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ON THE ORGANIZATION OF RURAL MARKETS
AND THE PROCESS OF ECONOMIC DEVELOPMENT

by

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1. Introduction

The dual economy growth model (Lewis (1954), Ranis and Fei (1961), and Jorgenson, (1961). See Dixit (1973) for a good survey), is thought to provide a good description and tool of analysis for problems of development. The sectoral division chosen reflects several key distinctions between the agricultural and manufacturing sectors. The main one of course has been product specialization, the agricultural sector producing food, used solely for consumption, the industrial or manufacturing sector producing goods which may be used for either consumption or investment.

Product specialization is not the only difference between the two sectors, however. Factor inputs and methods of production are quite different, as is the location of the two sectors, agriculture of course being predominantly rural, manufacturing predominantly urban. Finally the economic and social organization of the two sectors is quite different. The manufacturing sector is mainly competitive or "capitalist", while the rural sector is largely characterized by non-competitive land and labor markets.

A central question which development models address is the transition from a low-income rural economy to a higher-income urban or manufacturing economy. Typically, the focus of interest has been on a positive description of the dynamics of the economy or on government policies to foster capital accumulation, which is the main source of growth, taking as given the basic characteristics set out above. Specifically, the literature has emphasized the role of rural income and the agricultural surplus in affecting the migration of labor and the growth of the economy. Lewis (1954) and Ranis and
Fei (1961) emphasized the need for surplus labor in agriculture, while Jorgenson (1961) stressed the effects of rural income and food supply in inducing migration to the urban sector.

In this paper our focus is quite different. Rather than taking the organization of rural sector described above as given, we ask how changes in its organization will affect the process of development. More specifically, we ask how the organization of the rural factor markets will affect saving and the accumulation of capital in the short- and long-run. We will look at the rural land and labor markets and compare the effects of competitive (that is, freely-traded factors being paid their marginal products) and non-competitive organization.

Our interest in the organization of the rural sector is motivated by, among other things, the question of land and other sorts of reforms in the rural sector. Specifically, the argument for more equal distribution of land or competitive payments to labor is that these will increase welfare of rural workers. While a given reform may clearly increase worker welfare in a static model where factor supplies to each sector are fixed, whether the same will be true in a dynamic model in the longer run will depend on how factor supplies are affected. This means considering both the process of equilibrium migration from rural to urban sector and the process of capital accumulation. If a given reform significantly affects capital accumulation, its long-run effect on welfare may be quite different from its short run effect. The main result of this paper is to show that in a simple growth model, the steady state capital stock may be lower when rural land and labor markets are
competitive than when one or both of these markets are non-competitive. This suggests that any evaluation of rural reform should be done in an explicitly dynamic model.

We consider a market-clearing, overlapping generations model with saving and capital accumulation. Migration thus becomes an equilibrium phenomenon, with workers migrating to equalize wages between the rural and the urban sector. To highlight our interest in the saving process and the land market, we will assume that there is no population growth, no technical progress\textsuperscript{1}, and that agricultural and manufacturing goods are perfect substitutes in consumption. On the production side the two sectors differ by the assumption that capital is an input only in manufacturing (and can only be produced in the manufacturing sector), while land is used only in agriculture. These assumptions allow us to focus on the role of rural land and labor markets in affecting capital accumulation in the urban sector.

The organization of the paper is as follows. In the next section we present the general set-up of the model. Section three presents the benchmark competitive case, while the fourth section sets out the optimal planner’s solution. In section five we consider a model where land is not traded, while in section six we consider the case where neither rural land nor labor markets are competitive. In this section we also compare results of the various models in terms of the steady-state capital stock. The final section contains summary and conclusions.
2. The Model

We consider a model with two sectors. The urban sector produces commodity $Y$ using capital $K$ and labor $L^Y$ as inputs. Output is given by

$Y = G(K, L^Y)$. \hfill (1)$

$Y$ can be used for consumption or investment (that is, capital accumulation). The rural sector produces (agricultural) commodity $X$ using only land $A$ and labor $L^X$ with output given by

$X = F(A, L^X)$. \hfill (2)$

$X$ is used only for consumption and is not storable. Both $F(\cdot)$ and $G(\cdot)$ are continuous, twice differentiable and linear homogeneous. Furthermore, positive output requires positive inputs of both factors. The inputs are complements, so that $G_{KL}$ and $F_{AL}$ are both positive, where subscripts denote partial derivatives. Furthermore, as an input approaches zero, its marginal product approaches infinity, given a positive value of the other input. We further assume that labor is perfectly mobile between sectors with zero cost.

