

Oligarchic Land Ownership, Entrepreneurship, and Economic Development

Josef Falkinger and Volker Grossmann*

June 27, 2007

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1 Introduction

Economic development is intimately related to structural change from natural resource-intensive production like agriculture or mining to manufacturing and capital-intensive production. This process is typically driven by the emergence of a new entrepreneurial class which in oligarchic societies challenges the traditional elite of natural resource owners economically and politically. The relevant individual characteristic which enables agents to become entrepreneur is whether or not they have the means to finance the cost of setting up a firm. Under credit constraints this depends on the households' own income. An immediate implication is that, because every economy in an early stage of development is dominated by primary goods production, the income earned by landless workers or tenants in the primary sector is a decisive financial determinant of the possibilities to start manufacturing activity.

This paper argues that, for this reason, the ownership concentration of land or other natural resources plays an important role for entrepreneurship, structural change, and economic development.¹ According to our analysis, oligopsony power of large landowners in the agricultural labor market or their bargaining power when leasing land to tenant farmers depresses entrepreneurial investments of landless, credit-constrained households whose investment possibilities depend on their income earned in the primary sector. Consistent with this hypothesis we discuss and provide empirical evidence on negative effects of higher land concentration on income of landless peasants. Employ-

¹There is a voluminous literature, surveyed by Binswanger, Deininger and Feder (1995), on the effects of land concentration and land reforms on the performance of the agricultural sector. According to evidence by Besley and Burgess (2000), land reforms in India after 1958 had no effect on agricultural output, whereas Banerjee, Gertler and Ghatak (2002) show that tenancy reform in West Bengal in 1977, which to some degree assigned property rights to tenants, substantially raised agricultural productivity. Our focus is on the effects outside the agricultural sector.

ing historical U.S. state level data we find that a higher fraction of landowners in the population was associated with higher wages for farm labor. Fig. 1 shows a strongly positive partial correlation between both variables for 1910, after controlling for the share of workers in the primary sector. (In section 5 we present more detailed evidence on the presence and importance of oligopsony power.) This fits well into previous findings for India. Exploiting survey data for India at a district level from 1960/61, Rosenzweig (1978) finds that higher land inequality (among landowners) substantially depresses agricultural wage income.

<Figure 1>

Our main focus is on the adverse effects of *economic* power of the preindustrial elite in early stages of development. We thereby propose a complementary theory to the recently emphasized adverse effects of *political* power of landowners which enabled them to block institutional reforms conducive to economic development like public education (e.g. Sokoloff and Engerman, 2000; Falkinger and Grossmann, 2005a; Engerman and Sokoloff, 2005; Galor, Moav and Vollrath, 2006).

Galor, Moav and Vollrath (2006) show that land inequality is negatively related to the point of time in which human capital promoting institutions are adopted, thereby delaying economic development, and provide supporting evidence by employing U.S. state-level data from the beginning of the 20th century. Proto (2007) argues that high land inequality is associated with a high rental price of land, which in turn reduces the possibilities of tenant farmers to invest in education. Falkinger and Grossmann (2005a) relate the opposition of the landed elite to mass education to openness to trade, where an open trade regime is politically supported by the landed

elite under a comparative advantage for primary goods production. These contributions advance the hypothesis of Engerman and Sokoloff, developed in a series of papers, on the delay of mass education under an oligarchic distribution of landholdings. Our basic model abstracts from educational investments and political channels to focus on the dismal effects of oligopsony power of landowners on entrepreneurship. However, in an extension we show that landowners also oppose public investment and other policies which promote productivity in the manufacturing sector, because the possibilities of landowners to extract rents from their property depend on the volume of labor supplied to agriculture. We also show that, contrary to landowners, entrepreneurs support productivity-promoting reforms.² This suggests a vicious politico-economic circle: By impeding business creation and the size of the manufacturing sector, a high oligopsony power of landowners also hinders the emergence of a bourgeois class so that the pre-industrial elite remains the dominant political force. As a result, there is little support for economic policies or institutional reforms promoting manufacturing productivity and political change.

Our analysis provides a new link between credit market imperfections and long-run growth patterns. Several theories demonstrate that initial wealth inequality is negatively related to growth due to the disability of poor individuals to invest in profitable projects in the face of credit-constraints (e.g. Banerjee and Newman, 1993; Galor and Zeira, 1993; Bénabou, 1996; Aghion and Bolton, 1997; Piketty, 1997). The novel feature of our theory is to endogenize the means of the landless population to invest in manufacturing businesses by working out (in a dynamic two-sector model) the central role

²This is in line with Galor and Moav (2006), who argue that educational reform in 19th century Western Europe was orchestrated by capitalists.

of oligopsony power of landowners in an early stage of development.

The plan of the paper is as follows: Section 2 presents the basic, economic model. The equilibrium is characterized in section 3. Section 4 extends the model by introducing productivity-enhancing public investments, determined in a political process which highlights the conflict between landowners and the emerging class of entrepreneurs. Section 5 presents evidence from the years 1880 and 1910 on the link between the pattern of land ownership and farm wages in the U.S. We also discuss how oligopsony power in the rural labor market was historically associated with slow structural change in Latin America and India. Finally, we document the increasing orientation of peasants towards non-agricultural enterprises and fast industrial development in Taiwan and South Korea in the aftermath of successful land reforms initiated in the early 1950s – consistent with the link between ownership concentration, income levels of landless households, and structural change suggested by our framework. The last section provides concluding remarks.

2 The Basic Model

We consider a two-sector overlapping generations economy with two-period lives.

2.1 Endowments

Individuals differ in factor endowments. There is a “traditional elite”, represented by discrete number of $N^Z > 1$ households, who own some natural resource, hereafter referred to as “land”.³ In each period, a household con-

³For instance, the traditional oligarchy in 19th century South America mainly consisted of big landowners. Some of them made their fortune from mining.

sists of parent and child, where the child becomes parent in the second period of life and inherits the land estate. The total amount of land is time-invariant and denoted by Z . This fixed factor is equally distributed among landowners, each owning $z = Z/N^Z$. The rents from the fixed factor are shared within a household of the traditional elite between parent and child.

Moreover, in each period a large number of workers, N^L , is born. They are identically endowed with raw labor in the first period of life but don't own land. Besides raw labor, landless individuals are also endowed with an ability $1 - \xi$ to become entrepreneur in the second period of life, as specified in more detail in the next subsection. The distribution of ξ among the N^L individuals is time-invariant and uniform on the unit interval. When not becoming entrepreneur, workers retire in the second period of life.

To focus on the role of land ownership concentration, we normalize $Z = N^L$. Throughout, we measure ownership concentration by the ratio of workers to owners (N^L/N^Z), which in view of $Z = N^L$ equals ownership of land per member of the traditional elite, z .

2.2 Sectorial Structure

There are two sectors, a primary ($X-$) sector, called “agriculture” which is land-intensive, and a capital-intensive, manufacturing ($Y-$) sector. Goods markets are perfectly competitive. For simplicity, suppose the $X-$ and $Y-$ good are perfect substitutes, where both prices are equal to unity. Instantaneous utility of individuals from consumption in the first and second period of life is identical and linear in consumption. To save notation, suppose the discount rate is zero, and equal to the interest rate.⁴ Thus, individuals are

⁴Allowing for a positive interest (and discount) rate would not affect the predictions of our model.

indifferent between present and future consumption.

2.2.1 Manufacturing Sector

The manufacturing good is produced by a simple constant returns to scale technology with labor as only input. However, starting a business in which l_t^y units of labor can be employed in t involves set up costs. An individual with ability $1 - \xi$ has to invest

$$k(\xi, l_t^y) = \bar{k} + \xi + 0.5 (l_t^y)^2 \quad (1)$$

units of capital in $t - 1$, which allows to produce output

$$y_t = A_t l_t^y \quad (2)$$

in the second period of life.⁵ Parameter $\bar{k} \geq 0$ captures both technological set up requirements and barriers to entry. A_t is manufacturing productivity in t . It changes over time due to spillovers and learning-by-doing effects across entrepreneurs in the Y -sector. This is captured by assuming that A_{t+1} is an increasing function of the share of entrepreneurs among the landless population in the previous period.⁶ Moreover, as technical progress builds on the existing stock of knowledge, A_{t+1} depends positively on current productivity A_t , where $A_0 > 0$ is given. Let N_t^E be the (endogenously determined) number of entrepreneurs in t , where $N_0^E > 0$ is given, and denote $n_t^E = N_t^E / N^L$.

⁵Thus, higher ability of an individual to become entrepreneur reduces the part of the set up costs which is unrelated to employment capacity l_t^y . Alternatively, one could assume that entrepreneurial ability affects a firm's productivity in production function (2). The present formulation somewhat simplifies the analysis, but is not crucial for any of our main results.

⁶Qualitative results would be unchanged if we assumed that A is positively affected by manufacturing output, as e.g. in Matsuyama (1992).

Formally, A evolves over time according to

$$A_{t+1} = a(n_t^E, A_t), \quad (3)$$

where function a is increasing in its arguments.

An entrepreneur (who was a worker in the first period of life) cannot borrow more than a finite multiple of first period income, I . More formally, (s)he cannot invest more than ηI , $\eta \geq 1$.⁷ Together with set up costs in (1), this restricts the possibilities for workers to become entrepreneur. Parameter η captures the financial development of the economy, where $\eta = 1$ means that no credit market exists. If η is sufficiently large the credit constraint is not binding.

The wage rate in the manufacturing sector, w^Y , is proportional to total factor productivity:

$$w_t^Y = \alpha A_t, \quad (4)$$

$\alpha \in (0, 1)$. As shown in Appendix A, this can be rationalized either by Nash bargaining between single workers and entrepreneurs or by efficiency wage considerations of entrepreneurs.⁸ Both possibilities are plausible. Nash bargaining reflects the idea that a specific worker-firm relationship is important in manufacturing (in contrast to the X -sector). Similarly, efficiency wage setting in the Y -sector captures the notion that effort in the manufacturing sector is more difficult to monitor than in the agricultural sector. We assume

⁷See also Bernake and Gertler (1989). The following simple microfoundation heavily draws on Aghion, Howitt and Mayer-Foulkes (2005). Let r denote the interest rate and suppose an entrepreneur who invests k can defraud the creditors by paying a cost μk , $0 \leq \mu < 1 + r$. To do this is not worthwhile if $\mu k \geq (1 + r)(k - I)$, which is equivalent to $k \leq \eta I$, $\eta \equiv (1 + r)/(1 + r - \mu)$. Thus, the maximum amount of investment is ηI , where $\eta \geq 1$.

⁸Note that manufacturing firms would make losses under a perfect labor market, due to the presence of set up costs and the constant-returns production technology (2).

throughout that the manufacturing sector is not less attractive for workers than the agricultural sector (described below), such that entrepreneurs are always able to utilize all capacity they want to install at the given wage.⁹ For simplicity, we also assume that each worker can be employed in only one sector, and in the Y -sector inelastically supplies one unit of labor.

2.2.2 Agricultural Sector

The primary good is produced by a linearly homogenous production function, F , for output x_t on the landholding z per owner in period t :¹⁰

$$x_t = F(l_t^x, z) \equiv z f(l_t^x/z), \quad (5)$$

where l_t^x is the amount of labor a single landowner employs in period t and $f(\cdot)$ is an increasing and strictly concave function which fulfills the standard boundary conditions. Let L_t^Y denote employment of workers in the manufacturing sector in t , where the initial level $L_0^Y > 0$ is given. The implied number of workers in the X -sector in t is

$$N_t^X = N^L - L_t^Y. \quad (6)$$

Investment possibilities of these individuals depend on their income, I^X . The basic economic mechanism we advance in this paper critically rests on

⁹Positive wage income differentials between manufacturing and agriculture is consistent with overwhelming evidence on a positive (real) urban-rural wage gap. For instance, Hatton and Williamson (1992) provide historical data on the U.S. for the period 1890-1941, and discuss related evidence.

