

# The Causes of Slavery or Serfdom and the Roads to Agrarian Capitalism: Domar's Hypothesis Revisited

**Jonathan Conning\***

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## **Abstract**

I propose a simple general equilibrium formalization of Domar's famous hypothesis on the causes of slavery or serfdom that emphasizes the interactions between factor endowments, the nature of the production technologies, and the initial distribution of property rights over land. The model provides a framework within which to understand the choice between slavery, serfdom, and free labor and tenancy equilibria with or without bonded labor-service obligations. The model also sheds light on the 'Agrarian Question' regarding why some otherwise similar regions transitioned to free-labor agrarian capitalism via an 'American road' dominated by independent family farms while others followed a 'Junker road' with production dominated by large estates surrounded by small semi-proletarianized peasant households. The model is built around an otherwise canonical general equilibrium trade model adapted to allow for the endogenous emergence of land oligopoly and labor oligopsony power distortions that shape the pattern of agrarian production organization.

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# 1 Introduction

“[I]n the context of universal history, free labour, wage labour, is the peculiar institution (historian Moses Finley, 1976).”

Coerced labor arrangements or ‘voluntary’ but servile bonded labor relationships of one sort or another have played an important role in the organization of production for the better part of the history of human civilization and in virtually all known societies. Given the historical prominence of such institutions, it is somewhat surprising how little attention economists have devoted to building formal theoretical explanations for the rise or fall of these institutions or the nature of the transition to free labor and tenancy markets.

To be sure, economic historians have of course studied slavery and, especially following the work of Conrad and Meyer (1958), American Southern slavery has been examined in great empirical detail (Ransom and Sutch, 2001; Fogel and Engerman, 1989; Wright, 1978). However, the few formal treatments of slavery that do exist are mostly partial equilibrium in their focus and analyze mainly slaves’ work incentives (Findlay, 1975; Chwe, 1990) or are competitive general equilibrium treatments that do not attempt to explain the rise and fall of slavery or serfdom in comparative perspective (Bergstrom, 1971). Relatively more has been written on voluntary ‘interlinked’ or bonded labor contracts in developing country agriculture by appealing to asymmetric information and credit market imperfections (Srinivasan, 1989; Genicot, 2002), but the focus has been almost exclusively on partial equilibrium settings and the theories do not account for why information asymmetries should have such persistent influences over time, or why they vary so systematically across regions, to be able to explain the observed historical evidence.

To economists, the best known analytic narrative hypothesis is contained in Evsey Domar’s famous 1970 essay ‘On the Causes of Slavery or Serfdom: A Hypothesis.’ Domar conjectured quite simply that coerced labor arrangements were far more likely to emerge in economies where labor was scarce relative to land because larger economic rents would accrue to those who control labor rather than land. Basing himself on accounts of the re-imposition of serfdom in seventeenth century Russia by eminent historian V.O. Kliuchevsky, Domar explained that “when the central areas of the state became depopulated because of peasant migration into the newly conquered areas in the east and southeast,” serfdom emerged “under the pressure of the serving [landlord] class...[as] the government gradually restricted the freedom of peasants ... to move.”

Domar argued in straightforward neo-classical terms, starting with a simple competitive equilibrium description of a free labor equilibrium. In the first part of this paper I offer a simple formalization of his model. True to Domar, if the land to labor ratio rises sufficiently, competitively determined land rents will fall relative to wages to a point that may threaten the survival of any ‘servitor class’ that tries to live purely off land rents and also increases the attractiveness of ‘enslaving’ a portion

of the peasant population in order to expropriate the rising returns to labor. By analyzing the interactions between the market for land tenancies and the market for wage labor and examining the role of initial land ownership inequality, the model leads to a few simple but interesting predictions that Domar overlooked. One is that, *ceteris paribus*, slavery will be less likely to emerge or persist in economies with a higher concentration of land in landlord hands. This occurs for the simple reason that a large landlord has more to gain, or less to lose, when slaves are turned into free tenants compared to a landlord who owns much less land. This effect will be stronger, the more pronounced are potential diseconomies of scale favoring small farm or tenancy production, due for example to cost advantages in the use of family labor instead of supervised hired labor, or to the role of non-traded factors in farm production.

Domar's neo-classical hypothesis is neat and compelling, but leaves many questions unanswered. For one, he failed to distinguish between chattel slavery and serfdom, even though the distinction is clearly very important in practice. Another fundamental criticism is that while Domar used this neo-classical approach to explain the rise of serfdom in Eastern Europe and Russia, other economic historians such as North and Thomas (1973) employed very much the same competitive neo-classical model to explain pretty much the *exact opposite* conclusion for Western Europe. These economists had argued, in effect, that the labor scarcity brought about by the population crash that followed the ravages of the 14th century Black Plague led to increased competition amongst landlords, an increase in the relative 'wage' and the bargaining power of peasants, and a breakdown of legal serfdom.

This particular criticism was leveled perhaps most forcefully by Robert Brenner who argued that a neo-classical approach which interpreted "the response of the agrarian economy to economic pressures ... as occurring more or less automatically, in a direction economically determined by the 'law of supply and demand' (Brenner, 1976: 10)" could not possibly account for the wide divergence of institutional responses observed in comparing Eastern Europe (where serfdom was hardened) and Western Europe (where serfdom was essentially dissolved). The neo-classical model failed, he argued, because it ignored 'social or class structure.' The critique led to the "Brenner Debates," a series of pointed exchanges and rebuttals between historians and economists, that 'may justifiably lay claim to being one of the most important historical debates of recent years (Aston and Philpin, 1985).'

A closely related line of criticism is that, rarely has the abolition of serfdom or other forms of labor compulsion immediately led to anything resembling the textbook model of a competitive labor market. Whereas a simple neo-classical approach speaks only of wages and land rents, for much of history nominally 'free' peasants labored under a variety of different 'tied' or voluntary bonded arrangements. A typical arrangement was a labor-service tenancy contract in which peasants received access to a small plot of land in exchange for an obligation to provide regular labor services to the landlord. Such contracts do not readily fit into the standard competitive

supply and demand framework, yet dominated labor markets for centuries, and still can be found in rural societies today.

Indeed, the distinction between ‘coerced’ and ‘voluntary’ contractual forms of labor obligation has been at times rather difficult to delineate in practice. The descriptions of the introduction of legal serfdom in Russia by V.O. Kliuchevsky which inspired Domar are replete with detailed accounts of the many and varied forms of ‘voluntary’ bondage and ‘self-pledging’ that existed in Russia for centuries (1968: 174-199). Serfdom was not introduced by a single decree that all of a sudden allowed landlords to chase down and enslave peasants but rather was the result of the slow but steady introduction of a range of new legal mechanisms and re-interpretations of existing law that over time made it much more difficult for peasants to terminate the ‘voluntary’ labor-service obligations they had already contracted into.

Even later, after the formal abolition of serfdom and legal barriers to mobility in 19th century Russia, labor-service obligations persisted. Vladimir Lenin (1956) dedicated an entire chapter of *The Development of Capitalism in Russia* to an analysis of labor-service tenancy in the period following the abolition of serfdom. Morner (1970) and Binswanger et al. (1995) offer partial catalogs of the very large number of types of labor-service arrangements that have been used throughout the modern world. A partial list would include the *Statartorpare* (Sweden), *Husemenne* (Norway), *Instleuete* and *Heurerlinge* (North East Germany) all of which lasted into the early twentieth century, and the *Tamalia* system (Egypt). In Latin America servile workers and tenants with labor-service obligations known, depending on the region, by such names *asinquininos*, *yanaconas*, *peones encasillados*, *huasipungueros* or *colonos camaradas*, formed an integral part of the rural labor for centuries and could be found in some regions well into the second half of the twentieth century. Even in the United States, sharecropping arrangements between landlords and freed slaves in the post-bellum South often featured labor-service obligations.

The question of when slavery or serfdom emerge and when and how it gives way is hence very closely related to that other important historical debate on the ‘Agrarian Question,’ or the nature of production relationships in the transition toward agrarian capitalism. This question obsessed the attention of marxists including Kautsky and Lenin who made much of the contrast between an ‘American road’ transition toward agrarian capitalism in which agricultural production would come to be dominated by capitalist family farm producers and a ‘Junker Road’ where large landed estates dominated production but were surrounded by a fringe of ‘proletarianized’ peasant producers living on small plots of land and selling labor to the estates. Echoes of this ‘Agrarian Question,’ and the question of the relative size of landlord versus peasant farms, can be heard in many other historical debates, for example in the efforts to understand the emergence and persistence of the *Latifundia-minifundia* complex in Latin America (Engerman and Sokoloff, 2001; de Janvry, 1980) or debates amongst European historians on the relative size of the landlords’ *desmene* relative to peasants’ *villein* lands (North and Thomas, 1973; Fenoltea, 1975).

In light of these issues, in the second part of this paper, I propose several extensions to the basic model. The model continues to be built around a fairly canonical general equilibrium trade model (Bhagwati et al, 1998) but with a few important modifications. The distribution of land ownership between a landlord class and peasants or competitive farm operators is clearly specified and plays an important role. A fraction of the peasant group is landless as they own no land but can operate as tenants in a free-labor equilibrium. To capture the idea of a possible technological advantage to family farming, I employ a constant returns to scale production technology in land, labor, and non-traded farming management skills, or labor supervision ability. Efficient production will then be centered around households that possess this asset and farm-level production will be subject to decreasing returns in land and labor (this is along the lines that Domar himself proposed). In such a context, competitive factor markets would give rise to an ‘American Road’ economy with production spread between family farms and tenants in proportion to their farming skills. This is the environment that Domar had in mind in his descriptions of a ‘free labor’ equilibrium. If markets remain competitive, higher land concentration simply leads to more area under lease since landlords will supply all land in excess of their own efficient operational farm size.

Highly concentrated landownership may however lead landlords to try to exercise market power over the land lease market. As in a partial equilibrium analysis, landlords would withhold land from the market to try to drive up land rentals, except that in this general equilibrium context there is a further motivation to restrict peasant land access: by withholding land from tenancies the landlord can drive down the marginal product of labor on peasant farms, increasing peasant labor supply to landlord farms and therefore the scope for extracting monopsony rents from labor. I show that Latifundia-minifundia type arrangements or a ‘Junker Road’ may arise in which landlords withhold large amounts of land and operate large estates (far larger than efficient operational scale). They do this not only to raise land rents, but also to corral cheap labor into their estates to extract monopsony rents.<sup>1</sup> I label this type of model one of ‘monopsoly’ power to highlight the interaction land monopoly and labor monopsony.

If one extends the analysis to allow landlords the ability to price-discriminate it can be shown that the equilibrium contracts *must* involve labor-service obligations, precisely of the sort that were found in voluntary bonded labor and serfdom and have been in widespread use throughout the world. The model’s comparative statics are rich and interesting and help to make sense of several important historical puzzles. For example, a sudden rise in the relative price of a landlord crop can be shown to lead to the increase of ‘monopsoly’ power effects, which can lead to a decline in the size of peasant plots, an increase in labor-service obligations and a fall in real

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<sup>1</sup>The equilibrium is therefore described by the sort of ‘functional dualism’ between landlord estates and peasant farms that agrarian marxists often identify – but in my opinion misunderstood (de Janvry 1980: 98-99).

wages in circumstances where a competitive model would predict a rise in real wages. This would help to explain why regions that appear to have similar factor endowments could experience such different institutional transformations in response to a common external stimulus such as a population crash or an agro export boom.

The model also yields predictions about landlords returns from meddling with politics to affect property rights over land and labor mobility, and how these predictions vary depending on initial land concentration and other variables. This leads to a brief discussion of the comparative politics of land grabs and frontier policies, and a reexamination of the earlier question of when slavery and the imposition of legal limits on labor mobility will be most attractive to landlords.

These questions have often taken on significant political importance. Perry Anderson (1979) argues that the decline of serfdom in Western Europe coincided with and was in fact driven by the rise in Absolutist states, while serfdom re-emerged East of the river Elbe because central states were too weak. One can speculate that the Absolutist state emerged as a type of encompassing monopolist who intervened to break up the ‘monopsoly’ power of local lords because more revenue could be raised by taxing peasants directly in an economy closer to the efficient competitive equilibrium. Not unrelated to this, Barrington Moore famously hypothesized that a primary determinant of whether countries transitioned toward democratic capitalism, as opposed to totalitarian fascism or communism, was profoundly shaped by the character of this agrarian trajectory. He argued that countries characterized by “labor repressive systems” in which landlords relied on coerced labor or found other ways to manipulate factor markets to exercise control over land and labor, were far more likely to see the rise of Totalitarian Fascism, or Communism as either landed elites or peasant revolutionaries struck up alliances with rising industrial sectors.