The total supplies of land $A$, initial capital $K_0$, and labor $L$, are exogenously given. Hence, the production of the agricultural good can change only with changes in labor input in that sector and is bounded above by the total supply of land and labor.

Population consists of $L$ people in each generation, each of whom lives for only two periods. In each generation at time $t$, $L^X_t$ people are working in the rural sector and $L^Y_t$ ($= L - L^X_t$) in the urban sector. $L^X_t$ and $L^Y_t$ are the fractions of the total population in the rural and urban sectors at $t$. All workers are homogeneous in skills and preferences. For simplicity, we
assume that \( X \) and \( Y \) are perfect substitutes in consumption. Total consumption at age \( i \) (\( i = 1, 2 \)) in period \( t \) for an individual is defined as

\[
(3) \quad c_t^i = x_t^i + d_t^i
\]

where \( x_t^i \) and \( d_t^i \) is individual consumption of the agricultural and manufacturing goods.

Perfect substitutes implies that relative demands are perfectly elastic, or, equivalently relative prices are fixed. Therefore, even if one sector is not competitive, production must still be on the efficient frontier.

Each person is endowed with one unit of labor in his first period of life and no labor capacity in his second period of life. The individual decision problem when young is then given by choosing total consumption in each period and savings \( s_t \) to maximize utility

\[
(4) \quad U(c_t^1, c_{t+1}^2)
\]

subject to

\[
(5) \quad c_t^1 = w_t - s_t + \alpha_t^1
\]

\[
(6) \quad c_{t+1}^2 = R_{t+1} s_t + \alpha_{t+1}^2
\]

where \( w_t \) is wage income from work, \( \alpha_t^i \) represents possible other sources of income in the \( i \)th period of life, and \( R_{t+1} \) is one plus the interest rate in period \( t+1 \). The first-order condition for a maximum is

\[
(7) \quad \frac{U_1(\cdot, \cdot)}{U_2(\cdot, \cdot)} = R_{t+1}
\]

which yields a general saving demand function for the young

\[
(8) \quad s_t = s(w_t + \alpha_t^1, \alpha_{t+1}^2, R_{t+1}).
\]
One can show that if consumption is normal, saving of the young is increasing in first-period income and decreasing in second period income.

3. The Benchmark Competitive Case

In all the economies that we analyze we assume that the manufacturing sector is competitive. The representative firm in this sector chooses \( K_t \) at time \( t-1 \), and \( L_t^Y \) at \( t \) to maximize profits which are given by

\[
\pi_t^Y = q_t G(K_t, L_t^Y) - w_t L_t^Y + (1-\delta)q_t K_t - R_t q_t K_t
\]

where \( q_t \) is the price of \( Y \) in terms of \( X \) (Tobin's "q"). Since the model is deterministic, we assume perfect foresight, so that we obtain the following first-order conditions:

\[
w_t = q_t G_L(k_t, \ell_t^Y)
\]

\[
q_{t-1} R_t = q_t (1-\delta) + q_t G_K(k_t, \ell_t^Y)
\]

where \( k_t = K_t/L \) is capital per capita. Market clearing conditions for \( Y \) imply that

\[
k_{t+1} - (1-\delta)k_t + d_{1t} + d_{2t} \leq G(k_t, \ell_t^Y) = \frac{Y}{L}.
\]

If consumption of \( Y \) is positive, our assumption on preferences implies that the price of \( Y \) will equal that of \( X \) and \( q_t \) will equal 1. If \( Y \) is not consumed, entire urban output going to capital accumulation, then \( q_t \geq 1 \), with strict inequality holding when desired \( k_{t+1} \) exceeds urban output. The price of consumption is then the price of the agricultural good. Since capital is accumulated only for future production of \( Y \) and since increased \( Y \) increases welfare only if it is consumed, zero consumption out of urban output is possible only in the short run. In the long-run steady state, consumption of \( Y \) must be positive, so that \( q \) must equal one. In early
periods of development however, the price of the urban output would be greater than that of the consumption good. For simplicity we consider economies that are sufficiently developed that some urban output is consumed, so that \( q = 1 \) along the path.