¹⁰Allowing also for productivity progress in the X -sector would not affect our main results. In our model, a higher rate of exogenous productivity growth in land-intensive production would speed up economic development by raising wages in the agricultural sector and thereby easing credit-constraints of potential entrepreneurs.

two features. First, higher land concentration, measured by z , reduces I^X and thereby impedes entrepreneurship due to credit-constraints (with investment limit ηI^X for workers in the X -sector). Second, income of agricultural labor negatively depends on the share of individuals seeking employment in the X -sector, $n^X = N^X/N^L$. In sum, we have

$$I_t^X = I^X(n_t^X, z); \quad \frac{\partial I^X}{\partial n_t^X} < 0, \quad \frac{\partial I^X}{\partial z} < 0, \quad \frac{\partial I^X}{\partial A_t} = 0. \quad (7)$$

Appendix A provides a microfoundation for (7), by assuming that the labor market in the X -sector is oligopsonistic. We show that the degree of oligopsony power of landowners - i.e., the wedge between the wage rate and the marginal product of agricultural labor - increases if land ownership is concentrated on fewer owners (higher z). From this, consistent with the historical evidence presented in section 5, we obtain $\frac{\partial I^X}{\partial z} < 0$. This property is critical for our main results. According to Appendix A, $\frac{\partial I^X}{\partial z} = 0$ if workers in the X -sector were paid their marginal product.

A larger share of workers, n^X , who seek employment in the agricultural sector, lowers the marginal return to labor. Thus, $\frac{\partial I^X}{\partial n_t^X} < 0$ would also hold if the wage rate in the X -sector was equal to its marginal product. Under oligopsony power, also the labor input per worker in the X -sector is reduced, additionally depressing wage income. As also shown in Appendix A, under production function (5) the income (profits) of landowners, π_t^x , are given by¹¹

$$\pi_t^x = \pi^x(n_t^x, z); \quad \frac{\partial \pi^x}{\partial n_t^x} > 0, \quad \frac{\partial \pi^x}{\partial z} > 0. \quad (8)$$

Two remarks are in order. First, for the critical property $\frac{\partial I^X}{\partial z} < 0$, alter-

¹¹ $\pi^x(n^x, z)$ would also be increasing in both arguments if agricultural workers were paid their marginal product.

native microfoundations to oligopsony power of owners are conceivable. For instance, high ownership concentration may give rise to bargaining power over tenancy contracts which reduces income of tenants (and raises profits of owners).¹² Second, we have implicitly ruled out that the landowners adopt an entrepreneurial role in manufacturing. If landowners could choose to give up their estate and to become entrepreneur in the manufacturing sector, the question is in which sector their profits are higher. As their profits in agriculture, π^x , are increasing in z , landowners will not find it attractive to become entrepreneur if ownership concentration z is sufficiently high. This is supported by historical evidence. Consistent with our analysis, Young (1995) finds that savings from previous wage employment was the main source of start-up capital for micro-scale enterprises in rural Scotland between 1840 and 1914. Doepke and Zilibotti (2007) point out that in early stages of development the rich were typically landowners who did not engage in business outside the primary sector. According to Crouzet (1985), in the UK about half of the founders of large industrial undertakings during the first industrial wave (1750-1850) came from the working class or lower middle class. Some of them, or their fathers, were employed in the agricultural or mining sector. However, only 3 percent of entrepreneurs were part of the upper class (landowners or officers) and less than 10 percent of entrepreneurs were descendants of a landowner family. For instance, “after 1815, [landowners] did not make any serious contribution either to the cotton industry or to the great expansion of the iron industry which took place in the 1830s” (Crouzet, 1985, p. 77).¹³

¹²From the perspective of owners, tenancy contracts may have the advantage of providing better incentives for landless peasants, which is however not an issue in this paper.

¹³Doepke and Zilibotti (2007) explain such patterns in a model where altruistic parents can invest in the patience capital (time preference) of their children and credit constraints give rise to a complementarity between investment in patience and a steep income profile.

3 Equilibrium Analysis

This section shows that a high concentration of landholdings (z) is harmful for entrepreneurship in the manufacturing sector and thereby retards economic development. Moreover, we conduct comparative-static analysis with respect to entry barriers (\bar{k}) and the level of financial development (captured by η).

We first examine the decision of workers whether or not to become entrepreneur and the investment choice of entrepreneurs. Due to imperfect credit markets, a worker with first period income I_{t-1} , can maximally incur set up costs ηI_{t-1} . Hence, an entrepreneur with ability $1 - \xi$ and first period income I_{t-1} chooses optimal employment capacity (i.e., firm size) l_t^y to maximize net profits¹⁴

$$\max_{l_t^y} \pi_t^y(\xi) = \{(A_t - w_t^Y)l_t^y - k(\xi, l_t^y)\} \quad \text{s.t.} \quad \eta I_{t-1} \geq k(\xi, l_t^y), \quad (9)$$

where $k(\xi, l_t^y)$ is specified in (1). For concreteness, we focus on the situation where credit constraints are always binding for workers who are employed in the X -sector in their first period of life, but workers who are employed in the Y -sector are never credit-constrained.¹⁵

Using $w_t^Y = \alpha A_t$ and $k(\xi, l_t^y) = \bar{k} + \xi + 0.5(l_t^y)^2$, optimal capacity of

Employing this or alternative microfoundations of the negligible role of landowners in industrial development would not affect our main results.

¹⁴Since the interest rate is assumed to be zero, profits $(A_t - w_t^Y)l_t^y$ are not discounted.

¹⁵Possible reasons for this are that either there is a pronounced earnings gap between sectors ($w^Y \gg I^X$) or workers who are employed in the Y -sector in the first period of life have better access to the credit market than their counterparts in the X -sector (for instance, because of more favorable financial structures in urban manufacturing areas, as opposed to rural areas). Anyway, the main results would be unchanged if also workers who are employed in the Y -sector or only workers with relatively low ability were credit-constrained.

(unconstrained) workers in the Y -sector is given by

$$l_t^{y*} = (1 - \alpha)A_t. \quad (10)$$

Higher manufacturing productivity, A , raises the marginal profit from investments and therefore raises optimal capacity. Optimal entrepreneurial capacity choice then implies profits

$$\pi_t^{y*}(\xi) = 0.5(1 - \alpha)^2 A_t^2 - \xi - \bar{k}. \quad (11)$$

Whenever $\pi_t^{y*}(\xi) \geq 0$, a worker in the Y -sector born in $t - 1$ becomes entrepreneur in $t \geq 1$. This is equivalent to

$$\xi \leq 0.5(1 - \alpha)^2 A_t^2 - \bar{k} \equiv \xi_t^*. \quad (12)$$

Threshold level ξ_t^* positively depends on manufacturing productivity A_t and negatively on fixed costs \bar{k} .¹⁶

A worker endowed with ability $1 - \xi$ who works in the agricultural sector in the first period of life ($I = I^X$) chooses capacity

$$l_t^{yc} = \min \left(\sqrt{2(\eta I_{t-1}^X - \xi - \bar{k})}, l_t^{y*} \right). \quad (13)$$

As long as the constraints are binding, $l^{yc} < l^{y*}$. Thus, the installed capacity is larger if I^X is higher, that is, according to (7), if land ownership is less concentrated or if the share of workers in the X -sector is lower. Moreover, firm size (l^{yc}) now increases if the ability of an entrepreneur is higher (lower ξ), if the credit market is less imperfect (higher η), or if entry barriers are

¹⁶We focus on parameter configurations such that $\xi_t^* \in (0, 1)$ for all $t \geq 1$.

less severe (lower \bar{k}). Consequently, as formally stated in the next result, a lower fraction of workers from the X -sector than from the Y -sector become entrepreneurs. (All proofs are relegated to Appendix B.)

Lemma 1. *There exists a threshold ability level $\xi_t^c < \xi_t^*$ such that a (credit-constrained) worker from the X -sector becomes entrepreneur in period $t \geq 1$ if and only if $\xi \leq \xi_t^c$. ξ_t^c is increasing in A_t and η . Moreover, ξ_t^c is decreasing in \bar{k} , n_{t-1}^X and z .*

In sum, when a share n_{t-1}^X of workers was employed in the X -sector in $t - 1$, the share of workers who become entrepreneur in t is given by

$$n_t^E = n_{t-1}^X \xi_t^c + (1 - n_{t-1}^X) \xi_t^* \equiv \tilde{n}^E(A_t, n_{t-1}^X, z, \eta, \bar{k}). \quad (14)$$

The effects of A_t and \bar{k} on n_t^E come through both ξ_t^* (see (12)) and ξ_t^c (see Lemma 1), the effects of z and η come only through ξ_t^c . A change in n_{t-1}^X has both a direct impact on n_t^E and an indirect impact through ξ_t^c . Let us denote the manufacturing output per worker by Y_t . Using (10) and (12) in production function (2), we have in equilibrium at date t

$$Y_t = A_t \left[n_{t-1}^X \int_0^{\xi_t^c} l_t^{yc} d\xi + (1 - n_{t-1}^X) \xi_t^* l_t^{y*} \right] \equiv \tilde{Y}(A_t, n_{t-1}^X, z, \eta, \bar{k}), \quad (15)$$

where the first term in squared brackets is employment in firms founded by credit-constrained entrepreneurs and the second term comes from the unconstrained entrepreneurs. The share of workers in the X -sector, $n^X = 1 - L^Y/N^L = 1 - Y/A$, evolves over time according to

$$n_t^X = 1 - n_{t-1}^X \int_0^{\xi_t^c} l_t^{yc} d\xi - (1 - n_{t-1}^X) \xi_t^* l_t^{y*} \equiv \tilde{n}^X(A_t, n_{t-1}^X, z, \eta, \bar{k}), \quad (16)$$

$t \geq 1$, starting at $n_0^X = 1 - L_0^Y/N^L$. Finally, according to (3) and (14), for any $t \geq 1$, the dynamic process which governs manufacturing productivity can be written as

$$A_{t+1} = a(\tilde{n}^E(A_t, n_{t-1}^X, z, \eta, \bar{k}), A_t) \equiv \tilde{a}(A_t, n_{t-1}^X, z, \eta, \bar{k}), \quad (17)$$

where $A_1 = a(n_0^E, A_0)$ is determined by initial conditions.

System (16) and (17) characterizes the development of productivity (A) and employment structure (n^X) as functions of ownership concentration (z) and financial parameters (η, \bar{k}). The channels through which n_{t-1}^X and A_t are linked to n_t^E and Y_t are given by (14) and (15). They describe the emergence of entrepreneurship and their role for the development of the manufacturing sector.

The following lemma summarizes the properties of the functions defining system (14)-(17).

Lemma 2. *\tilde{n}^E, \tilde{Y} and \tilde{a} are increasing in A_t and η . They are decreasing in z, \bar{k} and n_{t-1}^X . With respect to \tilde{n}^X , the opposite holds.*

We are now ready to derive comparative-static results for the transitional dynamics. (A steady state analysis will follow.)

Proposition 1.

(i) *A more concentrated ownership of land reduces the share of entrepreneurs (n^E), manufacturing output (Y) and average entrepreneurial profits in any period, whereas it raises both the share of workers in the X -sector (n^X) and profits of landowners.*

(ii) *Better financial markets (higher η) or a decrease in entry costs (\bar{k}) positively affect n^E, Y and average entrepreneurial profits in any period,*

while reducing n^X ; moreover, profits of landowners decline.

Higher ownership concentration negatively affects first-period income of workers in the agricultural sector because landowners exert oligopsony power ($\frac{\partial I^X}{\partial z} < 0$). Thus, investments of credit-constrained entrepreneurs depart more from the optimal investment level, which depresses their profits. Consequently, both output in the manufacturing sector and the share of entrepreneurs, n^E , decline. A decrease in n^E has two further effects. First, more workers remain in the agricultural sector. This lowers their income further (as $\frac{\partial I^X}{\partial n^X} < 0$) and hence reduces investments of credit-constrained entrepreneurs also in the next period. Second, a decline in n^E reduces productivity in the subsequent period, which again raises n^X . In sum, oligarchic land ownership is harmful for development. Moreover, due to a positive link between n^X and π^x on the one hand and the direct impact of a higher z on π^x on the other hand (according to (8)), an increase in z raises profits of each landowner.

In contrast, if access to credit were unlimited for all individuals, both the equilibrium allocation of labor and manufacturing output would be unchanged. To see this, note that the equilibrium share of entrepreneurs would be given by ξ_t^* , which is independent of z . Moreover, as discussed in section 2.2.2, in the limit case where landowners cannot exert oligopsony power (i.e., when workers receive their marginal product), agricultural labor income would not be affected by the ownership concentration ($\frac{\partial I^X}{\partial z} = 0$); thus, an increase in z would be inconsequential for economic development even under credit constraints. Thus, it is the combination of credit constraints and oligopsony power which drives our results.

