfare, and the contracts that they would employ resembled the sort of labor service-tenancy contract that have historically found to be widely prevalent in many parts of the world.

The conditions that most likely led to the emergence and persistence of inefficient production organization included high initial land inequality, the ability of landlords to collude, a production technology that was approximately constant returns to scale in land and labor inputs. This last assumption was associated with a production technology where non-traded farming skills or labor supervision abilities that might have strongly favored small farm production did not play a big role. More generally, anything in the production environment that gives an advantage to being large can strengthen the exercise of market power. This helps to explain the historical observation that many of Latin America's large latifundia become consolidated during periods of export growth and technological change.

While economic historians have attributed the rise of the latifundia in Latin America to conditions of labor scarcity, this paper has argued that the effect of population

[17]Bauer (1975) calculates that approximately 35,000 inquilinos and permanent workers and 125,000 day laborers worked on estates in 1865. The next comparable data from the 1930 agricultural census shows inquilinos and permanent workers nearly doubling to 67,000 while the number of day laborers stood at 133,000. These figures count only inquilino heads of households.

growth on agrarian organization depends in important ways on the nature of the production technology, and on whether or not new arrivals into the labor force possess non-traded skills or other factors of production.

While most of the paper has focused on scenarios where property rights over land were secure and involuntary labor service could not be compelled, the model predicts that agent's incentive to resort to extra-legal mechanisms to encroach upon the property rights of others (or to defend against others' encroachment) will be most pronounced in precisely the same situations where the potential for capturing monopsoly rents is highest. The principle at work is quite general: landlords who withhold land from the market raise the price of land access to levels well above the social marginal product of land. Agents are therefore much more likely to spend resources to encroach upon the property of others, and/or to defend their own property compared to a competitive factor market where no agent would ever be willing to pay more than the social marginal product of land (the equilibrium market price) for access to an additional unit of land.

A longer time horizon and a land sales market does not undo the observed inefficiencies in the economy for precisely the same reason that the land rental market operates at less than the efficient level in the one period case: a higher volume of land sales would only dilute landlords' market power. Since the problem is not due to the absence of a credit market, so called 'market-assisted' land reforms – where the government or some other intermediary helps finance peasant land purchases – will not help improve efficiency unless the government can compel landlords to sell land at truly competitive market prices rather than at manipulated market prices.

1.0

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Figure 1: Peasant Sector and Total Income under different market structures as a function of θ