The economies in this paper differ with respect to the organization of the agricultural sector. As a benchmark we use the fully competitive framework, where both land and labor are fully traded. Let \( P_t \) be the price of land in terms of consumption at time \( t \). At \( t = 1 \) the stock of land is divided equally among the initial population of old people. Land is purchased at time \( t \) for use in production at time \( t+1 \). The optimization problem of producers of the agricultural good \( X \) is to maximize profits in each period, namely to maximize

\[
\pi_t^X = F(A_t, L_t^X) - w_t^X L_t + P_t^X A_t - R_{t-1}^X A_t
\]

by choice of \( A_t \) at \( t-1 \) and \( L_t^X \) at \( t \). The necessary conditions for a maximum are

\[
w_t^X = F_L(A/L, L_t^X)
\]

\[
R_t = \frac{F_A(A/L, L_t^X) + P_t}{P_{t-1}}
\]

In the fully competitive economy both sectors face the same wage \( w_t^X \) and interest factor \( R_t \).

The market clearing condition for \( Y \) is as given above while that for \( X \) is

\[
x_t^1 + x_t^2 = F(A/L, L_t^X) - X_t/L.
\]
The other two markets that must be cleared at each date are those for labor and capital, implying

\[(17) \quad \ell^X_t + \ell^Y_t = 1\]

\[(18) \quad s(w_t, R_{t+1}) - k_t + P_t A/L .\]

The equilibrium path for this economy is solved simultaneously by equations (8), (10)-(12), and (14)-(18). (Here $\alpha^1$ and $\alpha^2$ are identically equal to zero, since competitive factor payments exhaust total output.) The equilibrium solution path yields prices and quantities at all dates. An important characteristic of this competitive economy along the equilibrium growth path is summarized by the following proposition.

**Proposition 1**: On the equilibrium path of the economy an increase in the per-capita capital stock will be associated with a higher urban labor force and a higher real wage.

**Proof** From (10), (14), and (17) we obtain (for $q_t = 1$)

\[(19a) \quad \frac{\partial \ell^X_t}{\partial k_t} = \frac{G_{KL}}{G_{LL} + F_{LL}} < 0 \]

Hence, a higher capital stock is associated with more workers in the urban sector and fewer workers in the rural sector. We can then write $\ell^X_t = \ell^X_t(k_t)$ with a negative first derivative. From (14) we then obtain

\[(19b) \quad \frac{\partial w_t}{\partial k_t} = \frac{\partial \ell^X_t}{\partial k_t} > 0 \quad \text{since} \quad G_{KL} > 0 .\]
Proposition 1 establishes that the competitive equilibrium is characterized by a path consistent with the widely accepted facts of a positive relation between growth in production on the one hand, and migration and real wages on the other. These properties of the equilibrium should be part of any model of development. Here they are derived endogenously from the basic characteristics of the economy.

We now turn to the steady state of the competitive economy, which will serve as a point of comparison for the steady states of the other economies. The steady state of the competitive economy is characterized by the following five equations.

\[
(20) \quad s(w,R) = k + P \cdot A/L \\
(21) \quad w = G_L(k,1-\ell^X) \\
(22) \quad R = (1-\delta) + G_K(k,1-\ell^X) \\
(23) \quad w = F_L(A/L,\ell^X) \\
(24) \quad R = \frac{F_A(A/L,\ell^X) + P}{P}
\]

These five equations may be solved for the five steady-state values of the endogenous variables $k$, $P$, $w$, $R$, and $\ell^X$.

From (21) and (23) we can find the steady-state relation

\[
(25) \quad \ell^X = \ell^X(k)
\]

which has a negative first derivative (see (19a)). Substituting (25) into (24) and (23), we obtain $w$ and $R$ as functions of $k$. Similarly, (22) and (24) yield $P$ as a function of $k$. $k$ is solved from equation (20).
Before comparing the competitive steady state with the steady states of the other economies, we may quickly consider conditions for both goods to be produced. To rule out the possibility that none of the agricultural commodity is produced ($\ell^X = 0$), we assume that the marginal product of labor in the agricultural sector approaches infinity as $\ell^X$ approaches zero. Equation (23) then ensures that $X$ will be produced. This condition further implies that $P > 0$ (since $F_A(A/L, \ell^X) > 0$ and $R$ is finite). Equation (24) then further implies that $R > 1$. Hence, given the existence of productive land, the interest rate is always positive and the value of land cannot be zero.