Similar effects to an increase in z arise when η decreases, which means that credit constraints are ceteris paribus more severe, or when entry barriers

\bar{k} increase. Manufacturing profits and thus entrepreneurship are depressed in any period, again implying further effects on future investments by reducing productivity in the manufacturing sector and income of agricultural workers.

We next characterize the dynamic system and the steady state. According to (16) and (17),

$$\Delta n_t^X = n_t^X - n_{t-1}^X = \tilde{n}^X(A_t, n_{t-1}^X, z, \eta, \bar{k}) - n_{t-1}^X, \quad (18)$$

$$\Delta A_{t+1} = A_{t+1} - A_t = \tilde{a}(A_t, n_{t-1}^X, z, \eta, \bar{k}) - A_t. \quad (19)$$

The evolution of the system depends on two initial conditions, $A_1 = a(n_0^E, A_0)$ and $n_0^X = 1 - L_0^Y/N^L$.¹⁷ Steady state values are given by $\Delta n^X = \Delta A = 0$. Fig. 2 provides a phase diagram in the (n^X, A) -space and shows a unique stable steady equilibrium of the dynamic system (16) and (17), which is a stable node (as confirmed in numerical simulations discussed below).

<Figure 2>

In the situation of an underdeveloped economy where the primary sector is large and manufacturing productivity is low initially (i.e., $n_0^X > \bar{n}^X$ and $A_1 < \bar{A}$), there are three possible transition paths towards a stable steady state, depending on initial conditions. The first scenario applies when starting between the $\Delta n^X = 0$ and $\Delta A = 0$ line in the South-East corner of Fig. 2. Then we have a decline in n^X along with increases in productivity A during the entire transition path. In this case, entrepreneurship and manufacturing output always rise over time. In a second scenario, which applies when starting to the right of the $\Delta A = 0$ line, the transition path is characterized by a

¹⁷In the absence of credit constraints, development would be characterized by the productivity process alone. As $n_t^E = \xi_t^*$, (3) and (12) imply that productivity evolves over time according to $A_{t+1} = a(0.5(1 - \alpha)^2 A_t^2 - \bar{k}, A_t)$.

decline in productivity in the early phase of development (when n^X is high) and an increase in later phases (when the economy enters the first scenario). The X -sector always shrinks over time. In both scenarios, manufacturing employment L^Y will always increase over time (recall $n^X = 1 - L^Y/N^L$). Nevertheless, due to initially declining productivity, the share of entrepreneurs and manufacturing output may stagnate in an early transition phase in the second scenario, before taking off later on. The same may happen in the third scenario, which applies when starting below the $\Delta n^X = 0$ line, but for the opposite reason: The size of the agricultural sector increases in an early phase before declining in mature stages (when the economy enters the region considered in the first scenario). In this case, A increases during the entire transition.

Comparative-static results for the shown steady state follow immediately from our previous results. Applying Lemma 2 we see that when η rises or when z or \bar{k} declines the $\Delta A = 0$ line in Fig. 2 shifts to the right and the $\Delta n^X = 0$ line shifts downwards. This implies an increase in steady state manufacturing productivity, \bar{A} , and a decrease in steady state share of workers in the X -sector, \bar{n}^X . Moreover, it goes along with increases in the share of entrepreneurs, manufacturing output and profits in the Y -sector, whereas steady state profits of landowners are reduced.¹⁸

For illustrating the development patterns implied by our model we examined a parameterized version of the model numerically, assuming an oligopsonistic labor market in the X -sector as analyzed in Appendix A. We used specification $f(l^x/z) = (l^x/z)^\beta$, $0 < \beta < 1$, in production function (5) and specification $a(n^E, A) = h \cdot (n^E)^\gamma \cdot A^\varepsilon + (1 - \delta) \cdot A$ for productivity process

¹⁸The rise of n^E and Y follows from Lemma 2. The effects on profits follow from (8) and the arguments in the proof of Proposition 1.

(3).¹⁹ The main focus of interest in this paper is how ownership concentration (z) – in interaction with credit-constraint (η) and entry barriers (\bar{k}) – affects the pattern of economic development. Numerical solution of the dynamic system (16) and (17) suggests uniqueness and stability of steady state equilibrium, as shown in Fig. 2, whenever ownership concentration z is sufficiently high.²⁰ The relevant threshold for z increases with η , that is, when access to credit for start-up capital becomes easier. (With low ownership concentration and well-developed financial markets, we would be in the case where credit-constraints are not binding.)

In the following comparisons we choose $z = 25$, $\eta = 2$ and $\bar{k} = 0.1$ as baseline and calculated the effects of partial variations in the parameter values on the outcomes of the model. Fig. 3 shows how concentration of land ownership affects structural change, measured by the evolution of the share of workers in the agricultural sector, n^X , over time. For the initial values chosen ($n_0^X = 0.95$, $A_1 = 1.7$), there is monotonic convergence to steady state value \bar{n}^X .

<Figure 3>

For instance, $z = 50$ implies that about 2 percent of the population own land. Fig. 3 suggests that increasing the ownership share to about 10 percent ($z = 10$) would have a substantial impact on structural change. The steady

¹⁹ $\delta > 0$ reflects the notion that there is some depreciation of knowledge over time, as productivity changes according to $\Delta A_{t+1} = h \cdot (n_t^E)^\gamma \cdot A_t^\varepsilon - \delta \cdot A_t$. The following numerical evaluation is based on parameter values: $\beta = 0.5$, $h = 0.3$, $\gamma = 0.1$, $\delta = 0.15$, $\varepsilon = 0.2$, $\alpha = 0.5$. Moreover, for oligopsonistic wage setting in the X -sector, we assume that in the primary sector individual labor supply (l^S) as function of wage w is given by $l^S(w) = w^{0.02}$. The values for z , η and \bar{k} are varied as discussed in the text.

²⁰According to (18), (19) and the properties $\partial \bar{a} / \partial n^X < 0$, $\partial \bar{n}^X / \partial A < 0$ from Lemma 2, one needs to show that the $\Delta n^X = 0$ locus in the (n^X, A) -space is steeper than the $\Delta A = 0$ locus and both slopes are negative.

state value for the share of workers in the X -sector, \bar{n}^X , declines from 92 percent to 51 percent, as shown in the top-left cells of Tab. 1.

<Table 1>

Alternatively, we can look at the manufacturing share in total GDP (given in the second column of Tab. 1). The variation in the sectoral structure is also mirrored in the share of constrained and unconstrained workers who become entrepreneur (ξ^c and ξ^* , as given in the third and fourth column, respectively). Lower concentration of ownership means lower economic power of owners and higher earnings of workers in the agricultural sector (fifth column) so that more workers have the means to start an enterprise. The consequences for long-run GDP can be seen in the last column.

In a similar way, variations in the access to credit, η , or in entry costs, \bar{k} , strongly affect entrepreneurship and structural change (displayed in rows four to seven of Tab. 1). For instance, comparing the case where a credit market is absent ($\eta = 1$) to the case where workers in the X -sector can borrow three times their income ($\eta = 3$), we see a dramatic decline in \bar{n}^X (from 96 percent to 51 percent) associated with a substantial rise in entrepreneurship and the share of manufacturing in GDP.

4 Productivity-promoting Policy in Political Equilibrium

The previous literature on the effects of higher land concentration on development and structural change has mainly focussed on the interrelation between land inequality and human capital formation. A basic argument is that political power of landowners forestalled educational reforms (e.g. Sokoloff and

Engerman, 2000; Falkinger and Grossmann, 2005a; Galor, Moav and Vollrath, 2006). In this section, we not only argue that our framework is consistent with the opposition of landowners to political measures which promote manufacturing productivity,²¹ but also highlight the vicious circle of high land concentration when both economic *and* political power of landowners is taken into account.

The model is extended as follows. First, suppose now that productivity A_{t+1} is positively related to the level of public investment per worker in $t + 1$, denoted by G_{t+1} , e.g., the provision of infrastructure (railways, education etc.) or implementing a legal system (commercial law) which reduces transaction costs of sales contracts in manufacturing. Formally, (3) becomes $A_{t+1} = a(n_t^E, G_{t+1}, A_t)$, where $\frac{\partial a}{\partial G} > 0$. Secondly, suppose that public investment level G_t is politically determined as a weighted average of the preferred G -level of the representative landowner, G_t^Z , and a representative of the emerging class of entrepreneurs, G_t^E .²² We assume that entrepreneurs from the relatively rich group of previous Y -workers (who were not credit-constrained) represent the entrepreneurial elite.²³ Political weights are equal

²¹The attitude of the landed oligarchs in, for instance, Latin America towards public infrastructure investment is best summarized by the following quote from Mellafe (1971, p. 11): “The owners of great haciendas were opposed to just about everything: to the installation of the telegraph, to electric power, [...] to public schooling in rural areas, etc.” There exists a large body of evidence elaborating on this, which for space limitations we cannot discuss here. See Falkinger and Grossmann (2005b) for a more detailed discussion of the literature.

²²This captures the fact that, in earlier stages of development, countries are rarely characterized by democratic rule. For instance, in Latin America after independence, political institutions were usually characterized by severe voting restrictions (like wealth or literacy requirements for gaining citizenship) or lack of secrecy in balloting, as a consequence of oligarchic ownership structures (Engerman and Sokoloff, 2005). Apart from voting restrictions, the interests of economically powerful groups may dominate political outcomes through lobbying, corruption or direct political representation by members of the elites.

²³As will become apparent, unconstrained entrepreneurs have identical policy preferences, irrespective of their ability. We also checked that the main results qualitatively

to the ratio of total profits of an elite to the economy's aggregated profits. This captures the notion that wealth is an important determinant of political power in a non-democratic environment. Formally, in political equilibrium, the implemented policy is

$$G_t = \frac{\Pi_{t-1}^X G_t^Z + \Pi_{t-1}^Y G_t^E}{\Pi_{t-1}^X + \Pi_{t-1}^Y}, \quad (20)$$

where Π^X and Π^Y are total profits of the traditional and entrepreneurial elite, respectively.²⁴ For concreteness, we use for profit function $\pi^x(n_t^x, z)$ in (8) the functional form derived in Appendix A, which relies on oligopsony power of landowners in the agricultural labor market.

Public spending is financed by a uniform lump-sum tax on workers, levied in both periods of life.²⁵ That is, in period t , each worker pays a tax $g_t = G_t/2$. (Recall that G is investment per worker.) Uniform lump-sum taxation on individuals born as workers implies that entrepreneurial decisions are not affected by taxation.²⁶

Although the traditional elite does not pay any taxes, landowning households will oppose productive public investments; i.e., $G_t^Z = 0$ at all times.

remain the same when a credit-constrained entrepreneur with high ability represents the entrepreneurial elite (Falkinger and Grossmann, 2005b).

²⁴For simplicity, we assume that political weights are based on past profits. That past and not current profits are relevant may reflect some inertia in the political system. The assumption greatly simplifies the analysis. Otherwise, currently implemented policy, affecting current profits, would feed back on the political weights.

²⁵Taxing also landowners would strengthen our results. An interesting fact in this respect is that in 19th century Latin America, landowners hardly paid taxes. See, for instance, Centeno (1993).

²⁶Our main results would be unchanged if we assumed that entrepreneurs pay a different amount of taxes than retired workers in the second period of life. The occupational choice would be altered in a straightforward way by a differential tax treatment, without providing further insights. If retired workers pay taxes, they have to do it out of savings. Recall that individuals are indifferent between present and future consumption since utility is linear in consumption levels.

To see this, consider the decision of a landowner born in t . A decision in t to support a higher G_t would not affect the share of workers who seek employment in the X -sector in t , n_t^X , as entrepreneurial decisions have already been made. However, an increase in G_t would boost manufacturing productivity A_t and thus also A_{t+1} . A young landowner anticipates that this would decrease the share of workers supplying labor to the agricultural sector, n_{t+1}^X , which in turn reduces profits in $t + 1$ (the second period of life), according to (8). The preferences of the entrepreneurial representative are different. We focus on interior solutions for G_t^E (which requires that a is sufficiently concave as function of G) and assume that cross derivatives $\frac{\partial^2 a}{\partial G \partial n^E}$ and $\frac{\partial^2 a}{\partial G \partial A}$ are non-negative (which means that public investment is not less effective in raising productivity in more advanced economies). In this case, as shown in the proof of the following result, G_t^E is positively linked to the stage of development (characterized by n_{t-1}^E and A_{t-1}).