The rest of the paper is organized as follows. After laying out the elements of the model I analyze competitive equilibria with and without slavery, very much along the lines argued by Domar. The next section shows how market power effects can be endogenized and analyzes comparative statics of the ‘monopsoly’ equilibria that emerge as we change parameters in the economic environment. I characterize equilibria for a broad class of homogenous production functions and then illustrate by simulating equilibrium agrarian structures in a Cobb-Douglas economy. The next section extends the analysis by allowing price-discriminating monopolists to show how labor-service obligations emerge as an optimal contract. Next I carry out some comparative static exercises showing how equilibrium production structures and incomes evolve with changes in relative product prices and technology, and how outside interventions to ban certain forms of labor tying may increase peasant welfare even while reducing economic inefficiency. I illustrate with various historical examples. After this I return to the question of when landlords would choose slavery over tenancy, this time for the case where landlords can manipulate factor prices, which yields somewhat different predictions, and a few seemingly paradoxical results, compared to the earlier analysis. A final section analyzes how landlords might try to further

influence equilibrium allocations via land grabs and other political interventions. A conclusion is followed by appendices that contain an explanation of how to extend the model to allow for strategic non-cooperative ‘oligopsoly’ behavior amongst landlords, and proofs of the paper’s main propositions.

## 2 Model

The economy consists of  $\bar{T}$  units of cultivable land of “uniform quality and location (Domar 1970:19).” There are  $\bar{L}$  households with one unit labor each, so the land-to-labor ratio is  $\bar{t} = \bar{T}/\bar{L}$ . The  $\bar{L}$  households consist of an integer number  $m\bar{L}$  of landlord households and  $n\bar{L}$  ‘peasant’ households, where  $m$  and  $n$  denote population shares for each group. The landlords class owns fraction  $\theta$  of the land endowment. The  $n\bar{L}$  peasant households are in turn made up of  $n_1\bar{L}$  ‘yeoman’ households who possess the remaining units of land and  $n_0\bar{L}$  landless peasant households who own no land but may cultivate land as tenants. Landholding per household in each of the these three groups is therefore

$$\begin{aligned}\bar{t}_r &= \theta\bar{t}/m \\ \bar{t}_{p1} &= (1 - \theta)\bar{t}/n_1 \\ \bar{t}_{p0} &= 0\end{aligned}$$

where  $g \in \{r, p_1, p_0\}$  indicates landlord, yeoman peasant, or landless peasant households respectively. The land Gini in this simple economy can be shown to be given by the linear function  $Gini = (1 - n_0)\theta - (m - n_0)$ .

All households have access to the same production technology  $\hat{F}(T, L, S)$  which is linear homogenous in its three arguments, land, labor, and a non-traded production factor  $S$ . This last factor can be thought of as the household’s farming skill or management ability, or its labor supervision capacity. The assumption that  $S$  is a non-traded factor captures in a simple way the empirically well grounded assumption that transaction costs and information asymmetries pertaining to labor supervision generate farm-level diseconomies of scale which explain the widespread prevalence of family farming throughout the world (Hayami and Otsuka, 1993; Binswanger and Deininger, 1995).

INormalizing peasant holdings of the non-traded factor to  $\bar{S}_p = 1$  it is convenient to define a restricted production function  $F(T, L) = \hat{F}(T, L, 1)$  that will be homogenous of degree  $k \leq 1$ . A lower  $k$  indicates that non-traded skills or labor supervision activities are more important in production and therefore that diseconomies of scale in the restricted production function are more pronounced.<sup>2</sup> Landlords have access to the same production function  $\hat{F}$  but may possess more non-traded assets  $\bar{S}_r$ . We

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<sup>2</sup>To illustrate, if we assumed a Cobb-Douglass production function  $\hat{F}(T, L, S) = T^\alpha L^\beta S^{1-\alpha-\beta}$  the restricted production function is  $F(T, L) = T^\alpha L^\beta$  which is homogenous of degree  $k = \alpha + \beta < 1$ .

write the landlord's restricted production function  $G(T, L) = AF(T, L)$  where, by the properties of homogenous functions,  $A = (\bar{S}_r/\bar{S}_p)^k$ . One interpretation of this technology setup is that landlords and peasants produce the same crop using the same production technology. The possibility of a second crop produced by landlords with a relatively more land- or labor-intensive production technology is examined later.

## 2.1 Competitive Equilibria

In describing conditions in Russia prior to the re-establishment of serfdom, Domar lead his readers to think of a free-labor and tenancy equilibrium. In such an economy, marginal factor products should be equalized across farms, so “the country will consist of family-size farms ... the wage of a hired man or the income of a tenant will have to be at least equal to what he can make on his own farm.” He also assumed, initially, that “land of uniform quality and location is ubiquitous” implying that “hired labor in any form, will be either unavailable or unprofitable: the wage of a hired man or the income of a tenant will have to be at least equal to what he can make on his own farm (p.19).” Domar did realize the potential importance of non-traded factors however, as he modified this prediction by noting that estates that used hired labor would appear “in areas of unusually good (in fertility and/or in location) land, or specializing in activities requiring higher than average capital intensity, or skillful management (p.20).”

Domar's ideas can be readily formalized: Factor market balance in each factor market will be summarized by

$$mT_r + nT_p = \bar{t} \quad (1)$$

$$mL_r + nL_p = 1 \quad (2)$$

where  $(T_p, L_p)$  and  $(T_r, L_r)$  are, respectively, factor demands on the  $n$  peasant farms and the  $m$  landlord farms. Assuming no credit constraints, non-convexities, or other imperfections, all households that possess some quantity of the non-traded factor  $S$ , including any landless peasants, will engage in production.

Assuming all output is sold at a unitary price fixed on the world market, each household will choose factor inputs to maximize the value of farm sales plus net factor sales, or equivalently, to maximize the value of profits plus the market value of their labor and land endowment:

$$V_g^c(\bar{t}, \theta) = \max_{T_g, L_g} [F(T_g, L_g) - rT_g - wL_g] + w + r\bar{t}_g \quad (3)$$

where  $g \in \{r, p_1, p_0\}$  indicates landlord, yeoman peasant, or landless peasant households respectively. In an efficient competitive equilibrium marginal products will be equalized across all farm types, so  $F_L = G_L = w$  and  $F_T = G_T = r$ . If we assume that all farm households have the same non-traded skills (so  $A = 1$ ) and production functions that are homogenous of degree  $k < 0$ , all household groups  $g$  will operate

farms of identical operational size  $T_g = \bar{t}$  and  $L_g = 1$ . Every household will be exactly self-sufficient in labor and each landlord household leases out all land owned in excess of the efficient farm size, or  $\theta\bar{t}/m - \bar{t} > 0$  units of land to the market.

Higher land inequality  $\theta$  leads to more land leased out to the peasant sector. The simple linear relationship between  $\theta$  and the equilibrium quantity of land leased out is captured by the negative sloping straight line of figure 1. Each farm produces  $F(\bar{t}, 1)$  and economy-wide output is  $\bar{L}F(\bar{t}, 1)$  regardless of  $\theta$ . In a competitive equilibrium income for each household in group  $g \in \{r, p_1, p_0\}$  is given by the sum of profits (a return to the non-traded asset  $S$ ) plus the market value of owned factors:

$$V_g^c(\bar{t}, \theta) = F(\bar{t}, 1) - F_T(\bar{t}, 1)(\bar{t} - \bar{t}_g) \quad (4)$$

The flat dashed line in Figure 1 graphs total output  $\bar{L}F(\bar{t}, 1)$  and the falling dashed line peasant sector output  $[n_0V_{p0}^c + n_1V_{p0}^c]\bar{L}$  as a function of  $\theta$  for the representative competitive economy.<sup>3</sup> At higher  $\theta$  the peasant sector owns less land, so its income is lower. The non-linear broken-dashed line in the lower panel of the figure traces out peasant sector autarky or Chayanovian income – the fallback level of income each yeoman peasant household could earn if they withdrew from factor markets and only used their own land and labor. The solid lines correspond to output and peasant income in the market-power distorted economy to be described below.

If landlords had higher non-traded skills, so  $A > 1$  and  $k < 1$ , all farms would still employ the same factor proportions but landlords now operate on a larger efficient scale, hiring out less land and more labor at any level of  $\theta$ .<sup>4</sup>

## 2.2 Competitive Equilibria with Slavery

A very simple way to model the introduction of slavery is to assume that the landlord class can, at some collective political cost, collude to enslave a fraction  $\sigma$  of the free landless peasant population. Enslaved households can be forced to surrender each unit of their labor time to the landlord for only a subsistence wage  $\underline{w}$ . For simplicity, enslaved workers are assumed to be allocated evenly across landlord farms, so that each landlord receives  $\sigma n_o/m$  units of slave labor. Landlords can buy or sell slaves in a new competitive equilibrium, either to or from other landlords or to the remaining free farming households.

Domar did not himself distinguish clearly between slavery and serfdom, perhaps because he did not really focus on the operation of the market for land. Here I distinguish slavery from serfdom by assuming that a slave can be forced to supply unskilled labor if supervised by a landlord, but cannot be forced to supply his non-traded skills

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<sup>3</sup>Population and technology parameters used in this graph are described in the ‘Equilibria with Market Power’ section below.

<sup>4</sup>For any  $A$  and  $k < 1$ , the efficient allocation is  $T_p = \phi\bar{t}$  and  $L_p = \phi$  and  $T_r = A^{\frac{1}{1-k}}\phi\bar{t}$  and  $L_r = A^{\frac{1}{1-k}}\phi$ , where  $\phi = 1/(mA^{(1/1-k)} + n)$ . When  $k = 1$  then  $A$  must equal unity in the one crop model, otherwise landlord farms would dominate all production.

to organize tenant production. In other words you can have slave laborers but not slave tenants. This captures the idea that slave labor is less effective than tenant labor because you cannot make a slave a residual claimant without also giving them a substantial degree of independent control over land, and therefore some freedom of choice over how to allocate labor between their tenancy and labor services to the landlord.<sup>5</sup>

The fraction of the landless  $\sigma$  that can be potentially enslaved is taken here to be exogenously given. In practice, it might for example be the fraction of a population that is of a different ethnicity or linguistic group from the would-be slave-owners to reflect the fact observed in most slave-societies that slaves were almost always outsiders (Engerman, 1999), perhaps because outsiders may have found it harder to flee and hide amongst the free. Each landlords' share of the total costs of maintaining slavery and of coercing and supervising slaves is given by a landlord-level cost function  $F$  which may vary with the size of the slave population, the number of landlords, and other parameters. Rather than specify an ad-hoc functional form to represent these costs I instead study how the *benefits* that accrue to landlords from enslaving vary across different economic settings, so that I can then ask the maximum expense  $F$  that each landlord would be willing pay to capture those benefits.

The landlord faces a tradeoff in deciding on whether to support enslavement or not. Enslavement reduces costs by lowering the wages at which the landlord hires some or all of the labor it needs for its farm. But a slave-owning landlord must ask himself whether he might not earn more by turning his slaves into free tenants. Wages paid to slaves are low but tenants bring forth non-traded farming ability and skills in ways that cannot be coerced out of slaves. A landlord who is able to capture a large enough share of the gains to tenancy over labor via land rents may find a free tenant more profitable than a slave.

In a slave economy there will be  $\sigma n_0 \bar{L}$  slaves which leaves  $[n - \sigma n_0] \bar{L}$  free farming households. Equilibrium in factor markets now requires:

$$\begin{aligned} mT_r^s + T_p^s [n - \sigma n_0] &= \bar{t} \\ mL_r^s + L_p^s [n - \sigma n_0] &= 1 \end{aligned}$$

The landlord pays slave labor on his own farm subsistence wage  $\underline{w}$  but will sell or rent out any surplus slave labor to the yeoman sector or other landlords at the free labor market rate  $w$ . This is the same rate he would have to pay to hire free or slave labor from the market. This coincides with descriptions of the operation of several known slave economies. Fogel and Engerman (1989; p53) provide evidence that “there was an extremely active rental market for slaves” in the antebellum US South. Conrad and Meyer (1958) and others have argued that slave prices reflected present values and the marginal return to slave use was equalized across farms.

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<sup>5</sup>Note however that, depending on their outside opportunities, we will show that a tenant-serf or even a free-tenant may not have much higher welfare than a slave.

The slave-owning landlord's problem, not including slave supervision and coercion costs, can be stated as chooses labor and land allocations to maximize:

$$V_r^s(\bar{t}, \theta, \sigma) = \max_{T_r^s, L_r^s} [G(T_r^s, L_r^s) - rT_r^s - wL_r^s] + r\theta\bar{t}/m + (w - \underline{w})\sigma n_o/m \quad (5)$$

The last term is the market value of owned slave labor net of the costs of paying for slave subsistence. The first-order conditions for this problem are again  $G_T = F_T = r$  and  $G_L = F_L = w$  so slave and free labor will be allocated efficiently across farms. The number of peasant farming households has been reduced from  $n\bar{L}$  to  $(n - \sigma n_0)\bar{L}$ . A price-taking landlord will support the enslavement of fraction  $\sigma$  of the free peasant population so long as the gross private benefits  $B(\bar{t}, \theta, \sigma) = V_r^s(\bar{t}, \theta, \sigma) - V_r^c(\bar{t}, \theta)$  per landlord exceed his share of slave coercion and supervision costs  $F > 0$ , where  $V_r^s$  is the landlord's earnings in a slave economy and  $V_r^c$  is what the same landlord earns in the no-slavery free market equilibrium (given earlier by expression (3)). Clearly, at  $\sigma = 0$  we must have  $B(\bar{t}, \theta, \sigma) < F$  since  $V_r^s = V_r^c$ . By the Envelope Theorem,  $\frac{\partial B}{\partial \sigma} = (w - \underline{w})n_o/m > 0$ , so the benefits of slavery to landlords are increasing with  $\sigma$ . Therefore, if  $\underline{w}$  is sufficiently low and slavery enforcement costs  $F$  are not too large, slavery will be preferred by landlords for a high enough value of  $\sigma$ .