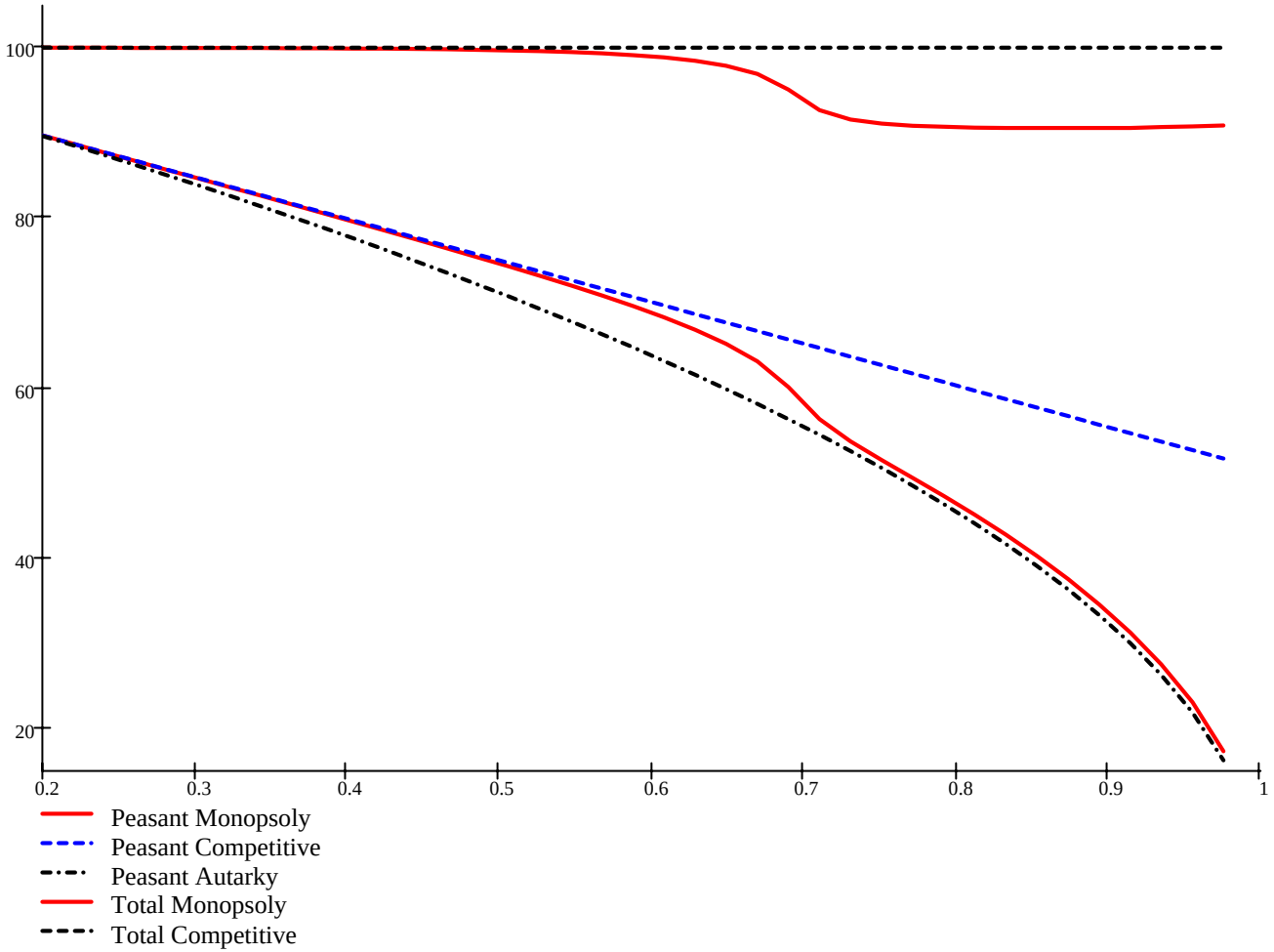

Figure 2: Equilibrium Net Factor Supplies as a function of θ

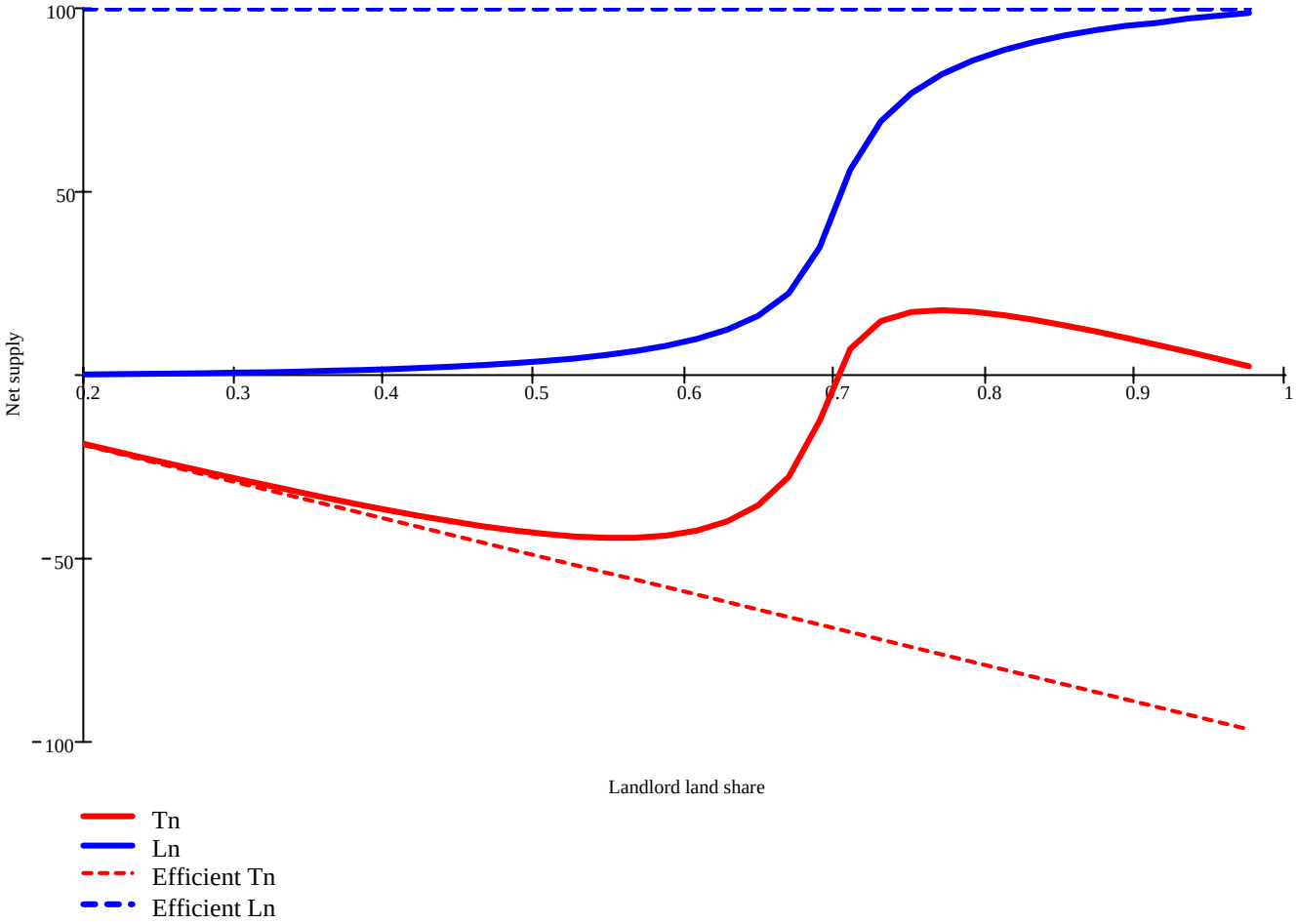