Proposition 2. *For $t > 1$, the following holds.*

(i) *A higher concentration of landholdings (z) or an increase in entry barriers (\bar{k}) lower G_t in political equilibrium, whereas better financial institutions (higher η) raises it.*

(ii) *Suppose that initial conditions are such that, for a time-invariant public spending level $G_t = G$, manufacturing productivity (A) increases and the share of workers in the X -sector (n^X) decreases over time. Then G_t in political equilibrium is increasing over time in the transition to a steady state.*

As higher public investment in some period \hat{t} , $G_{\hat{t}}$, raises manufacturing productivity $A_{\hat{t}}$, it is evident that (when anticipated) it raises the equilibrium share of entrepreneurs and manufacturing output for all $t \geq \hat{t}$ during the

transition to a steady state. Part (i) of Proposition 2 therefore implies that higher ownership concentration impedes economic development also through the political channel, in addition to the economic channel as shown in Proposition 1. Both channels are mutually reinforcing. By retarding development, a higher z shifts also political power from entrepreneurs to landowners, due to the effect on profits. The resulting lower G -level in political equilibrium further slows down economic development. Moreover, as lower entry barriers or better financial development increase the political weight of entrepreneurs vis-à-vis landowners, a decrease in \bar{k} or an increase in η raises public investment in political equilibrium.

Part (ii) of Proposition 2 implies that there is a positive feedback loop from economic development to public investment and further development. Suppose that we start in the first scenario discussed in section 3. That means, the economy has reached the stage of development corresponding to the South-East corner in Fig. 2. Then, over time, the distribution of profits, and consequently the distribution of political power, changes in favor of the entrepreneurial elite. Moreover, G^E is rising over time. Economic development, by giving rise to a new political class, triggers an increase of public investment in political equilibrium, which in turn leads to faster growth during the transition to a steady state.

5 Evidence

This section provides evidence for the main channel proposed by our theory: that oligopsony power associated with a high concentration of landholdings depresses income of peasants, therefore impeding entrepreneurship outside the agricultural sector.

5.1 Oligopsony Power of Owners: US State Level Evidence

Braunhaut (1949) and Wright (1987, Fig. 1) provide historical data for farm labor wage rates for the time periods 1909-1948 and 1866-1942, respectively. They find substantial and persistent regional wage differentials between the South – which was characterized by large plantations – and the rest of the country. Consistent with our basic hypothesis, Braunhaut (1949, p. 189) attributes these wage differences to “the fact that agricultural workers have largely remained unorganized [...] [and] virtually without bargaining power, particularly in the instances where farms are being operated on a commercial basis by absentee owners”. We will now provide more detailed empirical evidence from historical US state-level data on the presence and quantitative importance of oligopsony power of owners in the rural labor market. We aim to establish a positive relationship of dependent agricultural income, I^X , to the share of farm owners in the total population (inversely corresponding to the ownership concentration measure z in the model), and a negative relationship of I^X to the share of labor in the agricultural sector, n^X , as assumed in (7).

We utilize data for the years 1880 and 1910 from several sources. Data on remuneration of farm labor come from the US Department of Agriculture, which reports monthly wages for farm labor with and without board. Wages without board are received by those who earn cash wages only, without provision of food or housing. Log wages without board range from 2.33 to 3.71 in 1880 and from 2.8 to 3.99 in 1910, where the lowest wage was paid in South Carolina in both years. The percentage of labor force in agriculture is taken from Kuznets, Miller and Easterlin (1960). It varies greatly across

states for the considered time period, from 10.1 percent (Massachusetts) to 86 percent (Alabama) in 1880, where high shares can be especially found in the Southern states. In 1910, it ranges from 4.4 percent (Massachusetts) to 76.4 percent (Mississippi). The unweighted average across states has fallen from 53.1 to 35.8 percent between 1880 and 1910. The remaining variables, among them the share of farm owners in the population, are constructed from data obtained by the U.S. Bureau of the Census (1976). The exact definitions of utilized variables in Tab. 2 and data sources can be found in Appendix C.

<Table 2>

Tab. 2 shows results from regression analysis with log wages of farm labor without board as dependent variable. Columns (1) and (3) give the most parsimonious specification for 1880 and 1910, respectively, as suggested by the assumed relationship $I_t^X = I^X(n_t^X, z)$ in (7). Fig. 1 in the introduction is based on the estimation results shown in column (3). Both the ownership variable and the labor force share in the agricultural sector have the expected, statistically and economically highly significant impact on farm wages. The coefficients for the share of farm owners in total population provide support for the importance of oligopsony power of owners. Increasing this share by one standard deviation would increase farm labor wages by 11.8 percent in 1880 and by 18.7 percent in 1910. As we have argued in section 2 and shown formally in Appendix A, in absence of oligopsony power the ownership pattern would be inconsequential for wages in the primary sector.

Moreover, our estimates imply that a decrease of the agricultural labor share by 10 percentage points (about half a standard deviation in both 1880 and 1910) would increase wages by 11 to 16 percent, depending on the specification. Importantly, our results are not driven by differences in the fertility

of land or the type of crops grown. Controlling for the land value per acre does not affect the results.²⁷ Besides in column (6) where the land value enters positively and is statistically significant, it has an insignificant (and negative) effect. Interestingly, if we add the fraction of native whites among farm owners as additional control, the size and significance of our variables of interest are not affected either, as shown in column (7). Rather, we obtain the additional result that the share of native whites among owners negatively affects wages.²⁸ An increase in this variable by one standard deviation depresses wages of farm labor by about 12 percent. This suggests that especially native white owners possessed wage setting power in the primary sector.

We also performed several robustness checks. First, although according to our model the percentage of the labor force in agriculture affects farm wages contemporaneously, one might argue that there may be a problem of reverse causality: if wages in the primary sector are high, many workers seek employment in this sector. (Historically, though, farm wages were typically much lower than wages in the manufacturing sector.) We therefore entered the agricultural labor share from 1880 in the regression for 1910 (columns (5) and (6)). This basically leaves the results unaffected. Second, focussing on wages without board as done in Tab. 1 may be problematic if many farm workers received other forms of remuneration than cash wages. Replacing the dependent variable by log monthly farm wages with board leaves the results basically unchanged (not shown). The only difference is that it some-

²⁷It does not make a difference if we control for the value per acre of all land in a state or the value per acre of land operated by landowners (results not shown). Both variables are highly correlated across states, with a correlation coefficient of 0.991 in 1910. (The value of land operated by landowners is however not available for 1880.)

²⁸The variable cannot be constructed for 1880. For 1910, it ranges from 43 percent in Minnesota to 98 percent in West Virginia.

what enlarges the effect of the ownership variable on farm wages. Third, if we replace our ownership variable by the share of landowners in the rural population or alternatively by the number of landowners per family, results are not considerably affected either.²⁹

5.2 Latin America

The strong concentration of landholdings in Latin America has been widely documented in the literature (e.g. McBride 1936; Mosk, 1951; Katz, 1974; Morse, 1975; Clark, 1971; Barraclough, 1970; Bulmer-Thomas, 1994). Apart from its implication on political outcomes, an important economic result of the oligarchic ownership structure was a substantial degree of power of large landowners in the labor market for rural work and over tenants. Binswanger, Deininger and Feder (1995; p. 2678) conclude that “a major purpose of the huge landholdings was to restrict the indigenous population’s possibilities for independent cultivation”. Peasants were typically allowed to cultivate a small piece of land on the farm of owners of haciendas or landlord estates for own subsistence in exchange for labor services, for which they might not even receive a wage payment. Clearly as a result of oligopsony power of owners, these “share tenants do not receive their full marginal product” (Binswanger, Deininger and Feder, 1995; p. 2670).

Regional oligopsony power was also secured by restrictions on peasant

²⁹One may argue that the number of owners per family is more relevant for oligopsony power of owners in the labor market than the average number of owners in the total population used in Tab. 2. For 1880, however, the variable cannot be constructed since the number of families is not available in the Census data. For 1910, the number of owners per family across states is highly correlated with the average number of owners in the total population, with a correlation coefficient of 0.988. This explains why results do not change. All additional results and robustness checks not shown in Tab. 2 are available from the corresponding author upon request.

mobility through vagrancy laws or debt peonage.³⁰ Vagrancy laws were introduced 1825 in El Salvador and 1877 in Mexico.³¹ In Guatemala vagrancy laws replaced debt peonage in 1934 (abandoned in response to international pressure), implying that someone with little or no land had to work at least 150 days per year on a coffee plantation. From the perspective of a large landowner, such legal measures kept the elasticity of labor supply low and thereby enhanced oligopsony power. As a result, the real wage rate for agricultural labor was extremely low. For instance, in Guatemala it showed no upward trend in the century prior to the revolution in 1944 (Schweigert, 2004, Tab. 5). Still in the 1960s, average annual per capita peasant incomes in Brazil, Chile, Columbia, Ecuador, Guatemala and Peru were just about USD 40-100 (Barraclough, 1970).

Despite revolts and revolutions, triggered by the dramatic concentration of landholdings in Latin America and the resulting situation of most peasants, land reforms have mostly been unsuccessful. As a notable exception, Mexico implemented an eventually successful land reform, starting in 1917. It was confiscatory for land in excess of 100 hectares. Total compensation to landowners was a mere fraction of 0.5 percent of expropriated land (Flores, 1970).³² In line with our prediction that less concentrated land ownership

³⁰The poor village and smallholder population accepted to work on the plantations in return to cash advances and had to stay until the debt was paid off. Debt repayment was difficult, however. Employers operated company stores where goods were sold at inflated prices. This contributed to a stagnation of real wages for many decades. After death, the duty to repay debt was passed on to children. (See Katz, 1974, and Bulmer-Thomas, 1994, ch. 4.) As the 93th conference of the International Labour Organization, held in Geneva in June 2005, has pointed out, debt bondage is even nowadays frequently detected, at fairly large scale, by government inspectors on Brazilian farms.

³¹See Binswanger, Deininger and Feder (1995, Tab. 42.1, Appendix 1) for a systematic account of legal measures to “surplus extraction” to the favor of large landowners in many parts of the world.

³²In contrast, the envisaged large-scale land reform in Venezuela, which began in 1958, was impeded due to high costs of the government, which aimed to compensate landowners

is conducive for investments of initially landless households outside the primary sector, Flores (1970, p. 904) concludes that “there is no doubt that high rates of capital formation for Mexico’s industrial revolution in the early stages of the reform, 1917-42, came from agriculture”.

Overall, however, the oligarchic ownership of land in Latin America resulted in a slow-growing manufacturing sector.³³ Until the last quarter of the nineteenth century, industrial development was in fact negligible.³⁴ During the first half of the twentieth century the situation eventually improved, although manufacturing development still lagged considerably behind most regions of North America. Manufacturing output as share of GDP in 1913 was 16.6 percent in Argentina and 14.5 percent in Chile (Bulmer-Thomas, 1994, Tab. 5.3). In Brazil in 1920 it was 12.1 percent, but only 3 percent of the labor force was employed in modern manufacturing. Mexico, with 12.3 percent in 1910 had a comparable manufacturing share, whereas that of Columbia was just 6.7 percent in 1925. For instance, the share of employment in the agricultural sector was basically stable between 1880-1930 in Brazil at circa 2/3, whereas it sharply declined in the United States and Canada from around 50 percent to 22 and 31 percent, respectively.³⁵

according to the market value of land.

³³Consistent with our assumptions, labor was the main input in current manufacturing production and, in contrast to the agricultural or mining sector, typically decently remunerated (see Bulmer-Thomas, 1994, p. 121).

³⁴Unsurprisingly, also urbanization was much slower than in the United States. In Argentina, Chile, Mexico and Uruguay, for instance, the fraction of the national population living in the largest cities basically stagnated in the entire nineteenth century (e.g., around 10 percent in Mexico). In the U.S. the population share residing in towns of 8000 or more inhabitants gradually rose from 4.9 percent in 1810 to 33 percent in 1900 (Morse, 1975, pp. 5-9).

³⁵See the data provided by Peter Lindert under www.econ.ucdavis.edu/faculty/fzlinder/.