Ruling out the possibility that none of the manufacturing good is produced ($\ell^X = 1$) is a bit more subtle. If the urban production function is such that $G_L(0,0) = G_K(0,0) = 0$, then for $k = 0$ there exist saving functions that yield a solution to equations (20) and (22) through (24) for $\ell^X = 1$. An economy which started with no capital would reach such a steady state within one period. Such a steady state with no capital and a single non-produced asset is equivalent to Samuelson's original overlapping generations model with money.

In the case where initial capital is positive, we use a similar argument to the one used above for the agricultural sector. As long as the marginal products of the two factors approach infinity as the factors approach zero, positive production of $Y$ in steady state is assured. Hence, if we assume the standard Inada conditions on the utility functions in the two sectors, a sufficient condition for a steady state where both commodities are produced is a positive initial level of capital. Put another way, an initial level of
capital is sufficient to insure growth under standard assumptions about production. We therefore focus on the case in a fully competitive economy where \( 0 < \ell^X < 1 \) and \( k > 0 \). We refer to the allocation in the fully competitive economy as allocation "CE".

4. Optimal Steady State Allocation

We begin by considering the optimal steady state allocation with equal distribution across all individuals. It may be found as the solution to the following maximization problem

\[
(26) \quad \text{Max} \quad U(c^1, c^2)
\]

subject to

\[
(27) \quad G(k, 1 - \ell^X) + F(A/L, \ell^X) + \delta k = c^1 + c^2
\]

The first-order conditions are

\[
(28) \quad G_L(k, 1 - \ell^X) = F_L(A/L, \ell^X)
\]

\[
(29) \quad G_K(k, 1 - \ell^X) = \delta
\]

\[
(30) \quad \frac{U_1(c^1, c^2)}{U_2(c^1, c^2)} = 1
\]

Equations (28) and (29) are the conditions for maximum aggregate consumption \( c^1 + c^2 \). Equation (28) allocates labor efficiently between the two sectors. Equation (29) is the Golden Rule for this economy since population growth is zero. Equation (30) guarantees that the distribution of consumption over the life cycle is consistent with zero population growth. We denote this allocation by "PO".
We first show the relation between the optimal steady state and the competitive steady state allocation.

**Proposition 2:** The steady-state competitive allocation (CE) is not Pareto optimal, the per-capita steady state capital stock being smaller. This also implies a smaller urban labor force in the CE economy than in the PO allocation.

**Proof** In the CE allocation \( R > 1 \) due to equation (25). Hence from (7) \( c^1 \) and \( c^2 \) are not the same as in the PO allocation. Furthermore \( k \) and \( \xi^X \) cannot be the same since (24) and (22) imply that in the CE allocation \( G_K \) is greater than \( \delta \) while in the PO allocation they are equal. Equation (28) holds for both CE and PO implying that \( \xi^X \) is the same function of \( k \) in both allocations, where the derivative of \( \xi^X \) with respect to \( k \) is negative. Hence, the function \( G_K(k,1-\xi^X) \) is the same for both allocations, and we have that

\[
\frac{dG_K}{dk} = G_{KK} - G_{KL} \frac{G_{KL}}{G_{LL} + F_{LL}}
\]

\[
= (G_{KK} F_{LL} + G_{KK} G_{LL} - G_{KL}^2 (G_{LL} + F_{LL})^{-1})
\]

The term in the first parentheses is positive due to the strict concavity of \( G \) while the term in the second parentheses is negative. \( G_k \) is therefore decreasing in \( k \).

This completes the proof that \( k^{CE} < k^{PO} \) and that \( \xi^Y \) in \( c \) is lower than \( \xi^Y \) in PO.

Proposition 2 implies that the steady state competitive allocation does not maximize utility of the representative agent, the capital stock being
below the Pareto optimal level. One obvious way of intervening in the land market to reach the optimum is to tax away the physical marginal product of land and then distribute the proceeds by lump-sum transfers. Then, the only reason for holding land would be for capital gains. Land would be traded in steady state at a zero real interest rate. The competitive solution would then be Pareto optimal, assuming that land is traded at all. (Land prices could be zero, with no land traded and steady-state R greater than one. We return to this below.)