If we define  $\hat{\sigma}_c(F)$  to be the minimum fraction of the landless that must be enslaved for slavery to just become profitable, or  $B(\bar{t}, \theta, \hat{\sigma}_c) = F$ , and if we assume parameters are such that an interior solution  $0 < \hat{\sigma}_c < 1$  exists, then it is easily shown that  $\hat{\sigma}_c$  is increasing with the size of  $F$  or  $\underline{w}$ , and decreasing in anything that increases  $w$  such as an increase in the relative scarcity of labor or an increase in the price of the landlords' crop. This points to a confirmation of Domar's hypothesis that in a labor-scarce economy it was "the ownership of peasants and not of land that could yield an income to the servitors or to any non-working landowning class (p.19)" since:

**Proposition 1** *Ceteribus paribus, the threshold fraction of the population  $\hat{\sigma}_c$  falls with  $\bar{t}$ . Slavery is more likely in economies with a higher land to labor ratio.*

To see this note that gross benefits can be written:

$$\begin{aligned} B(\bar{t}, \theta, \sigma) &= V_r^s(\bar{t}, \theta, \sigma) - V_r^c(\bar{t}, \theta) \\ &= \Delta\Pi + (w^s - \underline{w})\sigma n_o/m + (r^s - r^c)\theta\bar{t}/m \end{aligned} \quad (6)$$

where  $\Delta\Pi$  is the change in farm profits on landlord farms following the transition from free labor to a slave economy and the other two terms are the 'exploitation rents' earned by the landlord and any possible change in the value of land due to changes in equilibrium rental prices.

If non-traded skills are not necessary in production so the restricted production becomes constant returns to scale in land and labor inputs ( $k = 1$ ), under competitive markets the initial distribution of operational farm sizes is indeterminate and in any

case irrelevant to the determination of relative factor prices and real allocations. In such an environment enslavement would amount to a simple transfer of property over peasant labor to landlords. Landlord earnings would increase because of the transfer of rents  $(w^s - \underline{w})\sigma n_0/m$  but this would not affect real allocations or equilibrium factor prices.<sup>6</sup>

When non-traded assets play a role in production (when the degree of homogeneity  $k$  is less than one) enslavement of  $\sigma n_0 \bar{L}$  households removes a similar number of farms units from production. The land and labor that these households would have used must now be reallocated to the remaining  $(1 - \sigma n_0) \bar{L}$  farms resulting in fewer, larger, farms and lower yields because slaves non-traded skills are no longer being used. Given the existence of diseconomies of scale in production, equilibrium wage and rental rates must fall ( $w^s < w^c$  and  $r^s < r^c$ ) proportionately. Profits per remaining farm must therefore increase (a simple property of any well-behaved profit function), so that  $\Delta \Pi > 0$ . The first two terms of (6) are therefore positive but the last term  $(r^s - r^c)\theta t/m$  is negative. This leads to the following two simple but interesting qualifications to Domar's hypothesis:

**Corollary 2** *Ceteris paribus,  $\hat{\sigma}_c$  increases with  $k$  and decreases with  $A$ , so that slavery is less likely in economies where technology is subject to diseconomies of scale and/or where peasant ownership of non-traded productive assets is not that different from landlords.*

**Corollary 3** *Ceteris paribus,  $\hat{\sigma}_c$  increases with  $\theta$ , suggesting that slavery is less likely in economies with high concentration of land in the hands of landlords.*

Consider the second result first. Each new slaveowner-landlord earns additional 'exploitation rents'  $(w - \underline{w})\sigma n_0/m$  but the fall in rentals  $r$  lowers the market value of any land the landlord might still hire out. A landlord with large amounts of land under lease will naturally therefore be more reluctant to enslave his tenants. Or stated differently, a slave-owner is more likely to agree to convert his slaves into tenants the more land that he will be in a position to lease out. For similar reasons, tenancy (or serfdom) is the more attractive option for landlords the more productive is land organized around family farm tenancies compared to large landlord estates – the lower is  $k$  and the closer is  $A$  to unity.

These results are consistent with the often made observation that slavery was more likely in staple or plantation crops where economies of scale were supposedly derived from gang labor applied to the execution of repetitive and easily monitored tasks by unskilled labor (Fogel and Engerman, 1974). The result here demonstrates that strictly positive economies of scale are not necessary. The result says simply that slavery is less likely in crops where the opportunity cost of running a large farm (i.e.

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<sup>6</sup>Bergstrom (1971) provides a model with slavery along these lines in an Arrow-Debreu framework. Real allocations will be affected of course by the fact that coercion and supervision generates real costs and distortions.

not using tenants) is not too high. A higher  $A$  can also be interpreted as a higher relative price for ‘landlord’ export crops favoring slavery.

The first corollary result suggests that slave owners are more likely to transition to tenancy (or serfdom as described below) without a fight in economies where there is a greater initial concentration of land. The next section demonstrates that this conclusion is yet further strengthened if land concentration increases landlords’ ability to exercise market power and manipulate factor market prices. As we shall argue, in such cases tenancies with labor-service obligations, very much characteristic of arrangements under many types of both voluntary and involuntary serfdom, emerge as attractive alternatives to slave labor. This offers some additional essential insights into the ‘Agrarian Question,’ or the nature of the agrarian trajectories involved in the transition from slavery and feudalism to capitalism.

### 2.3 Equilibria with market power distortions

Throughout history economic power has been associated as much with control over land as it has been with control over man. Even in Western Europe the end of serfdom most economies continued to be dominated by “servile’ but now voluntary’ bonded labor contracts, and tenancy arrangements with labor service obligations. To see why this might have been the case, the following sections extend the model to situations where land concentration can lead to market power over the land market and how landlords would reshape the pattern of agrarian organization to their favor. Peasants are now free to hire in land and lease out labor to any landlord at market-determined, but possibly distorted factor prices.

Consider first the simplest case where landlords are assumed to be able to coordinate production decisions as would a perfect non-price discriminating landlord cartel.<sup>7</sup> Peasant households, which are small relative to the market, take factor prices as given and lease-in or lease-out land and labor up to the point where the marginal revenue product equals a given factor price, or  $F_T(T_p, L_p) = r$  and  $F_L(T_p, L_p) = w$ . The landlord cartel’s problem is now to choose land and labor use on each landlord’s farm,  $T_r$  and  $L_r$ , to maximize the value of farm profits plus the market value of landlords’ land and labor endowment, taking into account peasant sector reactions:

$$V_r^m(\bar{t}, \theta) = \max_{T_r, L_r} AG(T_r, L_r) - F_T(T_p, L_p)T_r - F_L(T_p, L_p)L_r \quad (7)$$

$$+ F_L(T_p, L_p) + F_T(T_p, L_p)\theta\bar{t}/m$$

Since in equilibrium total demand for any given factor must equal total supply, using

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<sup>7</sup>The appendix extends the model to allow strategic non-cooperative behavior amongst landlords, and a later section considers price-discrimination.

(1)-(2) we can substitute for  $T_p$  and  $L_p$  using:

$$\begin{aligned} T_p &= \frac{\bar{t} - mT_r}{n} \\ L_p &= \frac{1 - mL_r}{n} \end{aligned}$$

This way of stating the landlords' objective function (7) highlights a key difference between the present analysis and a prior literature on monopsony factor market distortions in general equilibrium trade models (see Feenstra, 1980, Bhagwati et al, 1998 and the references cited therein). In this earlier literature, *exogenously* specified barriers to entry led to *de facto* monopsony power over both factor markets by one large firm (or firms) in one sector of the economy. This concentrated sector then exercised market power to maximize sectoral profits (i.e. the first line of (7) above) but was *not* concerned with how production decisions affect the value of its shareholders' factor endowments (i.e. the second line of (7)). This was because these models made the conventional simplifying assumptions that factor ownership was widely dispersed and also that production technology was constant returns to scale.

By contrast in the present analysis there are no assumed exogenous barriers to entry. Indeed there are always  $n\bar{L}$  peasant farms competing with the  $m\bar{L}$  landlords in the same sector. Furthermore, the assumption of diseconomies of scale in production ( $k < 1$ ) explicitly penalizes large farm units. Hence, if we restricted landlords to maximize only farm profits rather than also the value of land rents, equilibrium allocations would be hardly different from the efficient competitive outcome.

Our focus is instead on the endogenous market power distortions that may emerge when land ownership becomes sufficiently concentrated. From (1) and (2) we have  $\frac{\partial T_p}{\partial T_r} = \frac{\partial L_p}{\partial L_r} = -\frac{m}{n}$ . Suppressing arguments, the first-order necessary conditions for a maximum to (7) are:

$$AG_T = F_T \left[ 1 - \frac{m}{n} \frac{F_{TT}}{F_T} (T_r - \theta\bar{t}/m) - \frac{m}{n} \frac{F_{LT}}{F_T} (L_r - 1) \right] \quad (8)$$

$$AG_L = F_L \left[ 1 - \frac{m}{n} \frac{F_{TL}}{F_L} (T_r - \theta\bar{t}/m) - \frac{m}{n} \frac{F_{LL}}{F_L} (L_r - 1) \right] \quad (9)$$

The first expression (8) can be seen to be a modified version of the land monopolist's pricing rule for hiring out land until marginal revenue equals marginal cost. The direct marginal cost of leasing out an additional unit is measured in terms of foregone output on the landlord estate  $G_T$ . Marginal revenue is given by the rental rate  $r = F_T$  at which that unit is hired out plus the usual negative effect on rental earnings of having to lower the rental rate on inframarginal leases  $-\frac{m}{n} F_{TT} (T_r - \theta\bar{t}/m)$ , since  $\frac{\partial r}{\partial T_p} \frac{\partial T_p}{\partial T_r} = -\frac{m}{n} F_{TT}$ . Finally, there is an additional impact on the cost of hiring free wage labor  $-\frac{m}{n} \frac{F_{LT}}{F_T} (L_r - 1)$  that results as leasing out more land raises the marginal

product of labor on peasant farms. A similar interpretation can be given to first-order condition (9) as a modified version of the labor monopolist's markdown pricing rule.

Given our homogeneity assumptions ( $k < 1$ ), equations (8)-(9) can be solved for a unique set of landlord  $T_r, L_r$ . In general, the system is highly non-linear and closed form solutions for  $T_r$  and  $L_r$  will not be possible even for rather standard production functions. However, substantial insight into the properties and structure of this economy can still be deduced. Dividing (9) by (8) and rearranging yields the more compact expression:

$$\frac{G_L}{G_T} = \frac{F_L}{F_T} \Gamma \tag{10}$$

$$\text{where } \Gamma = \frac{\left[ n - m \frac{F_{TL}}{F_L} (T_r - \theta \bar{t}/m) - m \frac{F_{LL}}{F_L} (L_r - 1) \right]}{\left[ n - m \frac{F_{TT}}{F_T} (T_r - \theta \bar{t}/m) - m \frac{F_{LT}}{F_T} (L_r - 1) \right]}$$

Expression  $\frac{G_L}{G_T}$  and  $\frac{F_L}{F_T}$  are, respectively, shadow wage-rental factor price ratios on landlord and peasant farms. Efficiency in production would of course require production along the efficient locus given by  $\frac{G_L}{G_T} = \frac{F_L}{F_T}$ . If we continue to assume that landlords and peasants produce only one crop using the same general production function, but allowing for the possibility that landlords have a higher level of non-traded skills (i.e. we can write  $G = AF$  with  $A \geq 1$ ), the efficiency locus will be a single point along a straight line of slope equal to the economy-wide land to labor ratio  $\bar{t}$ . However, from (10) it is clear that in the distorted economy  $\frac{G_L}{G_T} \geq \frac{F_L}{F_T}$  as  $\Gamma \geq 1$ . Since landlords' concentrated ownership of land makes them net sellers on a competitive land market, they exercise market power by withholding land from the lease market. This makes them use everywhere more land-intensive production techniques and to operate larger farms:

**Proposition 4** *If landlord and peasant farms produce the same crop and have access to the same general production technology, with  $G = AF$  where  $A \geq 1$ . Then  $\Gamma > 1$  and therefore  $\frac{G_L}{G_T} > \frac{F_L}{F_T}$ . Landlord (peasant) farms will use inefficiently large (small) and land-intensive (labor-intensive) techniques and the economy displays an inverse farm-size productivity relationship.*

Consider first the case where  $A = 1$ . Then all farms are of equal operational farm size and by the definition of what it means to be a landlord ( $\theta > m$ ) landlords would be leasing out land and be self-sufficient in labor in a competitive equilibrium. The larger is  $\theta$  the larger the amount of land leased out in a competitive equilibrium, but the greater also is a landlord cartel's ability to pursue monopoly land rents by withholding land from the lease market. This is as would be predicted by a partial equilibrium analysis. In a general equilibrium setting however, reduced access to land

on peasant farms reduces the marginal product of labor on peasant farms which also increases peasant labor supply to landlord farms and hence the scope for landlords to capture monopsony rents from labor. I call this the ‘monopsony’ market power case to highlight this interaction and to distinguish it from the pure ‘size monopsony’ effects of the earlier literature. Landlords clearly stand to gain by depressing the wage-rental ratio<sup>8</sup>. Hence in a distorted equilibrium production techniques on peasant farms must become relatively more labor-intensive and the shadow wage rental on landlord farms will exceed that on peasant farms  $\frac{G_L}{G_T} > \frac{w}{r} = \frac{F_L}{F_T}$ . The distorted equilibrium allocation must lie above the diagonal efficiency locus in an isoquant Edgeworth box. For landlords to be able to exercise market power requires only that peasant demand for land be downward sloping ( $F_{TT} < 0$ ) and that the exercise of monopsony power on the labor requires only that peasant labor supply have positive slope ( $F_{LL} < 0$ ). There will be interaction effects so long as land and labor are Edgeworth complements ( $F_{LT} > 0$ ). Since the ‘efficiency cost’ of being large

Note that it is possible that landlord estates might expand to such an extent as to begin to encroach on peasant lands and end up hiring in both labor *and* land from the peasant sector. This last ‘reverse-tenancy’ scenario is not as improbable as it might seem: if land is sufficiently concentrated in landlords’ hands, and if the efficiency costs of becoming larger than the efficient scale are not too large (i.e. if  $k$  is close to one and hence diseconomies of scale are not too pronounced), then landlords may want to withhold all their land from the market or even turn to buying or leasing-in any remaining land so as to squeeze out peasant tenancy entirely in an all-out effort to further depress wages.