5.3 India

In India, during the British empire many small peasants lost their land and became wage workers in the agricultural sector (Patnaik, 1983). Land concentration particularly increased in areas where the British introduced landlord-based revenue systems for collecting land taxes. In these areas, single landlords were free to collect taxes from peasants to fulfil the revenue liability of a village, whereas in other areas revenue settlement was directly made with individual cultivators or village bodies which jointly owned the village (Banerjee and Ivor, 2005).³⁶ Similarly to many parts of Latin America, wage negotiations were infrequent and agricultural workers were often tied to landlords by debt peonage. Roy (2005) provides evidence that, as a result, the average real wage for agricultural labor in colonial India showed no upward trend from the 1870s until the end of the British empire. In contrast, real wages in urban areas increased significantly.

Rosenzweig (1978) exploited the regional variation of land inequality in India to examine labor market effects of changes in land concentration among owners, employing data from a household survey in 1960-61 from 159 Indian districts. He shows that higher land concentration (measured by the Kuznets ratio of landholding inequality) has a strong negative impact on agricultural wages. In line with our theory based on labor market power of large owners, he concludes that this finding “may partly reflect the monopsonistic restrictions on wages and employment by relatively large landowners” (Rosenzweig, 1978, p. 860).³⁷ Also consistent with our basic mechanism, Besley and

³⁶Banerjee and Ivor (2005) show that still in the period 1960-85 both agricultural investment and agricultural productivity were smaller in landlord-based systems, suggesting that historical institutions can have long-lasting effects on economic outcomes.

³⁷According to survey data from 1970-71, 79 percent of households with farms up to 1.5 acres had family members who participated in the labor market (Rosenzweig, 1978), implying that also smallholders are affected by labor market power of large owners.

Burgess (2000) provide evidence from panel data for 16 Indian states, 1958-92, that land reform measures, especially those improving income of tenants, have had a substantial positive impact on agricultural wages, but no effect on agricultural output, and reduced poverty.

5.4 Taiwan and South Korea

There is still a controversy about the determinants of the remarkable pace of development in Taiwan and South Korea after independence from Japanese colonial rule. For instance, Rodrik (1995) challenges the widespread belief that the ‘East-Asian miracle’ can mainly be explained by the governments’ trade policy. He rather points to possible effects of the unusually successful land reforms and a negative relationship between rates of economic growth and land inequality (rather than income inequality) in cross-country data.

Our paper may contribute to this debate by proposing an economic mechanism for beneficial effects of land redistribution. In Taiwan, during the Qing’s dynasty rule (1683-1895), land concentration was greatly enhanced when individuals or land companies purchased land from the government or from aborigines. Smallholders saw little change in real income during Japanese rule and were largely dependent on wage income, whereas the value of land increased quickly. At the end of World War II, after Taiwan was transferred to China, the Nationalist government confiscated Japanese property and, with American help, initiated a major land reform in three steps between 1949-53. First, public land was sold to tenants at a fairly low price (equal to 2.5 times annual yield of the main crop). Second, the rent tenants had to pay to landowners was limited to a maximum of 37.5 percent of normal harvest value, down from typically over 50 percent. Third, and maybe most important, landowners had to sell land in excess of 3 hectares to the govern-

ment, which resold it to tenants. An estimated 37 percent of cultivated land was redistributed under the program and farm incomes rose dramatically, by 230 percent to 1968 (Minns and Tierney, 2003). In line with our theory, Minns and Tierney (2003) argue that this “created the basis for a large number of small entrepreneurs [...] to develop manufacturing businesses. [...] Non-farm income for rural households was already 79 percent of their total household income in 1966, rising to 89 percent a decade later”. Per capita income grew by almost 6 percent in the three decades after land reform and productivity growth accounted for about 2/3 of total growth. Between 1945 and 1972, the agricultural labor share fell from 2/3 to 1/3 (Oshima, 1986). Consistent with our model, growth in manufacturing was driven by small enterprises. In 1961, 99.1 percent of manufacturing businesses had less than 100 employees. The average size was 8, increasing to 28 until 1971 (Mao and Schive, 1995).³⁸ Many small enterprises were located in rural areas.

In Korea, during the 19th century a powerful class of landowners emerged and real wages (in terms of rice) were falling, only slightly rebounding in the first half of the 20th century. Due to the fear that tenants would shift towards communism, the U.S. military administration pressed towards land reform, which started 1950 (Agricultural Land Reform Amendment Act). Similar to Taiwan, it enforced a cap on landholding of about 3 hectares. Moreover, farms had to be owner-managed or –cultivated. The government also bought land at low prices and sold it to tenants, who largely made payments in rice (Jeon and Kim, 2000).³⁹ Compared to the colonial period,

³⁸In the 1950s growth was particularly fast in food-processing and textile industries. Later, industries in electronics and metal products evolved.

³⁹Half of the land was already sold prior to 1950 in anticipation of land reform. Landowners were basically forced to these transactions due to personal security threats after the end of Japanese rule. This was also the reason for the weak resistance of owners to land reform.

rice wages almost tripled until the end of the 1960s (Cha and Wu, 2002, Fig. 7). Like Taiwan, South Korea saw quick emergence of small manufacturing enterprises. This is remarkable as political and economic support mostly focussed on big firms in the 1950s.⁴⁰ According to Rodrik (1995), and in line with the role of initial productivity and productivity-promoting policies in our model, the fast development of manufacturing businesses was supported by the good education system and public infrastructure, already established under Japanese rule. But the timing of the emergence of small businesses (despite suffering from the Korean war 1950-53) is consistent with the effects of a land redistribution predicted by our model.⁴¹

6 Concluding Remarks

While land and other natural resources are the key factor in primary goods production, development and structural change are driven by capital investments into manufacturing firms. The level of such investments depends on the number of individuals who have both an economic interest in and the economic means for entrepreneurial activities. In early stages of development, characterized by a substantial size of the primary sector and low manufacturing productivity, the means must be earned in the primary sector. How

⁴⁰These were mostly former Japanese large scale industrial facilities established before 1940. The 115 biggest firms produced 33 % of manufacturing output in 1958 (Regnier, 1993, Tab. III). Later on, government support shifted more and more to smaller firms as their important role was increasingly recognized.

⁴¹The salient role of small businesses in early stages of development is well documented also for today's transition countries. In their survey, McMillan and Woodruff (2002, p. 166) stress that "New firms have usually been the fastest growing segment in transition economies", compared to privatized firms. For instance, about one-sixth of industrial workers in Poland in 1994 were employed in start up firms. In Estonia, start-ups created almost all new jobs between 1989-94 and more than half of the new jobs in Bulgaria and Romania.

much of the income from primary goods production is left for entrepreneurial investment depends on the rents kept by landowners. These rents depend on the ownership-concentration of landholdings and on the size of the labor force supplied to the primary sector.

Based on this line of reasoning, the dynamic equilibrium model of economic growth proposed in this paper suggests that an oligarchic land ownership is a major obstacle to entrepreneurship, structural change and economic development. Our primary focus was on the oligopsony power of landowners in the rural labor market which in interaction with imperfect credit markets retards economic development. While emphasizing the economic channel through which concentrated land ownership affects development, we do not deny the important role of political factors. Since rents accruing to large owners diminish the opportunities for peasants to develop entrepreneurial activity, they also dampen the chances that a new political force – the owners of manufacturing firms – emerges and shapes policy and institutions. The emerging entrepreneurial class does not share the landowners' interests against policies that promote manufacturing productivity, for example, investment in education.

Our empirical analysis of historical US data about land ownership and farm wages is consistent with the predicted role of ownership concentration of landholdings for oligopsony power of landowners in the rural labor market. This role is also supported by evidence from Latin America, India, Taiwan and South Korea. Moreover, the evidence on the emergence of small manufacturing businesses in Taiwan and South Korea immediately in the aftermath of land reform suggests that a more equal land distribution plays an important role for promoting economic development apart from politically determined factors like the provision of education. An interesting task for

future research may be to examine the role of the ownership structure in the gold-, oil-, uranium-, tin- or diamond-industry for the poor development of African countries within our framework.

Appendix

A. Income Levels

This appendix provides microfoundations for the wage income in the manufacturing sector, $w_t^Y = \alpha A_t$, as well as for the properties of income of workers in the X -sector, I^X , and of landowners, π^x , as hypothesized in (7) and (8), respectively.

Manufacturing sector: $w_t^Y = \alpha A_t$ can be rationalized in at least two ways. First, consider Nash bargaining between entrepreneurs and workers. According to production function (2), the current profit per unit of labor is given by $A - w^Y$. Thus, when outside options of both parties are zero, wage rate $w^Y = \alpha A$ maximizes the Nash product $(w^Y)^\alpha (A - w^Y)^{1-\alpha}$, where $\alpha \in (0, 1)$ reflects the bargaining power of workers and $1 - \alpha$ that of entrepreneurs.

Second, suppose output of a single entrepreneur is given by $y = Ael^y$, where e denotes unobservable effort level per worker. Assume that disutility of effort provision enters workers' utility additively. Let this disutility be given by a function $q(e, w, \bar{w})$, where \bar{w} is a reference wage which workers perceive as fair, as in Akerlof and Yellen (1990). It is plausible to assume that \bar{w} is related to productivity per efficiency unit of labor, A . So let the fair wage in t be given by $\bar{w}_t = \alpha A_t$, $0 < \alpha < 1$. Also suppose that a higher gap between the actual wage w and \bar{w} raises disutility of effort. For concreteness,

we specify $q(e, w, \bar{w}) = 0.5e^2 - e - e \log(w/\bar{w})$, i.e., workers choose effort

$$\tilde{e}(w, \bar{w}) \equiv \arg \min_{e \geq 0} q(e, w, \bar{w}) = 1 + \log(w/\bar{w}). \quad (21)$$

Entrepreneurs now set wage rate w^Y to minimize wage costs per unit of effort, w/\tilde{e} . With $\tilde{e} = 1 + \log(w/\bar{w})$, this indeed leads to $w^Y = \bar{w} = \alpha A$; moreover, workers provide effort $e = \tilde{e}(\bar{w}, \bar{w}) = 1$, i.e., we have $y = Al^y$ as given by (2).

Agricultural sector: We present a simple oligopsony model which gives rise to the properties of I^X and π^X in (7) and (8), respectively. Let w_t^X be the wage rate and $l^S(w_t^X)$ be individual labor supply of a worker in the X -sector in t . At any date t capacity investment decisions by entrepreneurs are already made in the previous period, where total employment capacity installed in $t - 1$ will equal L_t^Y . Landowners therefore face a labor supply schedule $L_t^X = N_t^X l^S(w_t^X)$, $N_t^X = N^L - L_t^Y$. Suppose for simplicity that individual labor supply takes the isoelastic form $l^S(w) = w^{1/\vartheta}$, $\vartheta > 0$, so that the inverse labor supply function in the X -sector is given by $w^X = (L^X/N^X)^{\vartheta}$. Observing this schedule, owners simultaneously choose labor demand (l^x) to maximize profits $\pi^x = z f(l^x/z) - w^X l^x$, taking the hiring of others as given. Then, since employers are identical, in Nash equilibrium we have $l^x = L^X/N^Z$ and the wage rate follows the standard oligopsony formula:

$$w_t^X = \frac{f'(l_t^x/z)}{1 + \vartheta/N^Z}. \quad (22)$$

Thus, wages in the X -sector are below their marginal product. Individual wage income in the X -sector is given by $I^X = w^X l^S(w^X)$.