5. Competitive Labor Markets with a Group of Landlords

We now consider an economy in which the rural labor market is competitive as in the previous section (as of course is the urban labor market), but where land is not freely traded. We assume there is a subgroup of workers of unchanging size \( L^T \) who are also the owners of land. For reasons exogenous to the model, they do not sell the land but pass it on to their descendants. With constant population, we take the number of landlords to be fixed over time at \( L^T \) comprising a fraction \( L^T \) (= \( L^T / L \)) of the population. Suppose the rent from land accrues to landlords in their second period of life. Let \( \alpha_t^2 \) be the income from this land so that

\[
(31) \quad \alpha_t^2 = (F(A/L, x^\L_t) - w_t x^\L_t) / L^T.
\]

Landlords choose \( x^\L \) to maximize \( \alpha_t^2 L \), implying that condition (15) holds as in the CE economy. We assume that landlords also work. However, condition (16) does not hold and \( P_t \) is not defined since no land market exists. Aggregate saving is now defined by
\begin{align}
(32) \quad (1 - \ell^T) s(w_t^t, R_{t+1}) + \ell^T s(w_t^t, R_{t+1}, \sigma_{t+1}^2) &= k_t.
\end{align}

The equilibrium path of this economy is determined by equations (8), (10)-(12), (14), (17), (31) and (32). Obviously, $k_t > 0$ for all $t$ since capital is the only form of saving when land is not traded. Furthermore, proposition 1 will hold in this economy, so that its behavior is consistent with certain broad facts about development.

The steady state of this economy is described by the following equations:

\begin{align}
(33) \quad (1 - \ell^T) s(w, R) + \ell^T s(w, R, \sigma^2) &= k

(34) \quad w &= G_L(k, 1 - \ell^X)

(35) \quad R &= (1 - \delta) + G_K(k, 1 - \ell^X)

(36) \quad \omega &= F_L(A/L, \ell^X)
\end{align}

where $\sigma^2$ is defined by (31) with no time subscript in steady state. We refer to this allocation as "AC" (almost competitive).

We now turn our attention to a comparison of the properties of the steady state allocations in the two economies CE and AC. These may be summarized in

**Proposition 3**: The steady-state values of capital per capita and the urban labor force are higher in the AC than in the CE economy. An increase in the fraction of the population who are landlords will decrease the steady-state level of capital in the economy, moving it closer to that of the CE economy.

**Proof**: see Appendix.
The intuition of this result is easy to see. The competitive economy has lower capital as there exists land as a second traded asset to lower saving available for capital accumulation. Increasing the number of landlords widens land ownership, thus lowering saving available for capital.

This result is interesting for it says that a non-competitive land market will induce higher capital accumulation (as well as a larger urban sector). Combined with the results of Proposition 2, this suggests that an economy with a non-competitive land market may yield higher steady state welfare than one with land being freely traded, as the capital-labor ratio is closer to the optimum level. Under the reasonable assumption that the steady state capital stock in the almost competitive economy is not in the inefficient region, welfare will definitely be higher than in the competitive case. Furthermore, a particular set of lump-sum taxes on $\alpha^2$ combined with a transfer to first-period consumption will guarantee that $R = 1$ implying the Golden Rule allocation. This may be seen by manipulating equations (5)-(7) for the landlords.

6. Non-Competitive Rural Land and Labor Markets

We now consider an economy where neither land nor labor markets in the rural sector are competitive. We retain the assumption of the previous section about land distribution and add to it the assumption that workers in the agricultural sector do not receive their marginal product, but rather a share $1 - \mu$ of average product per worker (where $\mu$ is between 0 and 1). When $\mu = 0$ we have the case where land is divided among rural workers, a sort of total agrarian reform. $\mu$ could be viewed as resulting from a tendency
relation in agriculture which is common in developing nations. We take \( \mu \) to be determined exogenously.

