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THE OPTIMAL SEQUENCING OF LAND AND CREDIT MARKET REFORMS IN DEVELOPING COUNTRIES: A THEORETICAL PERSPECTIVE

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A Theoretical Perspective

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Abstract. This paper proves two theoretical results that serve to qualify the orthodox view that privatizing land transfer rights should (or must) precede the extension on a wide scale of the formal credit market in the rural sectors of developing countries. First, we show that prior to the establishment of an integrated national credit market, limitations on land transfer rights may increase efficiency by diversifying risk within each segment of the credit market. Second, we consider a novel mechanism that provides a partial substitute for land as collateral and show that it has the potential to make everyone better off. Although the mechanism creates a distortion in the labor market, it mitigates information problems that create inefficiencies arising in the credit market.

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Summary

This paper is about the sequencing of two kinds of policies in developing countries: the reform of indigenous land tenure systems in order to vest land transfer rights at the level of the individual, rather than the community; and policies that promote the extension of formal credit institutions in the rural sector.

The orthodox view is that, on efficiency grounds, land tenure reform should precede credit reforms. It has been argued that land tenure reform eliminates inefficiencies in the allocation of land and that it plays an indispensable role in the expansion of formal credit in rural areas. Because of high information and enforcement costs, formal lenders base their lending decisions primarily on the value of collateral. Land is the main form of alienable wealth in most rural areas, and land tenure reform would make land mortgageable.

This paper reevaluates the orthodox view of the sequencing of reforms. First, we show that prior to the establishment of an integrated national credit market, limitations on land transfer rights may serve to increase efficiency by improving the performance of segmented credit markets. In general, the informal financial markets on which most farmers in Africa and many farmers in Asian developing countries, as well, rely are highly segmented. In such environments, the indigenous land tenure systems could be understood as the (not necessarily perfect) result of an attempt to diversify risk within each segment of the credit market. Diversification of group risk

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expands the role that the credit market can play in mitigating each household's income risk. This explanation is distinct from, but complementary with, the "safety net/distributional equity function" view of indigenous land tenure systems.

Second, we contribute to the emerging literature on substitutes for land collateral in rural areas of low-income countries. We analyze a novel tax/transfer/mortgaging scheme that was suggested by a program in Sri Lanka in which all households received ration coupons, and ration coupons provided a source of collateral. The mechanism we consider entails a uniform tax on labor output to finance a transfer to each individual equal to the average tax payment made. The individual can pledge this (riskless) transfer payment as collateral. In a simple setting of adverse selection in the credit market, we show that this "bootstrap" collateral has the potential to make every individual better off. Although the tax creates a distortion in the labor market, it mitigates information problems that create inefficiencies in borrowing and investing. Numerical simulations illustrate the resulting welfare gains.

THE OPTIMAL SEQUENCING OF LAND AND CREDIT MARKET REFORMS IN DEVELOPING COUNTRIES:

A Theoretical Perspective

Karla Hoff and Andrew Lyon

A common feature of indigenous land tenure systems in Sub-Saharan Africa and parts of Asia is that they vest land-use rights at the level of the individual household, but alienation rights (the right to sell or rent) at the level of a community or group.[1] Economists have advised governments of developing countries all over the world to replace such land tenure systems by Western-style freehold tenure. Two reasons often cited as justification are that (i) restrictions on individuals' rights to alienate land undermine efficiency in the allocation of land, and that (ii) there is a "basic incompatibility between the land tenure system and the lending criteria of [formal][2] financial institutions" (Sharma, p. 464). Because of high costs of screening borrowers, monitoring investments, and enforcing loans, formal lenders base their lending decisions primarily on the value of collateral, and not on the future profitability of the funded projects. Limitations on the transferability of land thus impede the expansion of formal credit institutions into rural areas where lending would otherwise be profitable and

[1]In Fiji, for example, over 80 percent of the land area is under a communal land tenure system, as defined above (Sharma, 1985). A study of farmers in Kenya, Rwanda, and Ghana found that their use rights on land parcels were individualized, but their transfer rights with respect to a given parcel varied widely between the extremes of communal and freehold tenure systems:

> The distinguishing feature of different tenure regimes ... revolve[s] around restrictions on the individual holder's ability to transfer land (only among family members, within the lineage or community, or to outsiders; and with or without approval from other lineage or community members), which also tends to coincide with the model of transmittal (inheritance, gifts or bequest, and sale). (Migot-Adholla et al., 1991, p. 159).