We first show that, in equilibrium, w^X is decreasing in both n^X and z , which implies $\frac{\partial I^X}{\partial n_t^X} < 0$ and $\frac{\partial I^X}{\partial z} < 0$, respectively. Combining $L^X = N^X l^S$

with $L^X = N^Z l^x$ we have $l^x = l^S N^X / N^Z$. From this, using $n^X = N^X / N^L$, $z = Z / N^Z$ and normalization $Z = N^L$, we have obtain $l^x / z = l^S n^X$. Hence, using $l^S(w) = w^{1/\vartheta}$ and $z = N^L / N^Z$, (22) can be rewritten as:

$$f' \left((w^X)^{\frac{1}{\vartheta}} n^X \right) = \left(1 + \frac{\vartheta z}{NL} \right) w^X. \quad (23)$$

This implicitly defines the equilibrium wage rate in the primary sector, $\tilde{w}^X(n^X, z)$, as function of n^X and z . Observing $f'' < 0$, we find $\frac{\partial \tilde{w}^X}{\partial n^X} < 0$ and $\frac{\partial \tilde{w}^X}{\partial z} < 0$. This confirms the properties of $I^X = w^X l^S(w^X)$ in (7). For later use, from (23) it is also easy to show that

$$\frac{1}{\vartheta} \frac{\partial \tilde{w}^X}{\partial n^X} \frac{n^X}{w^X} + 1 = \frac{\vartheta f'}{\vartheta f' - (w^X)^{\frac{1}{\vartheta}} n^X f''} > 0. \quad (24)$$

We next consider the profit of a landowner, given by $\pi^x = z f(l^x/z) - w^X l^x$. Using $l^x/z = l^S n^X$ and $l^S(w) = w^{1/\vartheta}$ we can write

$$\pi^x = z \left[f \left((w^X)^{\frac{1}{\vartheta}} n^X \right) - (w^X)^{\frac{1}{\vartheta}+1} n^X \right], \quad (25)$$

where $w^X = \tilde{w}^X(n^X, z)$ in equilibrium. Hence,

$$\begin{aligned} \frac{\partial \pi^x}{\partial n^X} &= z \left[f' \left((w^X)^{\frac{1}{\vartheta}} n^X \right) \left(\frac{1}{\vartheta} (w^X)^{\frac{1}{\vartheta}-1} \frac{\partial \tilde{w}^X}{\partial n^X} n^X + (w^X)^{\frac{1}{\vartheta}} \right) - \right. \\ &\quad \left. \left(\frac{1}{\vartheta} + 1 \right) (w^X)^{\frac{1}{\vartheta}} \frac{\partial \tilde{w}^X}{\partial n^X} n^X - (w^X)^{\frac{1}{\vartheta}+1} \right]. \end{aligned} \quad (26)$$

Substitute (23) into (26) to obtain

$$\frac{\partial \pi^x}{\partial n^X} = z (w^X)^{\frac{1}{\vartheta}+1} \left[\frac{\vartheta}{NZ} \left(\frac{1}{\vartheta} \frac{\partial \tilde{w}^X}{\partial n^X} \frac{n^X}{w^X} + 1 \right) - \frac{\partial \tilde{w}^X}{\partial n^X} \frac{n^X}{w^X} \right]. \quad (27)$$

Using $\frac{\partial \tilde{w}^X}{\partial n^X} < 0$ and (24), we find $\frac{\partial \pi^x}{\partial n^X} > 0$. In an analogous way, (25) implies

$$\frac{\partial \pi^x}{\partial z} = \frac{\pi^x}{z} + z(w^X)^{\frac{1}{\vartheta}} \left(\frac{1}{N^Z} - 1 \right) \frac{\partial \tilde{w}^X}{\partial z} n^X > 0, \quad (28)$$

(Recall $z = N^L/N^Z$, $N^Z > 1$ and $\frac{\partial \tilde{w}^X}{\partial z} < 0$.) This confirms (8).

Finally, we address the claims in the main text for the case where the wage rate in the X -sector is equal to its marginal product; that is, landowners' labor demand, l^x , is implicitly defined by $f'(l^x/z) = w^X$ as a function $\tilde{l}^x(w^X, z)$ with $\frac{\partial \tilde{l}^x}{\partial w^X} < 0$ and $\frac{\partial \tilde{l}^x}{\partial z} = \frac{l^x}{z}$. Using this in the labor market clearing condition $N^Z \tilde{l}^x(w^X, z) = N^X (w^X)^{\frac{1}{\vartheta}}$, we get the following implicit characterization for the equilibrium wage for agricultural labor:

$$\tilde{l}^x(w^X, z) - n^X z (w^X)^{\frac{1}{\vartheta}} = 0 \quad (29)$$

(recall that individual labor supply is $l^S(w) = w^{1/\vartheta}$). This defines $w^X = \tilde{w}^X(n^X, z)$ in the competitive equilibrium. It is straightforward to show that $\frac{\partial \tilde{w}^X}{\partial n^X} < 0$ and $\frac{\partial \tilde{w}^X}{\partial z} = 0$. (Use $\frac{\partial \tilde{l}^x}{\partial w^X} < 0$ and $\frac{\partial \tilde{l}^x}{\partial z} = \frac{l^x}{z}$.) Thus, as claimed in the main text, $\frac{\partial I^X}{\partial n^X} < 0$ and $\frac{\partial I^X}{\partial z} = 0$. Moreover, an owner's profit equals

$$\pi^x = z f \left(\frac{\tilde{l}^x(w^X, z)}{z} \right) - w^X \tilde{l}^x(w^X, z), \quad (30)$$

where $w^X = \tilde{w}^X(n^X, z)$. Differentiation with respect to n^X yields: $\frac{\partial \pi^x}{\partial n^X} = -\frac{\partial \tilde{w}^X}{\partial n^X} \tilde{l}^x > 0$, where the envelope property has been used. In an analogous way, differentiation with respect to z yields: $\frac{\partial \pi^x}{\partial z} = f(\frac{\tilde{l}^x}{z}) - \frac{\tilde{l}^x}{z} f'(\frac{\tilde{l}^x}{z}) - \frac{\partial \tilde{w}^X}{\partial z} \tilde{l}^x$. Using $\frac{\partial \tilde{w}^X}{\partial z} = 0$ together with the fact that $f > \frac{\tilde{l}^x}{z} f'$ for a standard production function f also confirms $\frac{\partial \pi^x}{\partial z} > 0$.

B. Proofs

Proof of Lemma 1: If the credit constraint is binding,

$$l_t^{yc} = \sqrt{2(\eta I_{t-1}^X - \xi - \bar{k})} < l_t^{y*}. \quad (31)$$

Moreover, $\eta I_{t-1}^X = k(\xi, l_t^{yc})$. Hence, for an agricultural worker who becomes entrepreneur, profits are:

$$\begin{aligned} \pi^{yc}(\xi) &= (1 - \alpha)A_t l_t^{yc} - 0.5(l_t^{yc})^2 - \xi - \bar{k} \\ &= (1 - \alpha)A_t \sqrt{2(\eta I_{t-1}^X - \xi - \bar{k})} - \eta I_{t-1}^X. \end{aligned} \quad (32)$$

π^{yc} rises in both η and I^X . Workers who work in the X -sector in their first period of life become entrepreneur in t if $\pi_t^{yc}(\xi) \geq 0$, which is equivalent to

$$\xi \leq \eta I_{t-1}^X - 0.5 \left(\frac{\eta I_{t-1}^X}{(1 - \alpha)A_t} \right)^2 - \bar{k} \equiv \xi_t^c, \quad (33)$$

according to (32). Since π^{yc} declines with ξ and $\pi^{yc} < \pi^{y*}$ for any (A, ξ) , it is immediate that $\xi_t^c < \xi_t^*$. Moreover, π^{yc} is increasing in both η and I^X , since $l_t^{yc} < l_t^{y*} [= (1 - \alpha)A_t]$. Thus, ξ^c is increasing in η , and, according to (7), decreasing in z as well as in n^X . Moreover, recall that I^X is independent of A and \bar{k} . Thus, according to (33), ξ^c is increasing in A and decreasing in \bar{k} .

■

Proof of Lemma 2: The properties of $\tilde{n}^E(A, n^X, z, \eta, \bar{k})$ follow from (12), (14) and Lemma 1. (Note that (14) implies $\frac{\partial \tilde{n}^E}{\partial n^X} = -(\xi^* - \xi^c) + n^X \frac{\partial \xi^c}{\partial n^X}$, where $\xi^* > \xi^c$ and $\frac{\partial \xi^c}{\partial n^X} < 0$ from Lemma 1.) $\tilde{Y}(A, n^X, z, \eta, \bar{k})$ has the same properties as \tilde{n}^E , whereas the opposite holds for $\tilde{n}^X(A, n^X, z, \eta, \bar{k})$. This follows from (15) and (16), by accounting for the following facts. (7) and

(13) imply that l^{yc} is independent of A and reacts to n^X , z , η , \bar{k} in the same way as stated for ξ^c in Lemma 1. As a consequence, $Q \equiv \int_0^{\xi^c} l^{yc} d\xi$ has the same properties as ξ^c . Moreover, like ξ^* also $\xi^* l^{y*}$ is a positive function of A and negatively depends on \bar{k} . Finally, $Q < \xi^* l^{y*}$. $\tilde{a}(A, n^X, z, \eta, \bar{k})$ is increasing in A and η while decreasing in n^X , \bar{k} and z , according to (3), (17) and the properties of \tilde{n}^E . ■

Proof of Proposition 1: The comparative-static results on n^E , n^X and Y follow, by observing Lemma 2, from the dynamic system described by equations (14)-(17). With respect to the profits of entrepreneurs, first note that π^{yc} , given by (32), and π^{y*} , given by (11), are increasing in A and decreasing in \bar{k} . Second, note that π^{yc} is increasing in η and I^X , where I^X is negatively related to both z and n^X , according to Lemma 1. (π^{y*} does neither depend on η nor on I^X .) The results on profits of landowners follow from (8). ■

Proof of Proposition 2: First, because $G_t^Z = 0$, (20) reduces to

$$G_t = \frac{(\Pi_{t-1}^Y/N^L)G_t^E}{\Pi_{t-1}^X/N^L + \Pi_{t-1}^Y/N^L}. \quad (34)$$

Also note that $\Pi^X/N^L = \pi^x/z$ (use $\Pi^X = N^Z \pi^x$, $z = Z/N^Z$ and $Z = N^L$) and

$$\frac{\Pi_t^Y}{N^L} = n_{t-1}^X \int_0^{\xi_t^c} \pi_t^{yc}(\xi) d\xi + (1 - n_{t-1}^X) \int_0^{\xi_t^*} \pi_t^{y*}(\xi) d\xi. \quad (35)$$

Proposition 2 is proven by deriving three lemmas. The first lemma characterizes G^E (focussing on interior solutions throughout), whereas the latter two lemmas characterize Π^X/N^L and Π^Y/N^L , respectively.

Lemma A.1. *For any $t > 1$, G_t^E is decreasing in z , \bar{k} , and increasing in η .*

Proof. Using profit function (11) together with relationship $A_{t+1} = a(n_t^E, G_{t+1}, A_t)$ between public investment and productivity, we find that the preferred public investment level of the representative of entrepreneurs in $t \geq 1$ is given by

$$G_t^E = \arg \max_{G_t \geq 0} \{0.5(1 - \alpha)^2 a(n_{t-1}^E, G_t, A_{t-1})^2 - \xi - \bar{k} - 0.5G_t\}. \quad (36)$$

(Recall that landless individuals face a tax $G_t/2$ in the second period of life, like young workers.) The first-order condition for maximization problem (36) reads

$$(1 - \alpha)^2 \frac{\partial a(n_{t-1}^E, G_t, A_{t-1})}{\partial G} a(n_{t-1}^E, G_t, A_{t-1}) = 0.5, \quad (37)$$

which implicitly defines G_t^E as function of n_{t-1}^E and A_{t-1} . Using (37) and the second-order condition we calculate $\frac{\partial G_t^E}{\partial n_{t-1}^E} > 0$ and $\frac{\partial G_t^E}{\partial A_{t-1}} > 0$, since $\frac{\partial^2 a}{\partial G \partial n^E} \geq 0$ and $\frac{\partial^2 a}{\partial G \partial A} \geq 0$ was assumed. Combining this with $\frac{\partial n^E}{\partial k} < 0$, $\frac{\partial n^E}{\partial z} < 0$, $\frac{\partial n^E}{\partial \eta} > 0$ (from Proposition 1) confirms the result. ■

Lemma A.2. *For any $t > 1$, Π_{t-1}^X/N^L is increasing in z .*

Proof. According to (25),

$$\frac{\pi_t^x}{z} = f\left((w_t^X)^{\frac{1}{\vartheta}} n_t^X\right) - (w_t^X)^{\frac{1}{\vartheta}+1} n_t^X. \quad (38)$$

Differentiating (38) with respect to z , and substituting (23), we find that

$$\frac{\partial[\pi_t^x/z]}{\partial z} = (w_t^X)^{\frac{1}{\vartheta}} \left[\left(\frac{1}{N^Z} - 1 \right) \left(\frac{\partial \tilde{w}^X}{\partial n_t^X} \frac{\partial n_t^X}{\partial z} + \frac{\partial \tilde{w}^X}{\partial z} \right) n_t^X + \frac{\vartheta}{N^Z} \frac{\partial n_t^X}{\partial z} w_t^X \right], \quad (39)$$

where $\frac{\partial n_t^X}{\partial z} > 0$, according to Proposition 1. Recalling $\frac{\partial \tilde{w}^X}{\partial n^X} < 0$, $\frac{\partial \tilde{w}^X}{\partial z} < 0$ and $N^Z > 1$ confirms the result. ■