As before, migration insures the equality of the wage between the two sectors, implying

\[
    w_t = G_L(k, 1 - t_t^X) \\
    w_t = (1 - \mu) \frac{F(A/L, t_t^X)}{t_t^X} 
\]

The rest of income from agriculture is divided among the \( L^X \) landlords in the economy. We assume, as before, that landlords receive this income in the second period of their lives. Though the timing of the payment of rents may appear quite innocuous, it will in fact be crucial and therefore deserves comment. In a life-cycle model saving arises from the desire to transfer income from early periods of life in which the individual receives income to later periods when he does not. The effect of rental income on individual saving and hence on aggregate capital accumulation therefore depends on whether it induces or replaces saving. To the extent that rental income in this hereditary ownership model would probably be concentrated in later periods of life, we stress the role of rents as replacing other forms of saving and assume they are received in the second period of life. This implies that

\[
    \sigma_t^2 = \mu \frac{F(A/L, t_t^X)}{t_t^T}. 
\]

Before characterizing the steady state, we demonstrate that the conditions for the urban labor force to grow as the capital-labor ratio grows
are the same as before. Equating (37) and (38) and differentiating, we obtain

\[
\frac{d\ell^X_t}{dk_t} = \frac{\ell^X_t G_{KL}}{(1-\mu)(F_L - \ell^X_t) + \ell^X_t G_{LL}}
\]

From the concavity of \(F(\ )\) we know that \(F_L < \frac{F}{\ell}\). Hence, \(\frac{d\ell^X_t}{dk_t}\) is negative as long as \(G_{KL} > 0\), and along the equilibrium path, workers migrate to the urban sector as the capital stock grows. This result is independent of the way in which the rent from land is divided between rural workers and landlords. The lower the share of rents going to workers (the larger is \(\mu\)), the more migration there will be. This accords with common sense.

The steady state allocation in this share economy (which we denote "SE") is characterized by

\[
(1-\ell^X_T)s(w,R) + \ell^T s(w,R,\alpha^2) = k
\]

\[
w = G_L(k,1-\ell^X)
\]

\[
R = 1-\delta + G_K(k,1-\ell^X)
\]

\[
w = (1-\mu) \frac{F(A/L,\ell^X)}{\ell^X}
\]

\[
\alpha^2 = \mu \frac{F(A/L,\ell^X)}{\ell^T}
\]

We may characterize the SE allocation relative to the AC (and ultimately the CE allocation) in the following proposition.

**Proposition 4:** The steady-state allocation in the SE economy is equivalent to that in the a economy if \(1-\mu\) is set equal to the steady state share of labor in the agricultural sector in the AC economy. If the share of labor \(1-\mu\) in the SE economy is greater than (less than) the competitive share, then the
steady state capital stock in the d economy will be greater than (less than) that in the AC economy.

Proof: See Appendix.

Combining this result with Proposition 3, we see that the steady state capital stock will be highest in the non-competitive economy when income distribution favors rural workers over landlords \((\mu < \mu^*)\), next highest in the "almost" competitive economy where land is not traded, and lowest in the fully competitive economy. One may note as a special case that when all land is divided among agricultural workers \((\mu = 0)\), the steady-state capital stock will be higher than in the competitive and almost competitive economies.

If one interprets land reform as a shift in income distribution towards agricultural workers and away from landowners, then we see that land reform will increase capital accumulation and income in the long run. In fact, the same result will hold in the short run, if we think of an economy along its growth path suddenly "decreeeing" a decrease in \(\mu\). This result does not accord with the standard view of development (see, for example, Kuznets [1966]) which associates higher capital accumulation and growth with a more unequal income distribution, and hence sees land reforms as introducing a fairer income distribution in the short run at the expense of higher long-run growth. This analysis presents a model where these two goals need not be traded off.

The reasons for the difference in results is easy to see. The reasoning that usually lies behind the standard result is that saving is specified in a somewhat ad hoc manner, with the propensity to save being zero for low levels
of income and then rising as income rises. Under such a specification, a more unequal distribution of a given level of income will increase the aggregate saving rate. In this model saving was derived from a basic life-cycle model, so that the receipt of rental income in later periods of life would tend to discourage saving and hence capital accumulation. Shifting the distribution of income away from rents and towards wages received in earlier periods of life would therefore increase saving and capital accumulation. One can now also see why the CE economy has less capital accumulation than the AC economy. When land is traded, there two assets with which to save, so that the amount of saving is less than if land is not traded.