The analysis can be extended to more general situations where landlords have higher non-traded skills ( $A > 1$ ) or where landlords produce a different crop using a more land- or labor-intensive production technology. The key question is always whether landlords choose to increase or decrease the wage-rental ratio relative to competitive allocation. Any departure from the efficient ratio (i.e. a point off the efficiency locus) entails efficiency losses but may allow landlords to capture land monopoly and/or labor monopsony rents. The case Feenstra (1980) and others in effect analyzed was that of a (exogenously) monopolized sector producing a relatively more land-intensive production technology but where the firm was *not* concerned about rentals from the ownership of factors. The monopoly firm, which by assumption was large, only hired factors and therefore exercised monopsony power by reducing the hiring of both land and labor. The firm cut back relatively more on its hiring of land to reduce the price of the factor that it uses relatively more intensively in production. Their models predict that monopoly firms should make their sector *smaller* and more labor-intensive than in the competitive setting. This pure ‘size monopsony’ equilibrium for a firm using a land-intensive technology is indicated in

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<sup>8</sup>Raising it would obviously be suboptimal, unless the landlord crop were in a technological sense much more land-intensive than the peasant crop. This is ruled out by assumption here, but I consider this consideration below.

Figure 2.

If however the owners of agricultural firms also own land a higher  $\theta$  leads landlords to become larger net suppliers of land relative to labor in a competitive equilibrium. If  $\theta$  is high enough landlords will prefer to depress the wage-rental ratio even if the land crop is land-intensive. Figure 2 indicates how distorted equilibria are matched to different initial levels of  $\theta$ .

Summarizing, we can state the following loosely worded proposition, discussed in more depth in the appendix:

**Proposition 5** *If landlords have a more land-intensive production technology, then if  $k$  is not too low, and for high enough  $\theta$ , we will have  $\Gamma > 1$  and therefore  $\frac{G_L}{G_T} > \frac{F_L}{F_T}$ .*

If  $k$  is low, production is subject to strong diseconomies of scale which favors small-peasant production. Landlords will have little ability to distort the economy away from the efficient allocation. As  $k$  gets closer to unity (and or  $A$  gets larger) landlords can distort production allocations at lower efficiency cost. If land concentration  $\theta$  is high enough and a large enough fraction of landlord income is derived from land rents, they will have incentive to try to lower the wage-rental ratio by restricting peasant access to land.

### 2.3.1 Equilibrium agrarian structures: a Cobb-Douglas example

It is interesting to illustrate the possibilities by considering a standard Cobb-Douglas production technology  $F(T, L) = G(T, L) = T^\alpha L^\beta$ , where  $\alpha + \beta < 1$  and  $A = 1$ . For the base case I assume an economy with  $\bar{L} = 100$ ,  $\bar{T} = 100$  and  $m = 0.01$ , so there is one landlord household ( $m\bar{L} = 1$ ) and  $n\bar{L} = 99$  peasants. Production efficiency would require 100 farms of equal operational size each employing  $\bar{t}$  units of land and one unit of labor. All peasant households operate farms, regardless of the initial distribution of land.

Figures 2 to 4 show equilibrium inputs, outputs and incomes at different initial levels of land inequality  $\theta$ . I have set  $\alpha = 0.49$  and  $\beta = 0.49$ . This choice makes the production homogenous of degree  $k = 0.98$ , which is relatively close to constant returns to scale. This last assumption implies that the opportunity cost of expanding wage labor production onto larger than first-best efficient scale farms will be positive but not too large. Smaller values of  $k$  would raise the opportunity cost of operating larger scale wage-labor farms as smaller subtenancies or family-operated farms become relatively more efficient. Much lower degrees of production homogeneity  $k$  can also sustain the rather strong market power distortions illustrated below if landlords are allowed to have better technology or more skills than peasant farmers (i.e. if  $A$  is large enough).

Figure 2 shows equilibrium net factor supplies at different initial levels of land inequality  $\theta$ . Under the efficient competitive equilibrium benchmark net total supply

of land from the landlords sector  $(\theta\bar{t} - m\bar{t})\bar{L}$  rises linearly with  $\theta$ .<sup>9</sup> Net peasant labor supply would remain zero at every level of  $\theta$  since each household's labor demand exactly equals its own labor endowment. At relatively low levels of land inequality 'monopsony' equilibrium factor supplies closely match the efficient competitive allocations since the landlord sector does not yet have enough land to exercise much market power. At higher levels of inequality however landlords are able to exercise increasing amounts of market power by withholding larger and larger amounts of land from the market. As landlord farms become larger, monopoly power over land translates into monopsony power over labor since higher equilibrium land rents pushes peasant households to demand and employ less land, shifting out peasant net labor supply to the market. Peasant labor supply to the landlord sector  $n(\bar{L} - L_p)$  is seen to be increasing with  $\theta$ .

A very interesting shift of regimes occurs around the vicinity of  $\theta \approx 0.7$  on the graph. As  $\theta$  was increased up to that point, landlords had become ever more aggressive at exercising market power and withholding land. At around  $\theta \approx 0.7$ , landlords' supply of land actually falls to zero, and at yet higher levels of  $\theta$  landlords actually encroach on peasant farms by *leasing in* land. What is happening is that at relatively lower levels of land inequality landlords earn the bulk of their rents from land and not much from the monopsony rents because they are not yet hiring many workers. But at sufficiently high levels of inequality the landlord estate becomes sufficiently large that monopsony rents come to dominate the landlords' strategy. At about  $\theta \approx 0.7$  landlords earn all rents from labor monopsony, and at higher  $\theta$  landlords are actually prepared to pay costly land rents to buy or lease up peasant lands so as to push more cheap labor onto the landlord estates. In sharp contrast to a partial equilibrium setting where labor monopsony rents are created by withholding labor demand relative to the efficient optimum, here landlords *increase* their demand for labor by sharply limiting peasant's access to land on the lease market.

Figures 3 and 4 show how output and land-labor ratios change with  $\theta$  on landlord and peasant farms. Despite the fact that landlords enjoy no special skills or technological advantage over peasant farmers ( $A = 1$ ) and would in a competitive equilibrium produce only fraction  $m$  of economywide output, landlords come to almost completely dominate production in the distorted equilibrium at high enough levels of  $\theta$ . Peasant output contracts commensurately as  $\theta$  is increased while economy wide output falls relative to the efficient optimum.

These results speak directly to the 'Agrarian Question' regarding the nature of the transition to agrarian capitalism. Low  $\theta$  economies will follow the 'American Road' model where largely efficient family farms and free tenancies dominate production, while at higher  $\theta$  the economy follows an inefficient 'Junker Road' with inefficiently large landlord estates or *Latifundia* dominating production whilst being surrounded by a fringe of poor peasant farms or *minifundia* scratching out a living producing on

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<sup>9</sup>The figure indicates this as peasant sector net supply (=landlord sector net demand) falling linearly with  $\theta$ .

inefficiently small farms and tenancies and by selling labor to the landlords. Although the high  $\theta$  economy generates a Junker road, the model also suggests a reason why Lenin and Kautsky could have been led to the erroneous conclusion that the ‘peasant’ populations had to become increasingly ‘proletarianized’ because of some inherent technological advantage of ‘capitalist’ farming. Here peasant farmers do become ‘proletarianized’ but not because of any lack of skills or technology.<sup>10</sup>

As  $\theta$  rises landlords withhold ever greater amounts of land from the market, leading the land to labor ratio to fall on peasant farms and at first rise on landlord farms. Land-labor ratios cannot continue to rise with  $\theta$  on landlord farms however since in the limit a landlord estate the size of the entire economy must by definition employ the economywide land-labor ratio  $\bar{l}$ . So somewhere before  $\theta \approx 7$ , we start to see the land-to labor ratio on landlord farms tapering off and after that falling back. Even though landlords are still aggressively hoarding land, and eventually possibly hiring in peasant land, labor hiring on landlord farms starts to expand at faster rate at higher  $\theta$  as peasant farms find themselves with less and less land.

How pronounced market power distortions will be depends in general not only on land concentration but also on the nature of the production technology and parameters describing the relative profitability of landlord versus peasant crops.

## 2.4 Labor-service obligations and the rise of serfdom

As mentioned, Domar did not distinguish clearly between slavery and serfdom. Nor was he alone in this regard. Commenting on a long tradition of scholarship before him, historian Jerome Blum notes that the term “serf” had been used at various times and in different contexts to describe people ranging from “whose condition could scarcely be distinguished from that of chattel slaves to men who were nearly free (Blum 1957: 808).” After considering several alternative definitions and synthesizing controversies over the matter, Blum proposes recognizing a peasant “as unfree if he was bound to the will of his lord by ties that were degrading and socially incapacitating and that (as Struve puts it) were institutional rather than contractual.” This definition puts the emphasis on the landlords’ ability to place demands upon the peasant’s time beyond that already expected that the peasant would dedicate to his own tenancy and which seemed designed, at least in part, to limit the peasant’s outside opportunities.

The most obvious example of this type of imposition was the widespread use of

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<sup>10</sup>Both thinkers recognized the possibility of an ‘American’ or ‘farmer’ road, but even for this case they predicted a process of internal differentiation within the peasant sector leading to an inevitable polarization between proletarianized peasants and a rising rural bourgeoisie (de Janvry 1980: 98-99). The ‘American’ road of the model predicted here instead features the emergence and persistence of successful family farms without any process of proletarianization.

Lenin’s ‘interpretation’ would have tragically huge consequences as the Communists’ pessimism regarding the productive potential of the peasant sector would later be used to justify the forced collectivization of Soviet agriculture under Stalin.

labor-service requirements which obligated peasants to provide labor services to the landlord in exchange access to tenancy, and in addition to land rents or tribute. The distinction between free and unfree peasants was very often in fact a distinction of degree rather than of kind, since whether or not serfs had juridically restricted mobility the extent to which a peasant was ‘free’ depended in part on how arbitrarily landlords could impose demands on their labor time and how incapacitating those demands became. Hence after the 14th century the peasants of Western Europe were considered more ‘free’ than the peasants of Eastern Europe, not mainly because they faced fewer restrictions on their mobility (sometimes they did not), but also because Western Europe saw the emergence of stronger absolutist states that (in exchange for the ability to tax) intervened often to regulate and constrain the ability of local lords to impose crippling labor service obligations or to restrict peasant access to land.

In the previous section we saw how distortions create by a non price discriminating ‘monopolist’ raised landlords’ incomes by reducing economic efficiency. If the landlord cartel could act as a price-discriminating monopolist, it would want to maximize total output via efficient subtenancies but then find ways to extract all the gains to trade via take-it-or-leave-it contracts offered to each individual peasant household. The optimal way to do this, it turns out, is by using labor-service tenancy arrangements.

Formally the price-discriminating landlord cartel’s contract design problem can be seen as choosing land and labor input and a lump-sum transfer payment for each peasant household to maximize income from production on the landlord farm plus the value of total lump-sum rental/wage payments, subject only to the constraint that each peasant household earn at least as much as their autarky reservation payoff. Optimal contracts will be tailored to each peasant household’s level of asset ownership since the landless can be pressed down against a lower reservation utility than those with land. Contracts to each of the  $n_0\bar{L}$  landless peasants households will specify land and labor use  $T_{p0}^d, L_{p0}^d$  and a fixed payment  $R_0$ . Contracts to each of the  $n_1\bar{L}$  peasant households with land will be summarized by the contract  $T_{p1}^d, L_{p1}^d, R_1$ . The cartel now chooses the terms of these contracts to maximize

$$\begin{aligned} V_r^d(\bar{t}, \theta) = \max \quad & G(T_r^d, L_r^d) + n_0 R_0/m + n_1 R_1/m \\ \text{s.t.} \quad & F(T_{p1}^d, L_{p1}^d) - R_1 \geq F((1-\theta)\bar{t}/n_1, 1) \\ & F(T_{p0}^d, L_{p0}^d) - R_0 \geq F(0, 1) \end{aligned} \quad (11)$$

where  $mT_r^d = \bar{t} - n_0T_{p0}^d - n_1T_{p1}^d$  and  $mL_r^d = 1 - n_0L_{p0}^d - n_1L_{p1}^d$ .