Figure 3: Equilibrium Wage and Rental rates as a function of θ

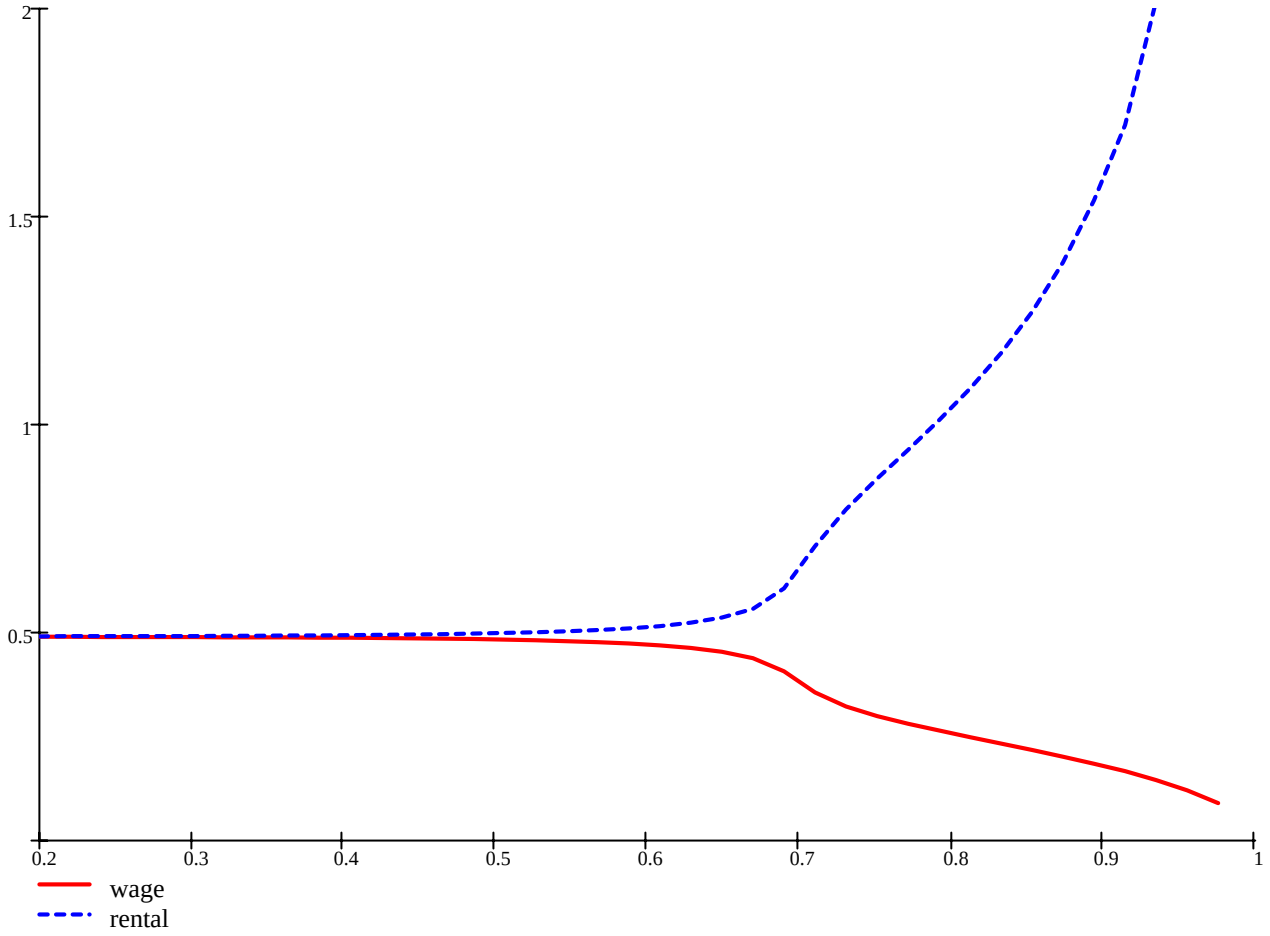