7. Summary and Conclusions

The main result of this paper is that the move from non-competitive to competitive land and labor markets in the agricultural sector may induce less saving in physical capital, and hence reduce the long-run income of the economy.\(^4\) This indicates not simply that the organization of markets in the economy may have a significant effect on the economy's development in the short and long run, but that a simple move towards more competitive rural markets need not imply an increase in welfare.

Why do non-competitive markets "favor" capital accumulation in this model? In the land market, as was indicated above, the possibility of saving in the form of land "crowds out" capital, in exactly the way that internally-held government debt in the Diamond model reduces capital accumulation and may reduce welfare even though it expands the individual's choice set.
Non-competitive rural labor markets may favor capital accumulation if the move away from competitive labor markets increases labor's share in the agricultural sector and if this increase in labor's share increases saving. We contrast this to the conventional wisdom that saving will be higher with a non-competitive rural labor market only if labor's share is relatively low with non-competitive market organization. If landlords receive income from the ownership of land in later periods of life, a distribution of rural income favoring labor would raise saving in this sector rather than lower it. In short, the move towards competitive rural markets might both lower total saving and lower the fraction of a given volume of saving going to capital.

Of course, there are other arguments which would yield a welfare-enhancing role for a more competitive organization of markets. This paper simply makes clear that in terms of its effects on capital accumulation in a simple model, competition need not increase welfare, implying that analyzing the effects of a change in market organization must be done in the context of a fully specified dynamic model.
APPENDIX

Proofs of Propositions 3 and 4.\(^5\)

Proof of Proposition 3

The equilibrium conditions for the two economies may be written from (20) for the competitive economy

\[
s(w,R) - k = \frac{PA}{L} \tag{CE}
\]

and from (33) for the almost competitive economy

\[
s(w,R) - k = T(s(w,R) - s(w,R,\alpha^2)) \tag{AC}
\]

Call the left-hand-side of the two equations \(H(k)\), the right-hand sides \(\varphi^\text{CE}(k)\), \(\varphi^\text{AC}(k)\), respectively. Differentiating \(H(k)\) we obtain

\[
\frac{dH}{dk} = s_w \frac{dw}{dk} + s_r \frac{dr}{dk} - 1
\]

where subscripts denote partial derivatives. Using the competitive relation between factor returns and \(k\), we obtain

\[
\frac{dH}{dk} = s_r C_{KK} - k s_w C_{KK} - 1
\]
The right-hand-side less than zero is the Diamond stability condition. Our economy approaches the Diamond economy as the quantity of land $A$ approaches zero, as long as $F_A$ is bounded away from infinity. Therefore, this condition must hold if the economy is to stable as $A$ approaches zero. We assume stability for all values of $A$, so that stability ensures that $\frac{dH}{dk}$ is negative. Intuitively, an increase in $k$ must increase supply of capital more than saving.

To analyze the right-hand-sides, note first that by (24) and constant returns to scale for $F$, (so that $F(x) = F(A, x^0) = F_A + F_L x^0$)

$$\text{PR} = F_A + P$$

$$P = \frac{A}{L} = \frac{1}{R-1} (F - wL^0)$$

which by (31) is simply $\frac{\alpha_2}{R-1}$ for the AC economy. Therefore the right-hand-side of (CE) may be written $\frac{\alpha_2}{R-1}$.

Now, looking at the budget constraint (6), $s$ can be written $s(w, R, \alpha^2) = \frac{c^2 - \alpha^2}{R}$. If $c^2$ is everywhere normal an increase in $\alpha^2$ implies that $c^2$ rises, so that $s$ falls by less than $\frac{\alpha^2}{R}$ rises, meaning that this sum rises. Noting that $s(w, R)$ is simply $s(w, R, \alpha^2 = 0)$, this implies

$$s(w, R) \leq \frac{\alpha^2}{R} + s(w, R, \alpha^2)$$
or \[ \frac{2}{R} \geq s(w,R) - s(w,R, \alpha^2) \]

which immediately implies

\[ \frac{2}{R-1} > s(w,R) - s(w,R, \alpha^2) \]

so that the right-hand-side of (CE) is greater than the right-hand-side of (AC) at each \( k \). Diagrammatically the curve representing the right-hand-side of (CE) as a function of \( k \) lies everywhere above the curve representing the right-hand-side of (AC). In other words, \( \phi^{CE} \) must be above \( \phi^{AC} \).