[2]The formal credit sector comprises banks and cooperatives that are regulated by government and that provide intermediation between borrowers and depositors, whereas the greater part of credit transactions in many rural areas of developing countries occurs in the informal sector, where private individuals lend largely out of their own equity.

would increase incomes.[3]

The purpose of this paper is to qualify each of these arguments, in turn.[4] As every student of economics knows, if it were possible to create well-functioning markets in all goods, then restrictions on one market -- such as the land market -- would surely be Pareto inefficient: by relaxing such restrictions through a land tenure reform, it would be possible to increase every person's real income. Earlier writers have called attention to the fact that insurance markets (or government social insurance) are missing in most low-income countries. Communal land tenure systems that guarantee all persons access to at least a small parcel of land may provide a partial substitute for those missing insurance markets and may also ensure a measure of distributional equity within and across generations (Platteau, 1992, and Blarel and Place, undated, pp. 5-22 - 5-33). One objective of this paper is to explore a different economic reason that complements, but is distinct from, the "safety net/distributional equity function" viewpoint. Our explanation focuses on the effect of land transfers on the performance of a segmented credit market.

In general, the informal financial markets on which most farmers in Africa, and many farmers in Asian developing countries, as well, depend, are highly segmented (Udry 1990, Siamwalla et al., 1990, Townsend 1991, Lim 1992, and Feder et al. 1993). Within certain groups, which may be based on kinship or village or ethnicity, financial flows are extensive and may even be approximately efficient, whereas there is a notable absence of flows across

[3]As an empirical matter, the link between transferable land rights, investment, and formal credit is firmly established for Thailand (Feder, Onchan, Chalamwong, and Hongladarom (1988)). But it has not been established for Sub-Saharan Africa (Migot-Adholla et al., 1991; Blarel and Place, undated, ch. 6; and Place and Hazell, 1992), and we briefly discuss one explanation for this below.

[4]This paper does not discuss two further arguments sometimes cited to justify the reform of communal land tenure systems, which relate to the security of rights and the limited incentives that communal tenure systems offer the farmer to invest in land improvements. Perfect security of usufructuary rights and a high level of incentives to invest in land improvements can coexist with communal tenure, both in theory and practice. For empirical evidence on investment incentives, see Blarel and Place, undated, ch. 6.

such groups. As suggested by Ben-Porath (1985), the group might be regarded as a set of contracts that establish rules of exchange and provide social enforcement of private contracts within the group. For cross-group financial transactions, enforcement mechanisms are not available.

Section I of this paper shows that in a setting of segmented credit markets and missing insurance markets, freehold land tenure will not generally yield an efficient land allocation. This is because it will be in the interest of the group to pursue a risk diversification strategy to reduce the variability of the interest rate in the capital market; yet each household within the group will have an economic incentive to deviate from the optimal group strategy.[5] Hence, risk diversification strategies at the level of the group entail group controls on land transfers.

This view has implications for the sequencing of reforms in land and credit markets. If restrictions on land alienability serve an efficiency purpose, then communal land tenure systems should not be supplanted by freehold land tenure until institutions are in place that integrate the rural financial markets.