The peasant participation constraints obviously must bind, as otherwise landlords could increase their earnings by raising  $R_0$  or  $R_1$ . These binding constraints yield expressions for  $R_1$  and  $R_0$ . Substituting these into the objective function, and differentiating with respect to the  $T^d$  and  $L^d$  leads to first-order conditions that, not surprisingly, are exactly the first-order conditions for the efficient competitive case analyzed earlier. Production will be organized efficiently, except that payoffs now

sharply favor the landlord:

$$V_{p1}^d(\theta) = F((1 - \theta)\bar{t}/n_1, 1) \quad (12)$$

$$V_{p0}^d(\theta) = F(0, 1) \quad (13)$$

$$V_r^d(\theta) = G(\bar{t}, 1) + nF(\bar{t}, 1)/m - n [\lambda V_{p0}^d(\theta) + (1 - \lambda)V_{p1}^d(\theta)] / m \quad (14)$$

Each landlord receives the value of production on his own farm plus his share of rental income from subtenancies. Rental income is set at the value of peasant production less tenants' autarky reservation payoffs or to  $R_1 = F(\bar{t}, 1) - F((1 - \theta)\bar{t}/n_1, 1)$  for each of the  $n_1\bar{L}$  tenants with land and to  $R_0 = F(\bar{t}, 1) - F(0, 1)$  for landless tenants.

Optimal price discrimination contracts will in general be characterized by non-linear tariff pricing and tied labor-service obligations, features that resemble the defining characteristics of labor-service tenancy arrangements and the contractual relationships under serfdom. The rental payment rate must be tied to the peasant household's factor endowment in a non-linear way because landless peasants can be charged higher rentals per unit land because they have less attractive fall-back options. Contracts *must* also involve control over labor in the form of labor-service obligations tied to tenancy. To see this more clearly assume that the landlord starts with a better technology or skills (i.e.  $A > 1$ ) so that an efficient allocation would require some peasant labor on the landlords' desmene. Then if the tenancy contract did not specify and enforce a labor obligation and just a rent, tenants would obviously not work on the landlords' desmene unless he was willing to pay them a wage proportional to the marginal product of their time on peasant farms cum tenancies.<sup>11</sup>

Lenin's descriptions of labor service tenancy in 19th century Russia provide evidence to support the interpretations presented here. For example, he seemed to recognize landlords' efforts to price-discriminate by tailoring contracts to peasants' outside opportunities when he noted that "rent in kind is developed to the greatest degree among the poorest groups of peasants ... well-to-do peasants do what they can to pay rent in money...to escape bonded hire (Lenin, 1956; Chapter 3, paragraph 3)." He also pointed to the effect on wages when he noted that "[t]he data from various sources are at one in testifying to the fact that the payment of labour where it is hired on a labour-service and bonded basis is always lower than under capitalist "free" hire."

Depending on the historical time period and setting, landlords might not be able to always tailor the terms of their contracts to peasant household's outside opportunities exactly because of legal impediments, peasant resistance, or because asymmetric information makes it difficult to condition contracts upon peasant's outside opportunities and actions. Intermediate agrarian structures, somewhere in between the

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<sup>11</sup>Sadoulet (1992) analyzes labor-service contracts within a principal-agent model. When peasants face limited liability, landlords restrict the size of tenancy plots for reasons similar to why a lender limits loan sizes and labor service obligation is a way to monitor/control peasant moral hazard.

monopsoly and the pure price discrimination scenario described here seem likely to have emerged.

Naturally these difficulties created a demand for outside enforcement mechanisms. As already mentioned, the rise of serfdom in Russia took place through the slow conversion of ‘free’ bonded labor relations into perpetual labor service obligations over time. Kliuchevsky writes that where formerly “a peasant contracting for a plot of land and a loan wrote in his promissory note that if he left without fulfilling his obligations, the landowner was to take his possessions as payment,” by the early seventeenth century additional clauses were being added to contracts, for example one that stated that “the landowner, his master, ‘was free to take him back from wherever he may be,’ and ‘in the future I, So-and-So, am to live as a peasant on the same plot and pay taxes or live as a peasant under my my master for the rest of my life and not run away anywhere.’ (Kliuchevsky 1968:184).”

More speculatively, it is not implausible to interpret Perry Anderson’s account of the earlier decline of serfdom and the rise of Absolutist states in Western Europe in terms of the model. Perhaps an unregulated landlord economy would have faced difficulties organizing production efficiently on either side of the Elbe because in the absence of a state to help enforce contracts one would expect to find the sort of inefficient equilibria associated with non-price discriminating ‘monopsoly’ equilibria, and its associated large landlord desmenes. In Western Europe, Absolutist States may have emerged as a sort of ‘encompassing monopolist’ to solve the inefficiency by compelling local lords to organize production more efficiently. States intervened on behalf of peasants, providing them with greater mobility and guaranteed access to land and justice in part because the States was able to efficiently collect part of the surplus by imposing virtually inescapable tribute obligations directly upon peasants. In Eastern Europe and Russia, where monarchs and states were usually much weaker to control the power of local lords or impose direct taxes on peasants, the inefficiency was overcome instead by local lords who enlisted the state to help them limit peasant mobility and enforce labor service obligations.

The type of land-labor market power interactions I have highlighted here would seem to provide a more compelling explanation for the genesis of serfdom, bonded labor contracts and other constraints on labor mobility and land access, than explanations such as that given by North and Thomas (1973) who in *The Rise of the Western World*, argued that labor-service obligations on the European manor arose primarily where “there was no organized market for goods and services (p.20).”<sup>12</sup>

Some authors, including for example Srinivasan (1989) and Genicot (2003) inter-

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<sup>12</sup>North and Thomas are aware of factors that seem to indicate the role of market power when they note that 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. (1973: 24).”

pret bonded labor contracts as credit contracts, with landlords advancing workers sizeable loans in exchange for a bondage pledge by workers. As mentioned above, Kliuchevsky describes that most of the voluntary labor bondage contracts that pre-date serfdom in Russia were set up precisely in these terms, with peasants signing promissory notes. The model of this section is consistent with this interpretation, but also shows how transactions in the land market will be bundled into the contract. Here peasants obtain access to landlords's land in exchange for the promise to repay with labor service and/or a fixed transfer payment. I modeled a situation where the landlord obtains the entire surplus, but in a different economy where peasants have more bargaining power, the same real allocations could be made consistent with a different division of the surplus which would obviously affect the terms of the 'loan advance' and repayment.

An interesting implication of the above analysis is that even though each individual contract is voluntary, and the perfect price discrimination equilibrium is Pareto efficient, efforts to legislate against labor service or other forms of labor bonding – for instance by legislating that laborers must be paid a uniform hourly agricultural wage – might reduce area under tenancy and total agricultural output (by returning the economy to the distorted monopsony equilibrium) *yet* still raise equilibrium peasant wages and welfare. Some evidence lends credence to this possibility. For example, de Janvry (1981) attributes most of the sharp mid 20th-century decline in Chile's labor-service tenants, or *inquilinos* to the passage of new laws requiring the payment of uniform minimum agricultural cash wages.

## 2.5 The effect of changes in Technology and Prices

Historical accounts of peasants being supposedly immiserized or disposed by the introduction of new export crop technologies or a commodity export boom abound in the economic history texts, as well as claims that landlords have sought to block peasant access to land, new technologies or skill accumulation (Binswanger et al., 1995; Bhaduri, 1973). This point of view may even have had an influence in shaping Arthur Lewis' view that manufacturing represented the 'dynamic sector' while agriculture remained backward:

”[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.” (Arthur W. Lewis, *Economic Development with Unlimited Supplies of Labour*, 1954: 149)

To many contemporary economists these accounts appear puzzling, if not logically incoherent. Why would a rational landlord object to peasants acquiring new skills or technologies when this would only seem to increase the productivity of land cultivated by peasants, and therefore the land rents that landlords stand to capture via tenancy

leases? Why would peasant labor be immiserized by a commodity export boom when a very likely consequence would seem to be an increased demand for labor which would almost surely translate into higher, not lower, equilibrium wages and incomes?

Many of these seemingly puzzling historical accounts can make sense however if one allows for ‘monopsony’ power effects within this otherwise canonical general equilibrium trade model. Immiserizing growth results are always and everywhere an application of the theory of the second best: where equilibrium allocations are already distorted by market power effects, improving the relative quality of technology or non-traded skills on the landlord farm, or increasing the relative price of a landlord crop, can help to deepen equilibrium allocation distortions. Conversely, improving peasant technology or prices can raise total incomes and peasant sector output but lower landlord returns if it simultaneously undermines or weakens landlords’ ability to exercise market power.

**Proposition 6** *Assume landlord and peasant farms produce the same crop and have access to the same general production technology,  $G = AF$ , with initial  $A \geq 1$ . An increase in relative total factor-productivity on landlord farms from  $A$  to  $A' > A$  lowers real wages, raises real land rents, and may be immiserizing.*

To see this, consider the competitive market scenario benchmark. A rise in the profitability of landlord production would lead landlord farms to operate on a new larger efficient scale.<sup>13</sup> Since the efficiency locus is a straight diagonal line with slope  $\bar{t}$ , land-labor ratios are unchanged and equilibrium wage and rental rates both rise to reflect greater demand for both factors on landlord farms. The welfare impact on the peasant sector is ambiguous, and depends on their ownership of land, as they gain from higher wages but now pay higher land rents for leases.

Now consider the monopsony case. Raising  $A$  to  $A'$  raises landlord output and his demand for both factors. By Proposition 1 we know that in a distorted equilibrium the land-to-labor ratio on landlord farms exceeds that of peasant farms. If this initial set of distorted factor prices were to remain unchanged as landlord farms expand, for each unit of land reallocated from the peasant sector to the landlord sector, the peasant sector would release more labor than the landlord sector needs to absorb. This must create an incipient excess demand for land and an excess supply of labor that can only be eliminated by a fall in wages and a rise in land rents.

The main constraint on the exercise of market power in this model are farm-level diseconomies of scale due to the role of non-traded assets which impose costs on landlords who try to operate on too large of a scale. An increase in landlords’  $A$  lowers the opportunity cost of being large and by increasing labor demand increases the scope for earning monopsony rents over wage labor. This is illustrated in figure 5. The lower and upper solid lines reproduce, respectively the net supply of land

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<sup>13</sup>As noted earlier, landlord land and labor use will be  $A'^{\frac{1}{1-\kappa}}$  times greater than on peasant farms.

from the landlord to the peasant sector and the total net peasant labor supply to the landlord's estate from the earlier monopsony analysis. The dashed lines in the figure show how each of these net factor supply curves change as a consequence of an increase in the landlord's TFP from  $A = 1$  to  $A' = 1.033$ .

Given that this represents a relatively small change in the productivity of a single farm one might expect only a small effect on real allocations. Figure 5 shows indeed that landlord net land supply changes only slightly under competitive markets, as indicated by the small vertical rise in the lower diagonal line. With monopsony power effects however, the result is a very sharp decrease in the net supply of landlord land to peasant farms, an increase in equilibrium supply of peasant labor to landlord estates, and (not shown) a *fall* in equilibrium wages.

This discussion suggests why the emergence of strong market power effects does not just hinge on the earlier assumption of approximately constant returns to scale in  $F(T, L)$ . Anything that helps raise the *relative* productivity of landlord farms, including a rise in relative total factor productivity or landlord skills, an increase in the relative price of landlord crops, or agricultural subsidies or policies biased against small farms will facilitate the exercise of market power and multiply its economic impact.

It is surprisingly easy to find historical evidence of episodes where an increase in the relative profitability of landlord crops seems to have been followed by a period where the size of peasant tenancies was reduced at the same time as landlords were imposing an increase in labor service obligations.

Blum (1957: 828-830), commenting on Russia and Eastern Europe in the century before the re-imposition of legal serfdom notes that soon after

“[a]gricultural prices rose sharply ... in the second quarter of the sixteenth century,” landlords responded by increasing demesne production “[i]n the East German lands, where labor services, when required, had originally been three to four and, rarely, six days a year ... by the end of the century in Mecklenbuq three days a week had become standard. In the early seventeenth century in Brandenburg and Pomerania-Stettin it was ordered that peasants were to be liable to unlimited labor service. ... [I]n Eastern Germany, Livonia, Poland, Silesia, Bohemia, and Hungary...[i]ncreased labor dues and immobilization of the peasant labor force were inevitable corollaries of expanded demesne farming...Moreover, as the decades went by ... with the increase in demesne and in peasant population the holdings kept getting smaller.”