To complete the argument stability conditions require that an increase in \( k \) increase supply of capital more than saving available for capital accumulation. Inspection of (CE) and (AC) indicates that this implies that \( \phi^{AC} \) and \( \phi^{CE} \) (which may be either upward or downward sloping) must cut \( H \) from below, as in Figure 1. Therefore \( k^{AC} \) must be unambiguously larger than \( k^{CE} \).

![Figure 1](image-url)
To prove the final part of the proposition we ask what happens to the curve at each $k$ as $T$ rises. From (31) an increase in $T$ for given $k$ causes $\alpha^2$ to fall by the same percentage (expressed as a percent of its new value). Normality of $c^2$ means $s(w,R,\alpha^2)$ rises by less so that $s(w,R) - s(w,l,\alpha^2)$ falls by less than $T$ rises. The product $T(s(w,R) - s(w,R,\alpha^2))$ therefore unambiguously rises, so that $\varphi^{AC}$ rises and $k^{AC}$ unambiguously falls. This completes the proof.

Proof of Proposition 4

The first part of the proposition is straightforward. Comparing the steady state equations for the two economies, we see that if $1-\mu$ in (44) is set equal to the steady-state value of $X_F/F_L$ in the A economy, then the equations and hence the allocations will be identical. Let us call this value $\mu^*$.

To prove the second part, consider $\mu < \mu^*$. At the same $k$, $R^{AC} = R^{SE}$ while $w^{SE} > w^{AC}$. This second relation may be demonstrated by noting that

$$
W^{AC} = G_L(k,1-L^X) = F_L(\cdot)
$$

$$
W^{SE} = G_L \cdot \frac{(1-\mu)}{F_L}
$$

When the production function is such that $\mu < \mu^*$ for all values of $L^X$ we have $(1-\mu)F_L > F_L$ for all $L^X$ and hence $k$, so that $w^{SE} > w^{AC}$. Finally, $\alpha^2$ in each economy is the share of agricultural output going to capital. Therefore, by definition, if $\mu < \mu^*$, then $\alpha^{SE} < \alpha^{GE}$. 
Equilibrium in the capital market in both economies is represented by (32), which in steady-state may be written

$$(1-l^T)s(w, R) + l^T s(w, R, \alpha^2) = k$$

where we denote the left-hand-side, total saving of the young, as $s^{AC}$ and $s^{SE}$ in the two economies. Since $w^{SE} > w^{AC}$ but $R^{SE} = R^{AC}$, $s(w^{SE}, R^{SE}) > s(w^{AC}, R^{AC})$. Since in addition $\alpha < \alpha$, $s(w^{SE}, R^{SE}, \alpha^{SE}) > s(w^{AC}, R^{AC}, \alpha^{AC})$. For given $l^T$, average saving per capital, $s^{SE}$ is therefore unambiguously greater than $s^{AC}$ at each level of $k$. Stability requires that an increase in $k$ raise steady state $s$ less than proportionally, so that the curve cuts the 45° line in figure 2 from above. Therefore, $k^{SE}$, steady state capital per capita in the SE economy, is unambiguously larger than $k^{AC}$, steady-state capital per capita in the AC economy. This completes the proof.

Figure 2
FOOTNOTES

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1. In models where land is fixed and essential to production, exogenous population growth and technical progress must balance one another in steady state. Our assumption, therefore, in no way changes the basic characteristics of the steady state. Jorgensen (1961), Dixit (1973), and Zarembka (1970) analyzed the issues of exogenous technical progress, food production, population growth and the elasticity of food consumption in affecting the process of development. Here we abstract from these issues.

2. A model extremely close in set-up to this one is that of Eaton (1984), which analyzes international trade questions. Tirole (1985) carefully analyzes the role of non-produced assets in the Diamond model.

3. This set-up assumes a perfect consumption-loan market. Imperfections in the capital market, sometimes thought to characterize the secondary sector, are here captured in the modelling of the land market.

4. The general point is that making a market non-competitive (for example, monopolizing supply of a factor) may be welfare-improving in the long-run in a dynamic model.
5. Efraim Sadka suggested using stability conditions to prove these propositions for the general case.

REFERENCES