But this qualification is a kind of *Catch-22*. While it might not be desirable to free land markets until institutions are in place that overcome the fragmentation of the credit market, freehold tenure makes land -- the principal rural asset -- mortgageable and thereby appears to be a prerequisite to any significant expansion of formal credit in rural areas of low-income countries. Banks in such areas must deal with individuals who have no publicly available credit history, where the infrastructure and the level of literacy and numeracy needed to create such a centralized system may not exist, and where transportation and communication costs are very high relative to the average loan size. Not being able to use many of the reputation mechanisms commonplace in developed countries, formal lenders in rural areas base lending decisions primarily on collateral, and the principal form of

[5]A general theorem that in an economy with missing risk markets, competitive equilibrium will not be constrained Pareto efficient is proved in Newbery and Stiglitz (1981).

collateral is land.

Section II of this paper contributes to the recent literature on alternatives to land or other private wealth as a source of collateral. This research has focused on the design of cooperatives and group lending programs that harness "social collateral" in the form of peer monitoring and social sanctions to ensure repayment.[6] Here, we consider a novel form of financial collateral--the pledging of transfer payments. The mechanism is similar to a program adopted in Sri Lanka:

> Sri Lanka's New Agricultural Credit Scheme which was inaugurated in 1967 had a provision of hypothecating the farm household's rice ration books which entitled them to a free quota of rice per week. Coupons were forfeited by defaulters and the value of these coupons credited against the dues in the loan scheme. (Sanderatne, 1986, p. 349)

An obvious objection to this mechanism is that it requires government to have the political will to enforce it, which means depriving possibly poor families of their ration coupons. This objection was in fact borne out in Sri Lanka, as the report above goes on to note:

> After about 3 years of implementation of this provision it was relaxed by the new government which had criticized this provision while in opposition and had promised its removal. Repayment rates which were over 80 per cent fell to about 50 per cent. (p. 349)

But the qualification that a method for the recovery of debt works only if the political will exists to enforce it applies with perhaps as much or more force to land collateral. The usefulness of land collateral depends partly on an independent judicial system able to enforce foreclosure on defaulting borrowers and a police system able to protect a purchaser from reprisals. The absence of such institutions makes land collateral of little value. For example, in Senegal foreclosure by banks on wealthy or well-connected borrowers cannot be enforced, while in Kenya "the presence of many kin around mortgaged land makes it politically infeasible to auction the holdings of defaulters" (Platteau, 1992, pp. 31-32, and Shipton, 1988, p. 120, cited in Platteau). And in cases where such an auction occurs, the purchaser

[6]For the analysis of group lending programs, where each member of the group suffers a penalty for default by other members of the group, see Besley and Coate 1990, Stiglitz 1990, and Huppi and Feder 1989; on cooperatives, see Banerjee et al., 1992.

may not be able to occupy the land for fear of reprisals (Bruce, 1988; Coldham, 1979). In India, Harriss (1983) reports that "during the election campaign of 1972 [in North Arcot], farmers were 'promised' that a vote cast in the right direction would write off a loan." Such behavior presumably helps explain the widespread view in rural india that institutional loans, even though generally backed by land collateral, are really grants (Bell, 1990).

Apart from the unavoidable political economy issues raised by enforcement, transfer payments that are to be used as collateral raise a purely economic problem: Are the gains from the transfer program worth the costs of the distortions imposed by the available financing instruments? This is the problem that Section II of this paper sets out to model and answer in an economy with adverse selection in the formal credit market. We consider a tax on labor output whose revenues are returned by uniform lump sum grants in an amount equal to the average tax payment. The transfer program has value because it creates a riskless source of income that can be used as collateral against debt. By increasing an individual's stake in any investment he undertakes, the provision of collateral improves the average quality of borrowers who are of heterogeneous ability but observationally identical to the bank lender. It thus reduces the externalities that high-ability persons impose on the low-ability persons. The improvement in the performance of the formal credit market more than offsets the efficiency cost that arises because the wage tax distorts relative prices. From the perspective of individuals who, at the beginning of their lives, do not know whether they will be high- or low-ability, the tax-transfer program yields a Pareto improvement. Numerical simulations illustrate the resulting gains in welfare.