An even more compelling case can be made by looking at historical transformations in South American agriculture. 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 *inquilinaje* labor service tenancy, during the second half of the nineteenth century. His analysis helped to put to rest the common myth

of inefficient landlords more preoccupied with status than profit, by demonstrating that estate production in responded very flexibly to the new opportunities created by new wheat export markets and falling transport costs.

During the period between 1850 and 1870.the area under wheat cultivation more than tripled and labor demand boomed. In neighboring Argentina where landownership was considerably less concentrated and labor more scarce, as conventional theory might have predicted a similar agricultural boom led to rising wages, increased mechanization and more open immigration policies. Yet, according to Bauer, in Chile the outcome was considerably different as “the information that is available suggests that real wages stayed constant and may have decreased slightly (p.1079)” over the same thirty year period. Rather than raise wages, landlords satisfied their demand for labor by “tightening of the screws on the service tenants (p. 1074)” and by radically restructuring their estates to bring in more labor service tenants<sup>14</sup> while reducing average tenants’ plot sizes while increasing labor service obligations. According to Bauer labor service obligations doubled or tripled in some regions tenants’.

Bauer’s account of this period would certainly appear puzzling to standard economic theory, yet the observed pattern is readily reconciled to the model in this paper. As argued previously, 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, to a reduction in the area under tenancy even if peasants could grow the same crop more efficiently, and may lead to declining or stagnant equilibrium wages.

## 2.6 Slavery when landlords have market power

Now that we have seen that a richer set of contractual alternatives may be available to landlords as an alternative to competitive free labor and free tenancy markets, let’s return to Domar’s question regarding when a landlord class might choose to enslave (or liberate) its peasants.

We now allow for the possibility of slavery alongside other contract forms in a ‘monopoly’ distorted economy. Landlords who act collectively to enslave a fraction  $\sigma$  of the landless would then be placed in an economy where they would choose to operate farms using a combination of slave and non-slave labor to maximize

$$V_r^s(\bar{t}, \theta) = \max_{T_r^s, L_r^s} G(T_r^s, L_r^s) - F_T(T_p^s, L_p^s)T_r^s - F_L(T_p^s, L_p^s)L_r^s + F_L(T_p^s, L_p^s)(1 + \sigma n_o/m) - \underline{w}\sigma n_o/m + F_T(T_p^s, L_p^s)\theta\bar{t}/m \quad (15)$$

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<sup>14</sup>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. Note that these figures count only inquilino heads of households.

where  $T_p^s$  and  $L_p^s$  are defined as in (1) and (2). The possibilities now become considerably more interesting and complex, and for this reason predictions are also now somewhat less clear cut. Here I will only briefly summarize some of the tradeoffs faced.

Note that enslavement now not only offers a direct source of cheap wage labor, it also eliminates peasant farm competitors. This is bad for landlords in so far as it reduces land rents to be earned from this group, but it might be good for landlords in so far as it also eliminates a potential source of competing labor demand, thereby further lowering the wages of free laborers as well.

If the fraction of the population that is enslaved is high and slaveownership is concentrated then we have the interesting possibility that landlords could have potential market selling power on both the market for land and for slaves. These two forms of market power may work at cross-purposes because a landowner who owns no slaves will withhold a lot of land in an effort to depress the market wage rate and earn monopsony rents in the hiring of free labor. But a landlord who is also a large slaveowner wouldn't want to depress the market wage rate as much because this is also the wage at which he leases out his slaves. Hence, paradoxically perhaps, economies where landowners concentrate both land and slaves are less likely to distort the market for free labor compared to landlords who control just the land market.

This last possibility is illustrated in figure 6. The model is parameterized as in the earlier simulations. Fifty percent of peasants are landless and enslavement makes 50 percent of these households slaves. In other words, the slave economy will have 25 slave households and 50 free laborer households (50 with land, 25 landless). At midrange levels of  $\theta$  total output in the slave economy with monopsony power is actually higher than in the monopsony equilibria in the absence of slavery. The reason is that, for these parameters, slavery has turned the landlords into slave traders, selling or leasing out slave labor to the other independent farms. Obviously the landless peasants who have been enslaved have been expropriated and deprived of their freedom, but independent farmers with land gain from the fall in rents and wages. Landless labor households who remain free experience a fall in wage income, but at lower  $\theta$  at least, may gain increased access to land. Hence landlord estates are less large, and independent farms which now hire some slave labor operate at a more efficient scale, at least as compared to the monopsony equilibria without slavery. At very high  $\theta$  however the landlords return to their old ways, and the efficiency gains are lost as we see the emergence of Latifundia, now with slaves.

## 2.7 Property Rights conflicts

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

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

and secure. Throughout history property rights are however frequently contested, and landlords and peasants both have incentives to invest in private and collective efforts to reshape property rights in their favor. Landlords have at times employed violence and/or legal manipulation to encroach upon peasant lands including commons via land grabs and evictions. Peasants also at times contest landlords' property rights by mobilizing in support of land or tenancy reform or by squatting. Frontier land policies have also at times varied markedly across regions. In marked contrast to the United States where frontier lands were distributed massively and in a highly egalitarian fashion to hundreds of thousands of settlers or squatters, landlords wielded more power in Latin America and often shaped the evolution of land policies sharply in their favor, denying rural lower classes access to the vast available areas of frontier lands (de Soto, 2000). Similar policies to expropriate or otherwise severely limit independent peasant farming and access to land have been carried out via legal or extra-legal mechanisms throughout history (Binswanger et al., 1995) and have often been closely linked to efforts to also limit labor mobility for an underprivileged class. Examples include the imposition of legal limitations on black farmers access to land and Apartheid laws to limit mobility in Southern Africa (Lundahl, 1992), limits on ownership of land in other areas of Western Africa (Cooper, 1980), 'Black-Codes' and other discriminatory policies that limited access to land and forest resources to freed-slaves in the post-bellum United States South (Ransom and Sutch, 2001).

This paper will not attempt to explicitly model property rights conflicts, but the model already suggests when property rights conflicts are most likely. To see note that a redistribution of property rights is equivalent to a change in  $\theta$ . Under competitive markets no agent is 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  $F_T(\bar{t}, 1)$  independently of the value of  $\theta$ . However, when landlords can exercise market power the private marginal return to land is increasing in  $\theta$  for both landlords and peasants. To see this differentiate expressions (3) and (11) to obtain:

$$\frac{\partial V_r^d}{\partial \theta} = \frac{\bar{t}}{m} F_T \left( \frac{(1-\theta)\bar{t}}{n}, 1 \right) > \frac{\partial V_r^c}{\partial \theta} = \frac{\bar{t}}{m} F_T(\bar{t}, 1) > 0$$

These expressions state that the marginal impact of an increase in  $\theta$  on landlord income is always higher when the landlord has full market power compared to a competitive allocation. Furthermore, this difference is increasing in  $\theta$  since

$$\frac{\partial V_r^{2d}}{\partial \theta^2} = -\frac{\bar{t}}{nm} F_{TT} \left( \frac{(1-\theta)\bar{t}}{n}, 1 \right) > 0 = \frac{\partial V_r^{2c}}{\partial \theta^2}$$

The *marginal* incentive to challenge property rights rises with the initial level of land inequality in the market power case. This suggests that latent or actual property rights conflicts are more likely to arise in economies where higher initial inequality allows landlords to exercise market power.

## 2.8 Related Literature

While the institution of slavery, particularly in the US South, has been discussed and analyzed at length empirically since the seminal work of Conrad and Meyer (1958), there have been very few theoretical analyses that explicitly attempt to explain slavery or serfdom in a general equilibrium context, and much less its rise or demise.<sup>15</sup> Beginning in the 1970s a large literature developed on tenancy and interlinked transactions explained by the theory of incentives and asymmetric information (Bardhan, 1989). Within this tradition, Srinivasan (1989) and Genicot (2002) for example model bonded labor as a solution to a credit market imperfection.

This literature has provided essential new insights, but the analysis has tended to be partial-equilibrium in nature, a shortcoming that often drives results (contract terms in one market are shaped by the assumed absence of other markets and would often disappear if that market were opened). It also is hard to believe that asymmetric information problems could explain such large and persistent differences in agrarian trajectories over such very long periods of time. It seems unlikely that we could explain serfdom or the persistence of the Latifundia-minifundia complex over hundreds of years across entire continents mainly because of credit market imperfections or information asymmetries. Surely a few hundred years would be enough for tenant or family farmers dynasties to save enough to get around a credit constraint?

## 3 Conclusion

Although coerced labor arrangements have been widely used to organize production for the better part of human history and in virtually all known societies, economists have to date devoted remarkably little theoretical attention to building analytic frameworks that might explain the rise or fall of slavery, serfdom or other mechanisms.

The classic political economists from Smith to Marx to Marshall wrote at length on how the character of agrarian organization in a given society shaped the nature of subsequent political and economic transformations, and the topic has spawned important debates ever since. Writing in 1969, Sir John Hicks paused to footnote his discussion of rise of serfdom in East Europe and its contrast to free labor in the West by noting that it was “no coincidence that the frontier which so long separated these agricultural systems has so striking a resemblance to the [Iron] Curtain which is dividing Europe at the present day.”

More recently, and in somewhat less sweeping terms, economic writers such as Engerman and Sokoloff (2000) have helped to refocus historical and empirical interest

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<sup>15</sup>There is a literature on the incentives for motivating slave effort in partial equilibrium settings (e.g. Chwe, 1990, Findlay, 1975). Bergstrom (1971) analyses slavery, or ownership of labor, in a competitive Arrow-Debreu general equilibrium model, but has little to say about its emergence or profitability in non-competitive settings. An interesting recent paper by Lagerlof (2004) explains the rise and fall of slavery, but in a model without a market for land or tenancies.

on the hypothesis that initial land inequality can have profoundly negative impacts on the evolution of political and economic institutions and the quality and rate of future economic growth in Latin America and other regions.

Several other stylized features of what has at times been dubbed the ‘backward’ agrarian economy 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.

As Domar hypothesized, the model predicts that slavery as an institution is more likely to emerge and be maintained in economies with high land to labor ratios, and where high-value staple crops can be grown. But the model also predicts that, all else equal, slavery is more likely to give way to tenancy (be it serfdom or free tenancy) in economies where landownership is concentrated. This is an hypothesis that could be tested empirically. Certainly at first impression, the concentration of landownership amongst landlords appears to have been lower in the US South and the Carribean islands than in many parts of Latin America where Indian slavery was abolished very early in the days of the colony.

The conditions that most likely led to the emergence and persistence of inefficient production organization consistent with serfdom or labor-service tenancy 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 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 monopoly 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.

## 4 Appendices

### 4.1 Landlords as multi-market oligopolists

The main text assumed a perfect landlord cartel, but the model can be generalized to strategic non-cooperative 'oligopoly.' To fix ideas, consider the case of non-cooperative competition in Cournot style amongst the  $m\bar{L}$  landlords (assumed an integer number). This can be modeled adaptatng the multi-market oligopoly framework of Bulow, Geanakoplos and Klemperer (1985).

In a symmetric Nash equilibrium in pure strategies, landlord  $i$  decides on his best 'strategy' of land and labor use  $(T_r^i, L_r^i)$ , taking the symmetric choices (or conjectures about) every other landlord  $(T_r, L_r)$  as given to maximize.

$$\max \quad AG(T_r^i, L_r^i) - F_T(T_p, L_p)(T_r^i - \theta\bar{t}/m) - F_L(T_p, L_p)(L_r^i - \sigma n_0/m) \quad (16)$$

where from the factor market balance equations we must have

$$T_p = \frac{[\bar{T} - (m\bar{L} - 1)T_r - T_r^i]}{(n - \sigma n_0)\bar{L}}$$

$$L_p = \frac{[\bar{L} - (m\bar{L} - 1)L_r - L_r^i]}{(n - \sigma n_0)\bar{L}}$$

Differentiation of (16) with respect to  $T_r^i, L_r^i$  yields a set of first-order conditions for

each landlord that are analogous to (8)-(9)

$$AG_T = F_T \left[ 1 - \frac{1}{(n - \sigma n_o)m\bar{L}} \frac{F_{TT}}{F_T} (mT_r - \theta\bar{t}) - \frac{1}{(n - \sigma n_o)m\bar{L}} \frac{F_{LT}}{F_T} (mL_r - 1) \right]$$

$$AG_L = F_L \left[ 1 - \frac{1}{(n - \sigma n_o)m\bar{L}} \frac{F_{TL}}{F_L} (mT_r - \theta\bar{t}) - \frac{1}{(n - \sigma n_o)m\bar{L}} \frac{F_{LL}}{F_L} (mL_r - 1) \right]$$

When  $m\bar{L} = 1$  the conditions collapse to the previously derived conditions (8)-(9) for a single monopoly cartel. When there are two or more oligopolists, each oligopolist now faces a more elastic set of peasant (net) factor demands and hence produces less of an impact on wages or rentals from restricting land supply or labor demand. As the number of landlords  $m\bar{L}$  rises, the two last terms on the right-hand side of each equation vanish and the first-order conditions approaches those of the efficient competitive solution. It is evident that the perfect monopoly and perfect competition equilibria bracket the possible outcomes of the oligopoly case.<sup>16</sup>

## 4.2 Proposition Proofs

The following Claim will be useful in the proof of Proposition 4:

**Claim 7**  $\frac{T_p}{L_p} = \frac{F_{TL}F_L - F_{LL}F_T}{F_{LT}F_T - F_{TT}F_L}$ .

**Proof.** As  $F_T(T, L)$  is homogenous of degree  $k - 1$ , by Euler's Theorem,

$$(k - 1)F_T = F_{TT}T_p + F_{TL}L_p$$

$$(k - 1)F_L = F_{LT}T_p + F_{LL}L_p$$

Multiplying the first expression by  $F_T$  and the second by  $F_L$  gives:

$$(k - 1)F_T F_L = F_{TT}F_L T_p + F_{TL}F_L L_p$$

$$(k - 1)F_L F_T = F_{LT}F_T T_p + F_{LL}F_T L_p$$

and since the two left hand sides are the same,

$$F_{TT}F_L \frac{T_p}{L_p} + F_{TL}F_L = F_{LT}F_T \frac{T_p}{L_p} + F_{LL}F_T$$

which upon rearranging delivers the desired result. ■

### 4.2.1 Proof of Proposition 1:

**Proof.** We need to show that  $\Gamma > 1$  as if  $\theta > m$ . Now  $\Gamma > 1$  as

$$\frac{F_{TT}}{F_T}(T_r - \frac{\theta}{m}\bar{t}) + \frac{F_{LT}}{F_T}(L_r - 1) < \frac{F_{TL}}{F_L}(T_r - \frac{\theta}{m}\bar{t}) + \frac{F_{LL}}{F_L}(L_r - 1)$$

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<sup>16</sup>In future work I hope to model transaction costs or threshold barriers to labor movement which would bring non-cooperative 'oligopoly' equilibria closer to the cartel equilibria described in this paper. The size of these barriers or transaction costs might be subject to political control. When barriers are high we would expect equilibria resembling serfdom or bonded labor.