Lemma A.3. *For any $t > 1$, Π_{t-1}^Y/N^L is decreasing in z .*

Proof. Differentiating (35) with respect to z yields

$$\begin{aligned} \frac{\partial (\Pi^Y/N^L)}{\partial z} &= -\frac{\partial n^X}{\partial z} \left[\int_0^{\xi^*} \pi^{y^*} d\xi - \int_0^{\xi^c} \pi^{y^c} d\xi \right] + \\ & n^X \frac{\partial \left(\int_0^{\xi^c} \pi^{y^c} d\xi \right)}{\partial z} + (1 - n^X) \frac{\partial \left(\int_0^{\xi^*} \pi^{y^*} d\xi \right)}{\partial z}. \quad (40) \end{aligned}$$

The first term in this sum is negative, since $\xi^c < \xi^*$, $\pi^{y^c} < \pi^{y^*}$ and, according to Proposition 1, $\frac{\partial n^X}{\partial z} > 0$. The second part of the sum is negative as well since ξ^c and π^{y^c} decrease with z , according to Lemma 1 and the proof of Proposition 1, respectively. The last term vanishes, since π^{y^*} and ξ^* are independent of z , according to (11) and (12). This proves Lemma A.3. ■

Now consider the implications of Lemma A.1-A.3 for G_t as given by (34). First, the impact of an increase in z on G_t (part (i) of Proposition 2) follows by combining Lemma A.1-A.3. The other comparative-static results in part (i) of Proposition 2 follow from Lemma A.1 together with Proposition 1. Part (ii) of Proposition 2 follows from $\frac{\partial G_t^E}{\partial n_{t-1}^E} > 0$ and $\frac{\partial G_t^E}{\partial A_{t-1}} > 0$ (see proof of Lemma A.1) and the fact that, along with declining n^X and rising A , entrepreneurial profits, π^{y^*} , π^{y^c} , as well as the share of entrepreneurs, n^E , increase over time whereas profits of landowners decrease. (Recall the proofs of Lemma 2 and Proposition 1.) This concludes the proof. ■

C. Definitions of Variables and Data Sources

Wages of farm labor without board: This corresponds to the variable “Wages of farm labor per month for the year or season, without board, by years and by States and Territories, in dollars”. For the 1880 regressions, it is obtained from U.S. Department of Agriculture (1901). As for the year 1880 wage data are not available, we took data from 1879. For 1910, we used data from U.S.

Department of Agriculture (1920).

Share of landowners in total population: We used the variable “Total farms cultivated by owners” for 1880 and “Total farms operated by owners” for 1910, respectively divided by “Total population”, from the U.S. Bureau of the Census (1976).⁴² For 1880, the variables “Total farms cultivated by owners”, “Total farms rented for fixed money rental” and “Total farms rented for shares of products” add up to the total number of farms in a state. We thus capture in the regression analysis the oligopsony power exerted by landowners. For 1910, there is also a category “Total farms operated by managers”, which may be related to the number of absentee landowners. We nevertheless leave this category out to ensure comparability to the 1880 data and because it is quantitatively of minor importance according to the data: only about 1.5 percent of farms are operated by managers (unweighted average across states), compared to a fraction of 70.9 percent of farms which are operated by owners in 1910.

Percentage of Labor Force in Agriculture: This is obtained from Kuznets, Miller and Easterlin (1960). As the variable is not separately reported for North Dakota and South Dakota, we use averages across these two states for all variables in our regression analysis.

Land Value per acre: We divided the variables “Average value per farm” for 1880 and “Average acreage per farm”, both available from the U.S. Bureau of the Census (1976).

Share of native white farm owners: The U.S. census data contain for 1910 the variable “Native white farm owners” which we divide by “Total farms operated by owners”.

⁴²See also <http://fisher.lib.virginia.edu/collections/stats/histcensus>, which however does not contain data on the size of the rural population which we used in our robustness checks available upon request.

References

Aghion, Philippe and Patrick Bolton (1997). A Theory of Trickle-Down Growth and Development, *Review of Economic Studies* 64, 151-172.

Aghion, Philippe, Peter Howitt and David Mayer-Foulkes (2005). The Effect of Financial Development on Convergence: Theory and Evidence, *Quarterly Journal of Economics* 120, 173-222.

Akerlof, George A. and Janet Yellen (1990). The Fair Wage-Effort Hypothesis and Unemployment, *Quarterly Journal of Economics* 105, 255-283.

Banerjee Abhijit V., Paul J. Gertler and Maitreesh Ghatak (2002). Empowerment and Efficiency: Tenancy Reform in West Bengal, *Journal of Political Economy* 110, 239-280.

Banerjee Abhijit V. and Lakshmi Iyer (2005). History, Institutions and Economic Performance: The Legacy of Colonial Land Tenure Systems in India, *American Economic Review* 95, 1190-1213.

Banerjee Abhijit V. and Andrew F. Newman (1993). Occupational Choice and the Process of Development, *Journal of Political Economy* 101, 274-298.

Barracrough, Solon L. (1970). Agricultural Policy and Land Reform, *Journal of Political Economy* 78, 906-947.

Bénabou, Roland (1996). Inequality and Growth, *NBER Macroeconomics Annual*, 11-74.

Bernanke, Ben, and Mark Gertler (1989). Agency Costs, Net Worth, and Business Fluctuations, *American Economic Review* 79, 14-31.

Besley, Timothy and Robin Burgess (2000). Land Reform, Poverty Reduction, and Growth: Evidence from India, *Quarterly Journal of Economics* 114, 389-430.

Binswanger, Hans P., Klaus Deininger and Gershon Feder (1995). Power, Distortions, Revolt and Reform in Agricultural Land Relations, in: J. Behrman

and T.N. Srinivasan (eds.), *Handbook of Development Economics*, Vol. 3B, Amsterdam, North Holland.

Braunhut, Herman Jay (1949). Farm Labor Wage Rates in the South, 1909-1948, *Southern Economic Journal* 16, 189-196.

Bulmer-Thomas, Victor (1994). *The Economic History of Latin America since Independence*, Cambridge: Cambridge University Press.

Centeno, Miguel A. (1997). Blood and Debt: War and Taxation in Nineteenth-Century Latin America, *American Journal of Sociology* 102, 1565-1605.

Cha, Myung Soo and Tsong-Min Wu (2002). Colonial Transition to Modern Economic Growth in Korea and Taiwan, Yeungnam University and National Taiwan University (mimeo).

Clark, Ronald J. (1971). Agrarian Reform: Bolivia, in: P. Dorner (ed.), *Land Reform in Latin America: Issues and Cases*, Land Economics Monographs, University of Wisconsin-Madison.

Crouzet, François (1985). *The First Industrialists: The Problem of Origins*, Cambridge: Cambridge University Press.

Doepke, Matthias and Fabrizio Zilibotti (2007). Occupational Choice and the Spirit of Capitalism, NBER Working Paper No. 12917.

Engerman, Stanley L. and Kenneth L. Sokoloff (2005). Colonialism, Inequality, and Long-run Paths of Development, NBER Working Paper No. 11057.

Falkinger, Josef and Volker Grossmann (2005a). Institutions and Development: The Interaction between Trade Regime and Political System, *Journal of Economic Growth* 10, 229-270.

Falkinger, Josef and Volker Grossmann (2005b). Distribution of Natural Resources, Entrepreneurship, and Economic Development: Growth Dynam-

ics with Two Elites, CESifo Working Paper No. 1562.

Flores, Edmundo (1970). Issues of Land Reform, *Journal of Political Economy* 78, 890-905.

Galor, Oded and Omer Moav (2006). Das Human Kapital: A Theory of the Demise of the Class Structure, *Review of Economic Studies* 73, 85-117.

Galor, Oded, Omer Moav and Dietrich Vollrath (2006). Land Inequality and the Emergence of Human Capital Promoting Institutions, Brown University Economics Working Paper No. 05-03.

Galor, Oded and Joseph Zeira (1993). Income Distribution and Macroeconomics, *Review of Economic Studies* 60, 35-52.

Hatton, Timothy J. and Jeffrey G. Williamson (1992). What Explains Wage Gaps between Farm and City? Exploring the Todaro Model with American Evidence, 1890-1941, *Economic Development and Cultural Change* 40, 267-294.

Jeon, Yoong-Deok and Young-Yong Kim (2000). Land Reform, Income Redistribution, and Agricultural Production in Korea, *Economic Development and Cultural Change* 48, 253-268.

Katz, Friedrich (1974). Labor Conditions on Haciendas in Porfirian Mexico: Some Trends and Tendencies, *Hispanic American History Review* 54, 1-47.

Kuznets, Simon, Ann Ratner Miller and Richard A. Easterlin (1960). *Population Redistribution and Economic Growth, United States, 1870-1950 / Volume 2: Analysis of Economic Change*, American Philosophical Society, Philadelphia.

Mao, Yu-Kang and Chi Schive (1995). Agricultural and Industrial Development in Taiwan, in: J.W. Mellor (ed.), *Agriculture on the Road to Industrialization*, Baltimore: John Hopkins University, 23-66.

Matsuyama, Kiminori (1992). Agricultural Productivity, Comparative Advantage, and Economic Growth, *Journal of Economic Theory* 58, 317-34.

McBride, George (1936). *Chile: Land and Society*, New York: American Geographical Society.

McMillan, John and Christopher Woodruff (2002). The Central Role of Entrepreneurs in Transition Economies, *Journal of Economic Perspectives* 16, 153-170.

Mellafe, R. (1971). *The Latifundio and the City in Latin American History*, Toronto: University of Toronto Press.

Minns, John and Robert Tierney (2003). The Labour Movement in Taiwan, *Labour History* 85, 103-128.

Morse, Richard M. (1975). The Development of Urban Systems in the Americas in the Nineteenth Century, *Journal of Interamerican Studies and World Affairs* 17, 4-26.

Mosk, Sanford A. (1951). Latin America versus United States, *American Economic Review* 41, 367-383.

Oshima, Harry T. (1986). The Transition from an Agricultural to an Industrial Economy in East Asia, *Economic Development and Cultural Change* 34, 783-809.

Patnaik, Utsa (1983). On the Evolution of the Class of Agricultural Laborers in India, *Social Scientist* 11, Issue 7, 3-24.

Piketty, Thomas (1997). The Dynamics of the Wealth Distribution and the Interest Rate with Credit Rationing, *Review of Economic Studies* 64, 173-189.

Proto, Eugenio (2007). Land and the Transition from a Dual to a Modern Economy, *Journal of Development Economics* 83, 88-108.

Regnier, Phillipe (1993). The Dynamics of Small and Medium-Sized En-

terprises in Korea and Other Asian NIEs, *Small Business Economics* 5, 23-36.

Rodrik, Dani (1995). Getting Interventions Right: How South Korea and Taiwan Grew Rich, *Economic Policy* 20, 55-97.

Rosenzweig, Mark (1978). Rural Wages, Labor Supply, and Land Reform: A Theoretical and Empirical Analysis, *American Economic Review* 67, 847-861.

Roy, Tirthankar (2005). Agricultural Labor and Economic Transition in Colonial India: Lessons from Wage Data, Yale University (mimeo).

Schweigert, Thomas E. (2004). Agricultural Wage Rates Under Forced and Free Labour: Pre-1944 and Post 1954 Guatemala, *Journal of Agrarian Change* 4, 532-552.

Sokoloff, Kenneth L. and Stanley L. Engerman (2000). Institutions, Factor Endowments, and Paths of Development in the New World, *Journal of Economic Perspectives* 14, 217-232.

U.S. Bureau of the Census (1976). *The Statistical History of the United States: From Colonial Times to the Present*, New York: Basic Books.

U.S. Department of Agriculture (1901). *Wages of Farm Labor in the United States, Results of Eleven Statistical Investigations, 1866-1899*, Bulletin 22.

U.S. Department of Agriculture (1920). *Yearbook of the United States Department of Agriculture*.

Wright, Gavin (1987). The Economic Revolution in the American South, *Journal of Economic Perspectives* 161-178.

Young, Craig (1995). Financing the Micro-Scale Enterprise: Rural Craft Producers in Scotland, 1840-1914, *Business History Review* 69, 398-421.