Figure 4: Equilibrium Land-Labor ratios as a function of θ

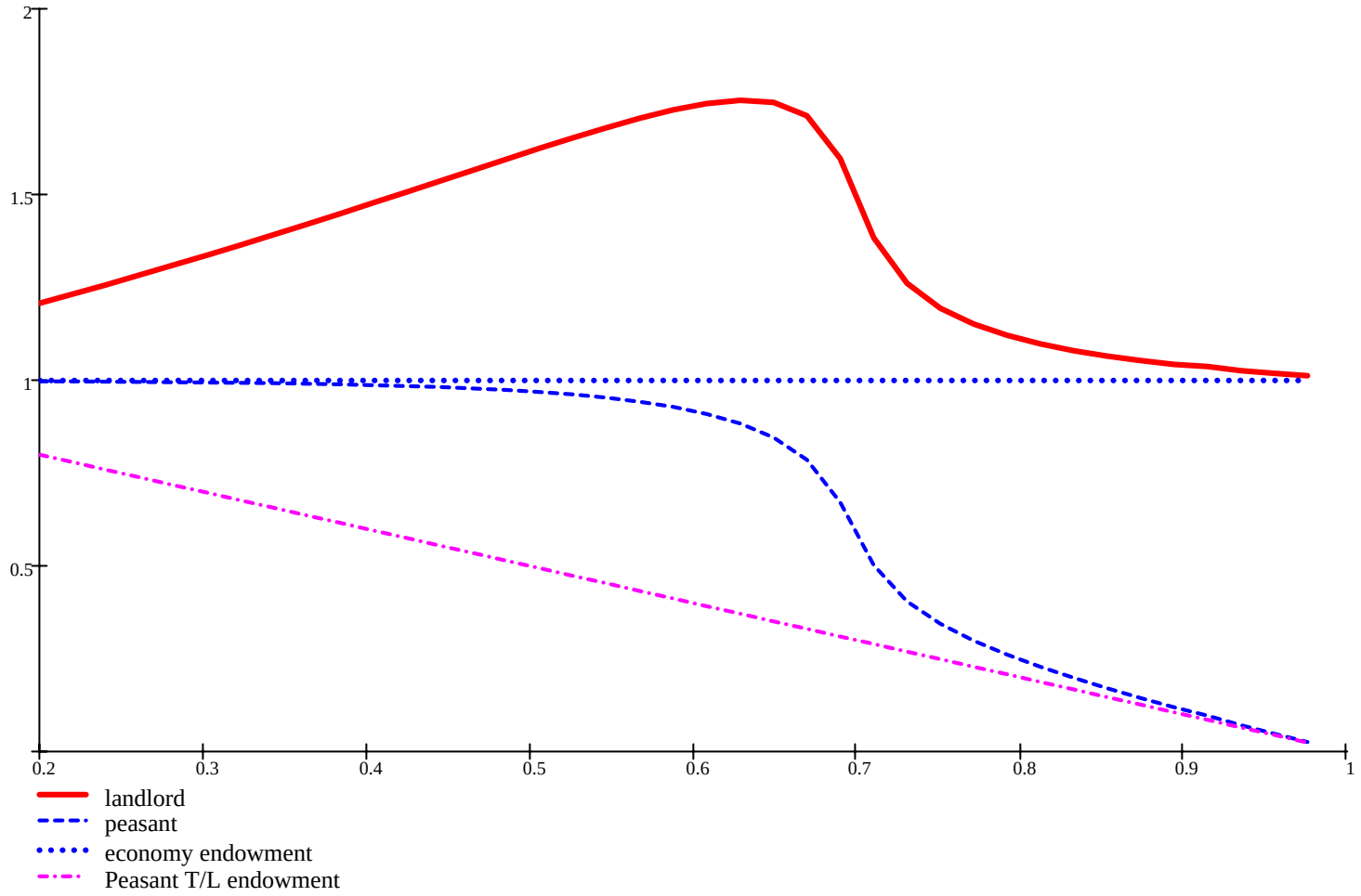

Figure 5 : Effects of an increase in the number of Peasant Households