Collecting terms and rearranging yields

$$\begin{aligned} \frac{\left(\frac{\theta}{m}\bar{t} - T_r\right)}{(1 - L_r)} &< \frac{F_{LL}F_T - F_{LT}F_L}{F_{TT}F_L - F_{TL}F_T} \\ \frac{(\theta\bar{t} - mT_r)}{(m - mL_r)} &< \frac{F_{LT}F_L - F_{LL}F_T}{F_{TL}F_T - F_{TT}F_L} = \frac{T_p}{L_p} \end{aligned} \quad (17)$$

where the last equality follows from the previous claim. Note that in Feenstra (1980) firms own no factors, in which case  $\theta = 0$  and landlords own no labor, so the above becomes simply  $\frac{T_r}{L_r} = \frac{T_p}{L_p} = \bar{t}$  and hence  $\Gamma = 1$ . Landlords would exercise monopsony power by operating proportionately smaller than efficient farms (i.e.  $T_r < T_p$  and  $L_r < L_p$ ) since this lowers both  $F_L$  and  $F_T$ . Here, the inequality is satisfied as long as landlord farms lease in labor and lease out land which will occur if  $\theta > m$  and  $A \geq 1$ . [to be further completed] ■

1.0

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**Isoquant Edgeworth Box (landlord technology more land-intensive)**

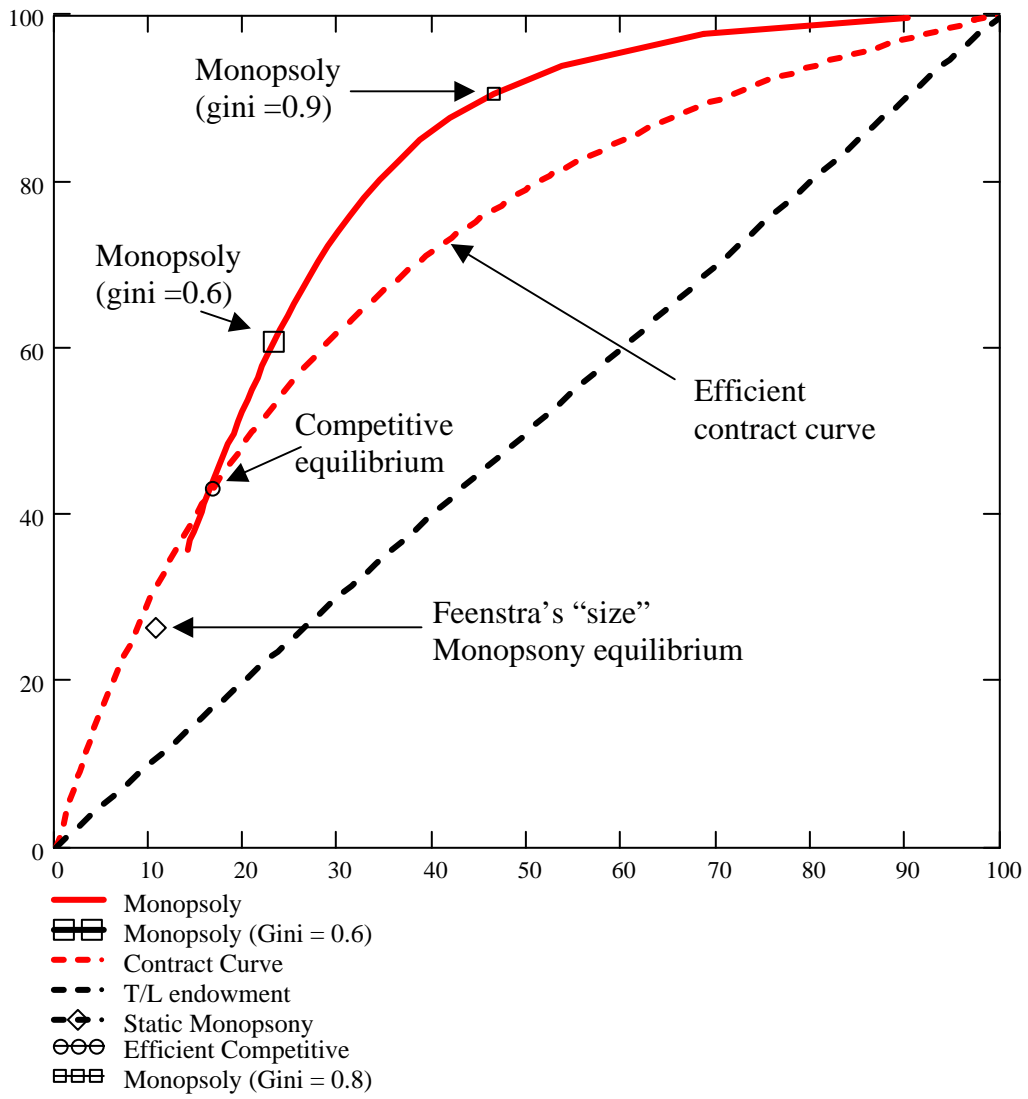
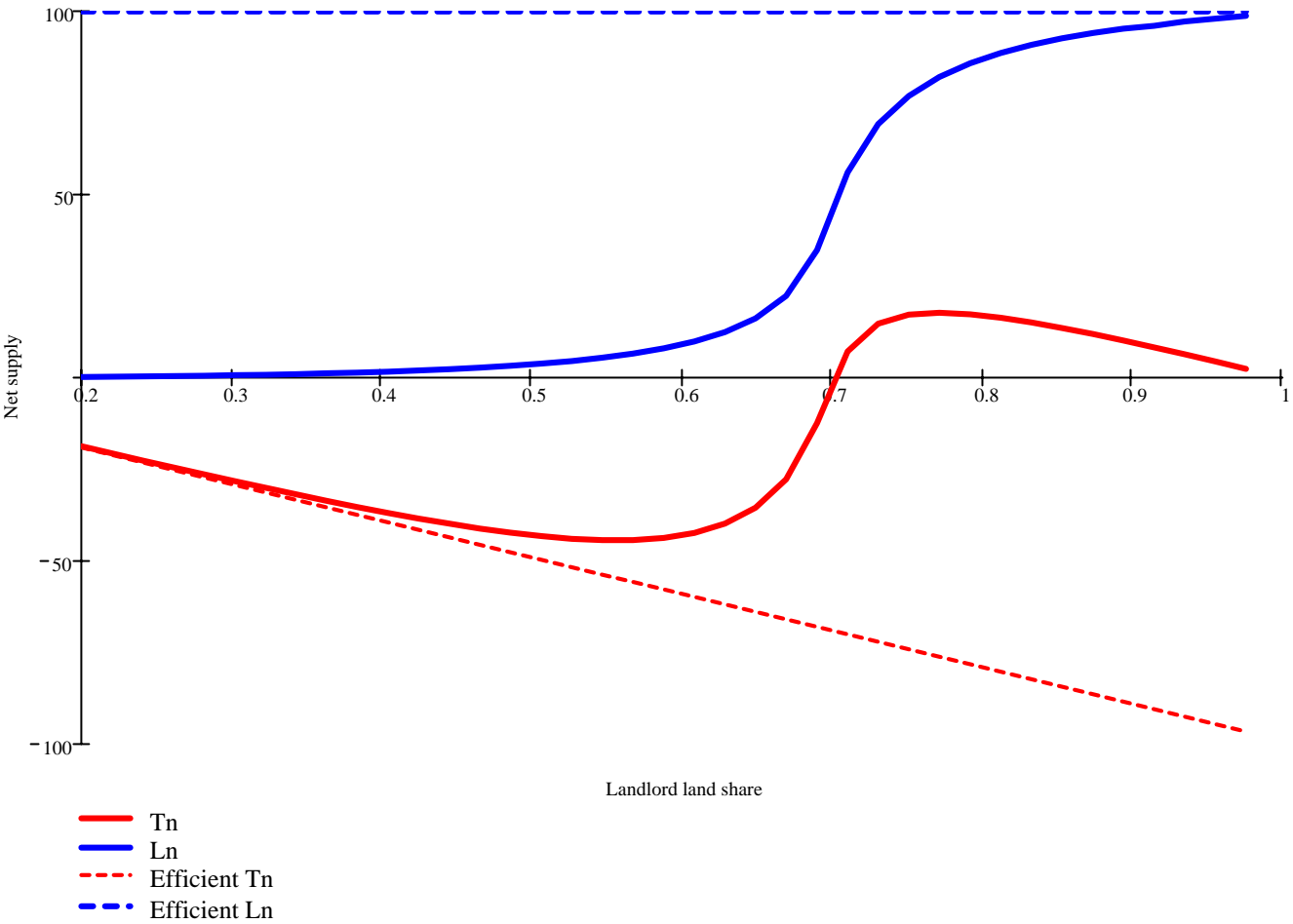


Figure 2: Equilibrium Peasant Sector Net Factor Supply of Labor and Land as a function of  $\theta$