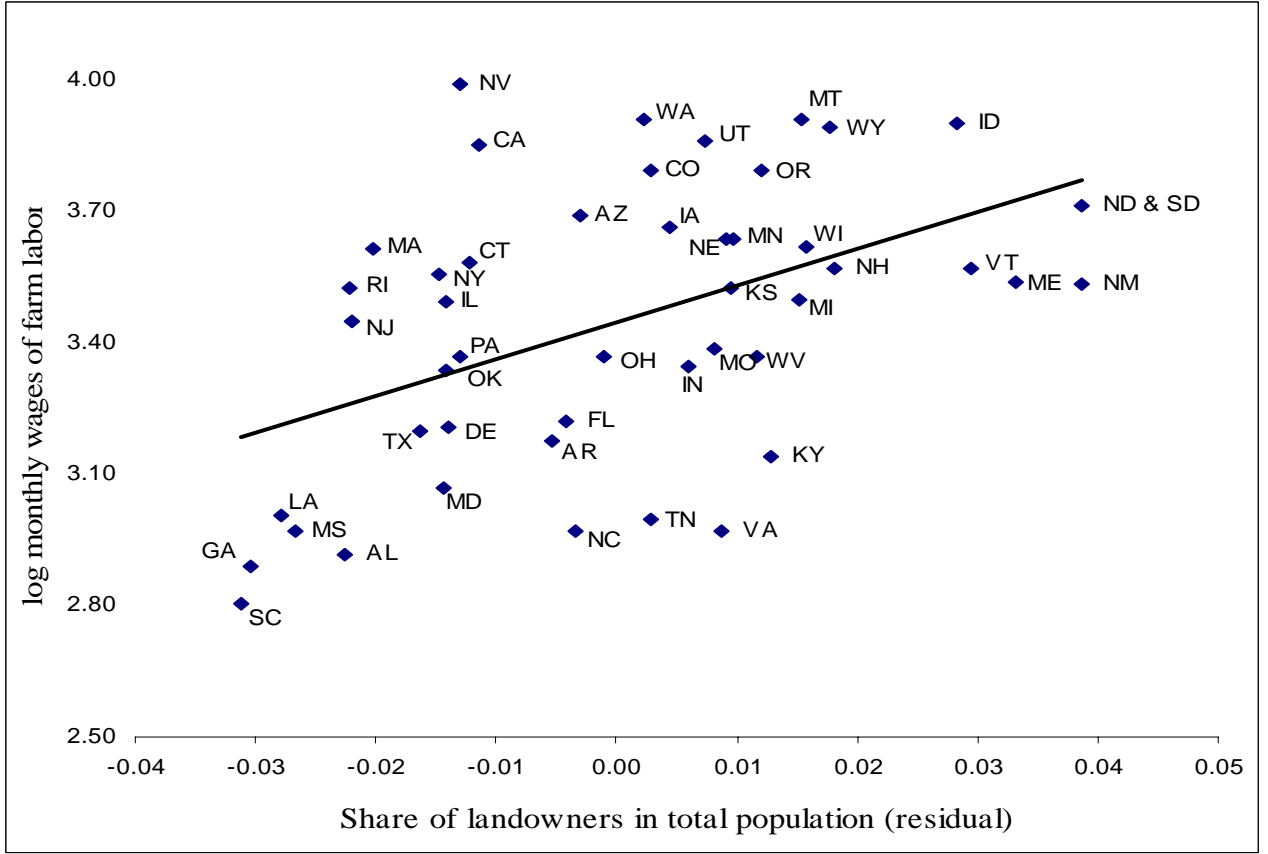


Figure 1: Relationship between share of landowners and log wages of farm labor in 1910 in U.S. states, controlling for the agricultural labor share.

	\bar{n}^X	Y / GDP	ξ^c	ξ^*	I^X	GDP
$z = 50$	0.90	0.16	0.15	0.35	0.15	1116.58
$z = 25$	0.72	0.41	0.29	0.44	0.26	1417.25
$z = 10$	0.47	0.63	0.47	0.49	0.48	1824.15
$\eta = 1$	0.95	0.08	0.09	0.30	0.22	1046.13
$\eta = 3$	0.48	0.62	0.47	0.49	0.32	1818.45
$\bar{k} = 0.2$	0.90	0.17	0.14	0.24	0.23	1123.98
$\bar{k} = 0$	0.42	0.67	0.49	0.61	0.34	1931.17

Table 1: Comparative-steady state analysis of variations in ownership concentration (z), financial development (η), and entry cost (\bar{k}).

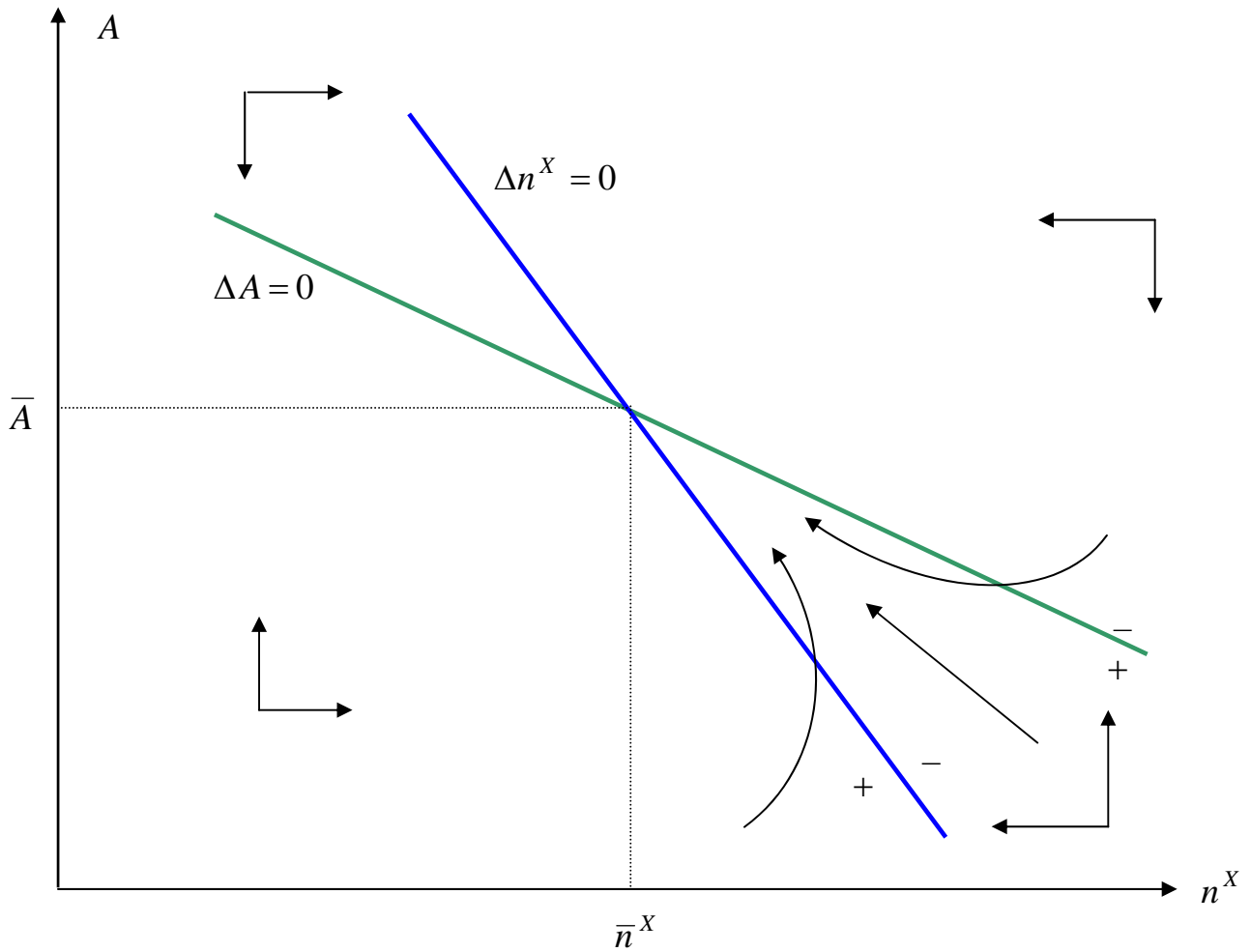


Figure 2: Productivity and structural change around a locally stable steady state.

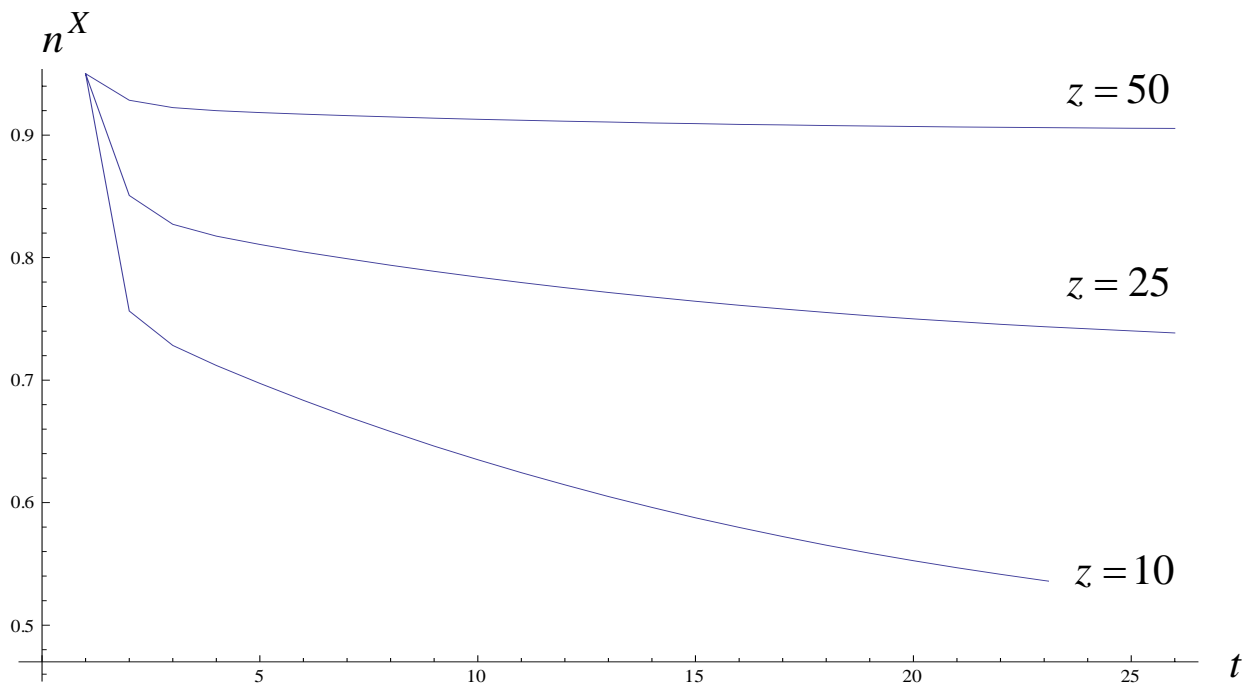


Figure 3: Impact of ownership concentration on structural change.

	1880		1910				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Log Wages of farm labor without board						
Share of landowners in total population	4.332** (1.784)	4.187** (1.839)	8.397*** (1.478)	8.315*** (1.591)	6.872*** (1.967)	8.111*** (1.733)	8.218*** (1.306)
Percentage of Labor Force in Agriculture	-0.011*** (0.002)	-0.014*** (0.004)	-0.015*** (0.001)	-0.015*** (0.002)			-0.016*** (0.002)
Percentage of Labor Force in Agriculture in 1880					-0.012*** (0.001)	-0.010*** (0.001)	
Land Value per acre		-0.005 (0.005)		-0.0004 (0.002)		0.004*** (0.001)	-0.0005 (0.002)
Share of native white farm owners							-0.974*** (0.214)
Constant	3.229*** (0.123)	3.515*** (0.382)	3.565*** (0.075)	3.596*** (0.184)	3.652*** (0.077)	3.308*** (0.110)	4.372*** (0.234)
Observations	37	37	47	47	37	37	47
R-squared	0.434	0.455	0.554	0.555	0.511	0.603	0.691

Values of robust standard errors are given in parentheses

*, **, *** indicate significance at the 10-percent level, 5-percent level and 1-percent level respectively

¹US States excluding District of Columbia, Alaska, Hawaii, North & South Dakota, Montana, Idaho, Wyoming, New Mexico, Arizona, Utah,

Washington, Oklahoma, Nevada

²US States excluding District of Columbia, Alaska, Hawaii

Table 2: Determinants of farm labor wages, using U.S. state-level data.