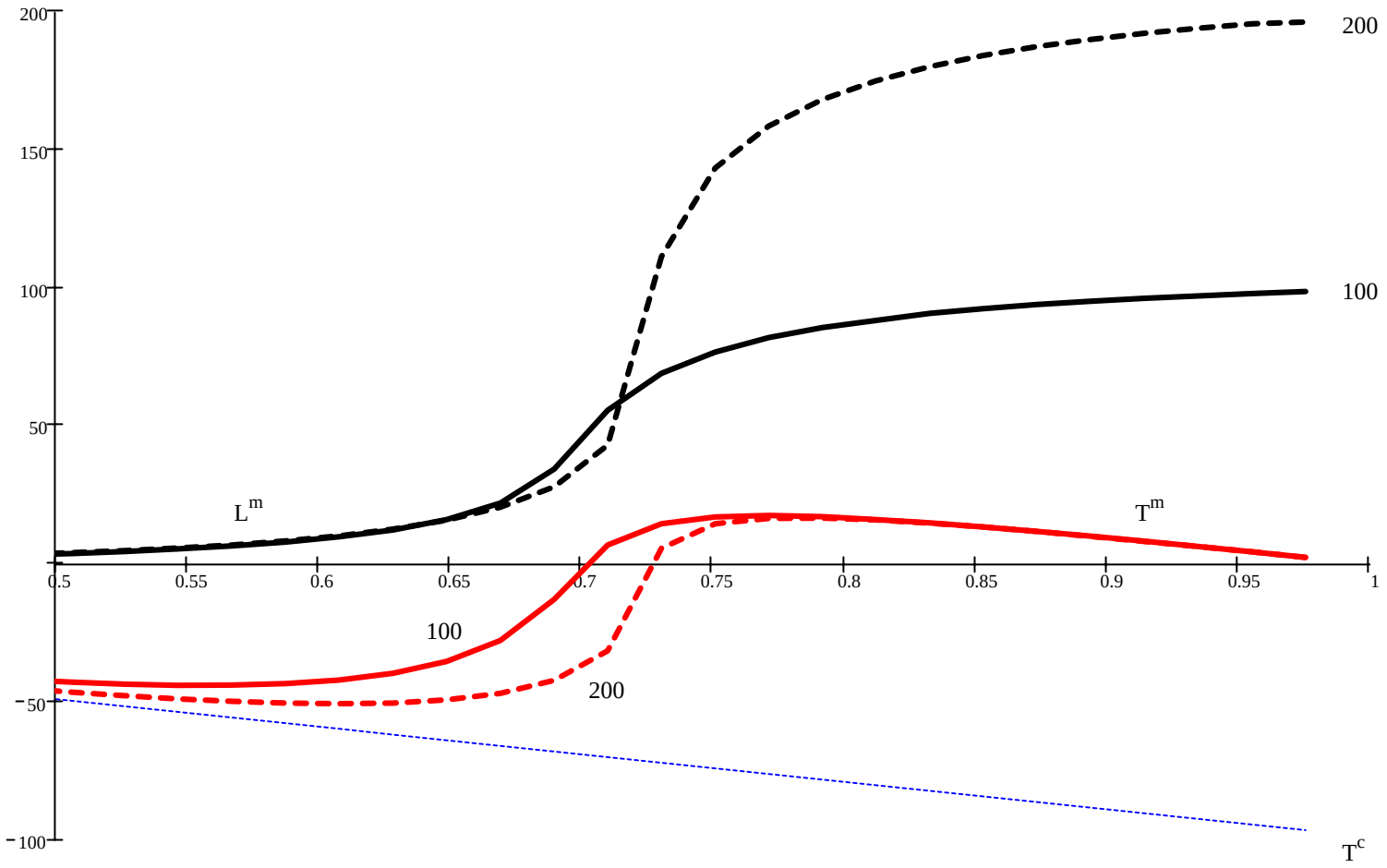

Figure 6: An increase in landlord skill can increase market power effects