# American vs. Junker Road

Landlord, Peasant, and total farm output function of Land Gini

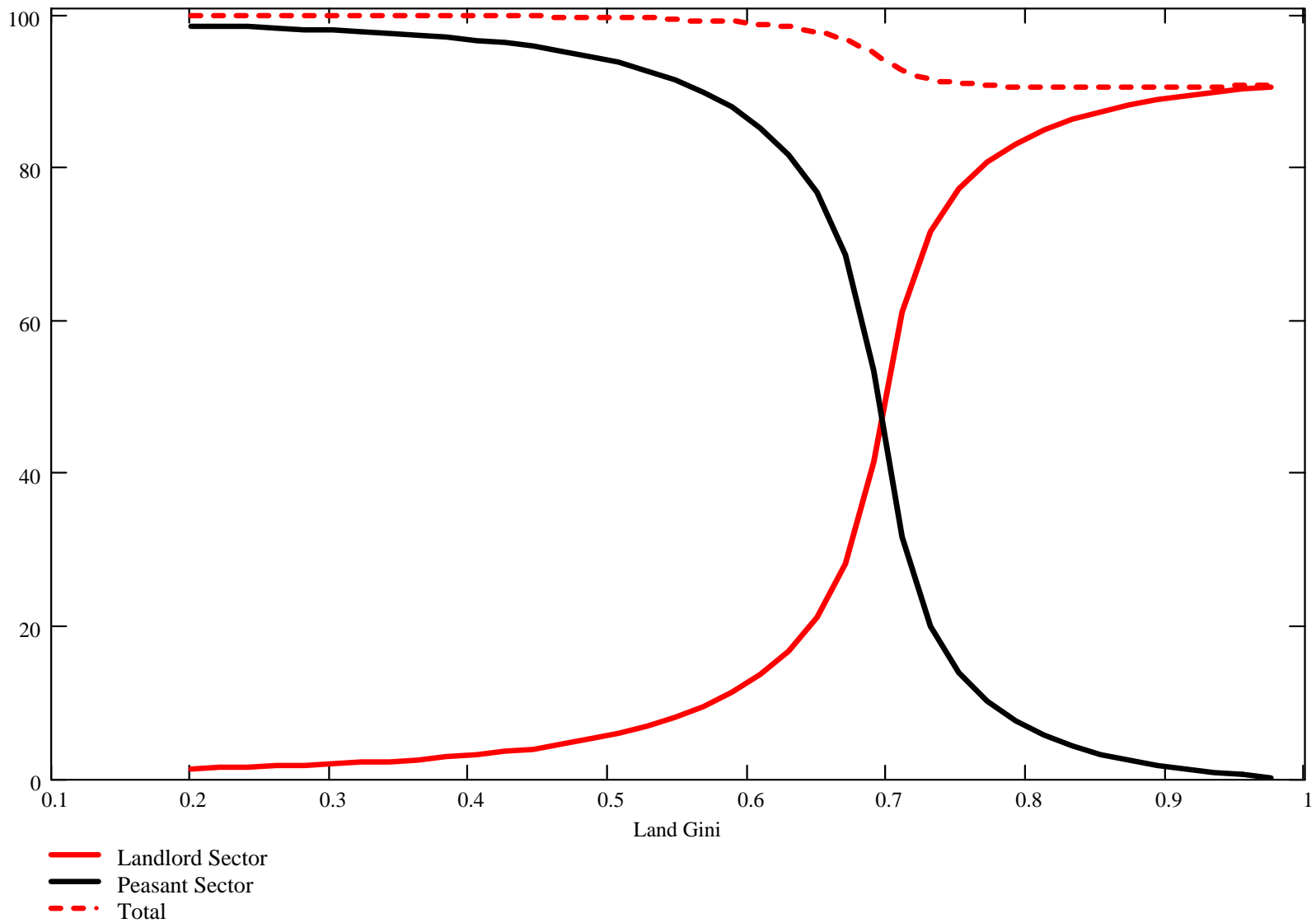
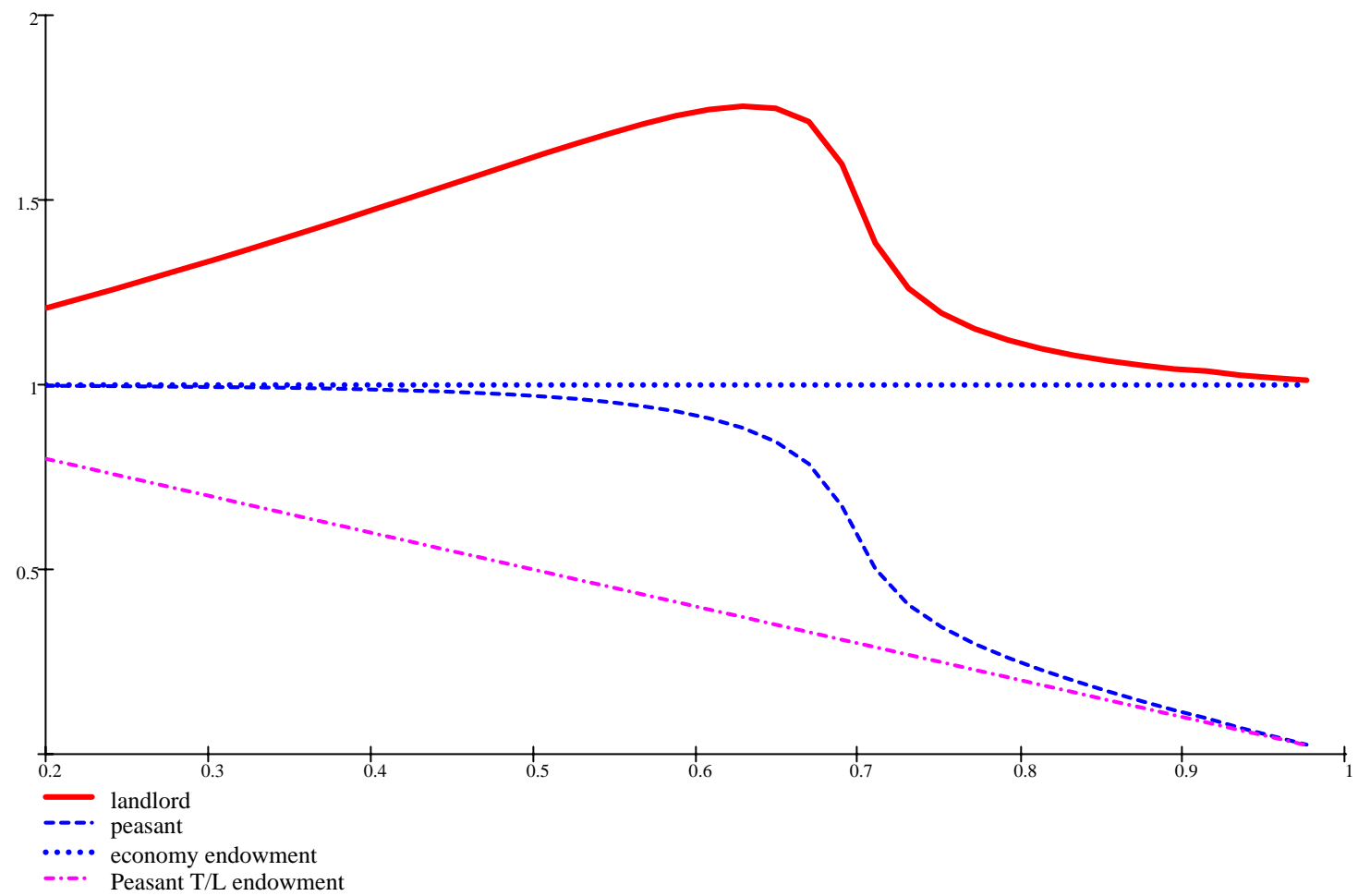
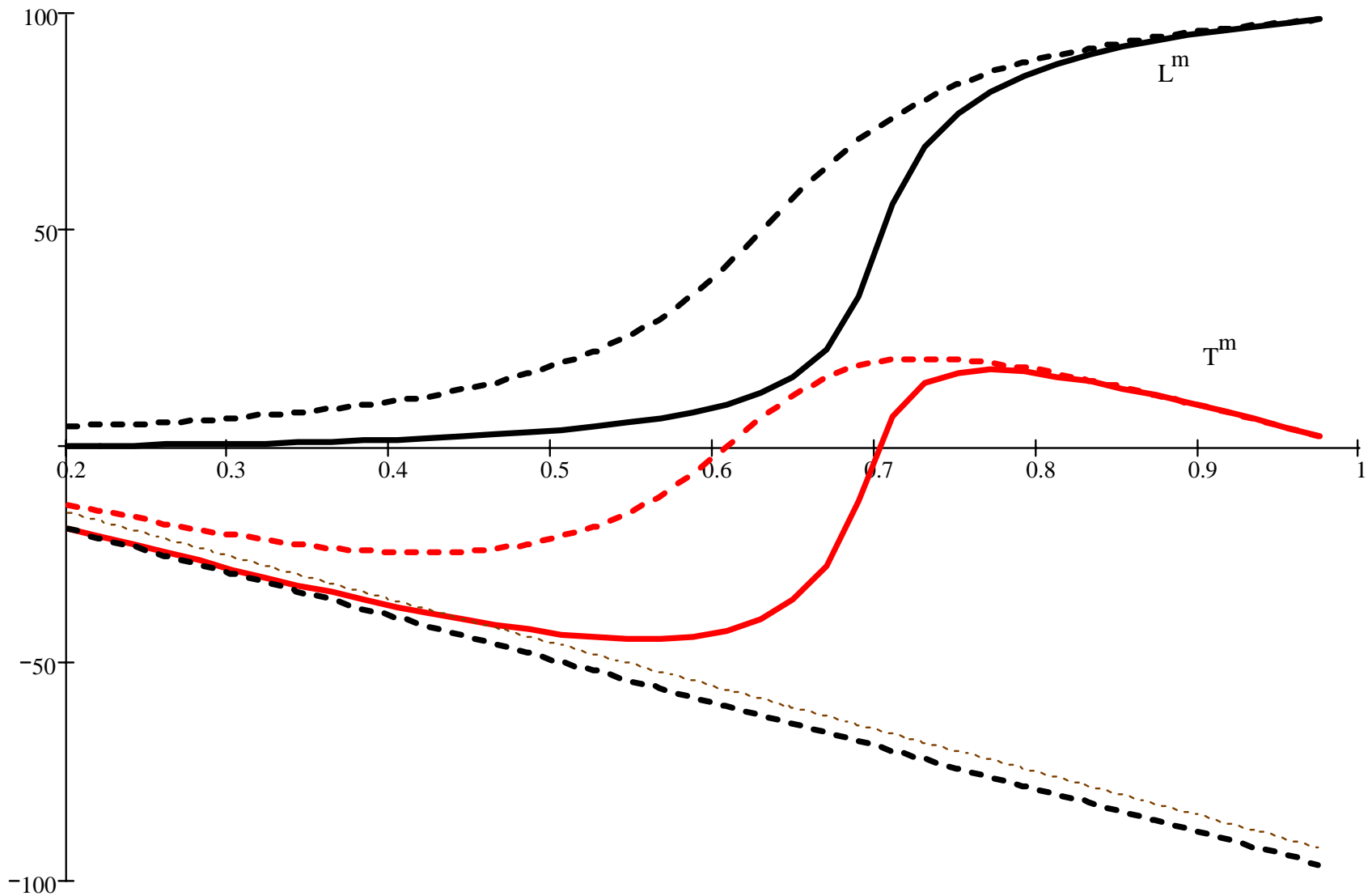


Figure 4: Equilibrium Land-Labor ratios as a function of  $\theta$

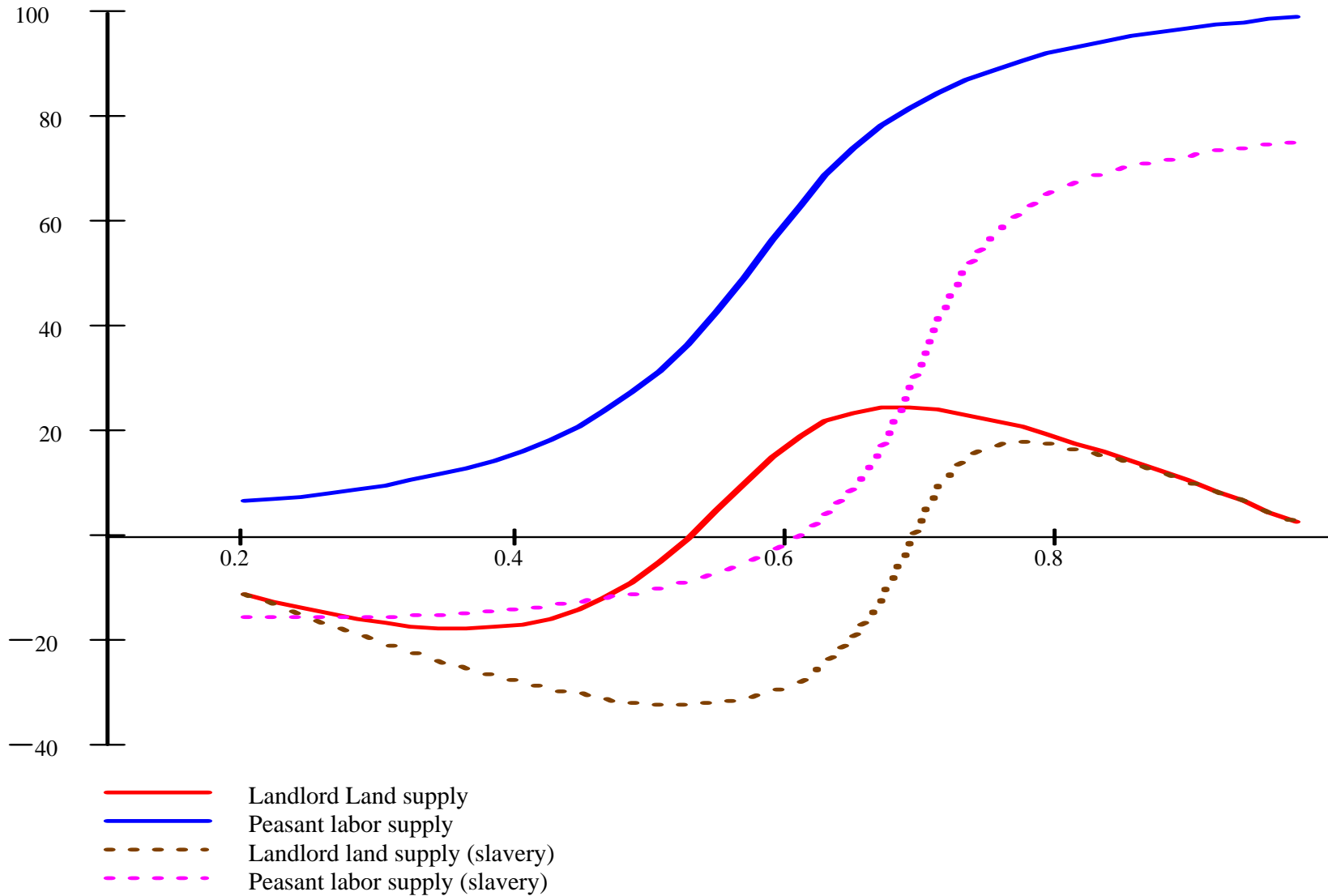


# Improvement in Landlord's Relative Technology or Product Price

## Effect on net factor supplies



# Net factor supply from free peasant farms in slave and non-slave economy as a function of land Gini



# Monopsony Equilibria, with and without slaves