I. Pareto Inefficiency of Free Land Markets

This section examines the efficiency of private land transfer decisions within a very simple economy in which there is only one financial market--a credit market that operates among a group of households that are related by lineage, but which does not operate across lineage groups. We will show that

freehold land tenure will not, in general, lead to an efficient allocation of land given the segmentation of financial markets.

To see informally the reason for this result, we might suppose that the lineage group occupies one end of a village, and therefore that it reduces a household's transport costs for manure, crops, etc. to hold land only at that end of the village. Suppose also, as Townsend (1991) observed in a village in India, that rainfall measured at opposite ends of the village is not highly correlated. In order to mitigate income risk, each household will have an incentive to hold land at the far as well as the close end of the village, but in taking account of the risk diversification benefits, each household, which is a price-taker in the credit market, will not take account of the effect of its choice on the distribution of the interest rate. Hence, too little risk diversification will generally be obtained, and the means of diversification (at the level of the group versus the level of the household) may also be inefficient.

An alternative intuition comes from the observation of "acute differences in the physical environment (e.g. soil quality, slope of field) ... within small areas in Rwanda" (Blarel and Place, undated) as well as in other areas of West Africa (Van Staveren and Stoop, 1985). Upper and lower slopes are therefore suited to different crops, and when exposed to the same environmental conditions, yields of different crops are negatively correlated (Carter, undated, table 5). Again, in choosing its landholdings, a household that is a price-taker in the credit market will consider only its comparative advantage and the diversification of its own "portfolio," and not the benefits that its pattern of landholding provides to the group via the transmittal of income shocks to the interest rate.

For simplicity, suppose that the group of households within which the credit market operates has access to two kinds of land. Suppose also that the group is small in relation to the total usable land so that its behavior does

not affect the relative price of the two land types (normalized at one)[7].

The model has two periods. A representative household is endowed with capital and land in a ratio of k_0, and makes a one-time decision, ξ, about the share of land of each type that it wishes to hold.[8] At the end of the first period, incomes are realized, savings and second-period investment decisions are made, and the interest rate adjusts to clear the credit market and thereby reconcile the savings and borrowing decisions of the households in the lineage group. Household utility depends on consumption in the first period, c, and on terminal wealth, denoted W:

$$Eu(c) + Eu(W)/[1+\delta]$$

where $u' > 0$, $u'' < 0$, $[1+\delta]$ is the marginal rate of time preference, and E is the expectations operator.

There are two sources of uncertainty. First, incomes in each period are random because of household-specific risks (e.g., sickness of a member of the household) and environmental risk (rainfall, crop disease, infestation, and so on). Second, given the uncertainty in first-period income, savings and hence the market-clearing interest rate are uncertain.

If we normalize the household's total land holdings at one, then its income y_t in period t is $y_t = f(k_t, \xi, \theta_t)$, where k_t is the capital-land ratio in period t, ξ is the variable reflecting land transfer decisions, and θ_t defines a state of nature in period t with $\partial^2 f/\partial\xi\partial\theta_t \neq 0$. It is assumed that there are diminishing returns to capital on the land. At the end of period 1, first-period income is realized and the household chooses a level of first-period consumption, $[1-s]y_1$, and a level of borrowing (or lending), k_1-sy_1, given the interest rate that clears the market. Formally, the maximization

[7]That is, the lineage group is either a small proportion of a given region, or is spatially dispersed. It is not unusual for a single village to comprise several distinct farming communities divided on the basis of ethnicity and religion; see, for example, Mation's (1991) study of Burkina Faso.

[8]This assumption reduces notational complexity. The central result of the model carries over in a straightforward way to the case where the land market opens in every period.

problem at the end of the first period is[9]

$$V(\xi, r) \equiv \mathrm{Max}_{s,k_1} \; u([1-s]y_1) + \frac{\int u(f(k_1, \xi, \theta_2) - [1+r]\,[k_1 - sy_1])dH(\theta_2)}{1+\delta}$$

where $H(\theta_t)$ is the distribution function of θ_t.

Assuming an interior solution, the first-order condition for s is

$$(1) \qquad [1 + \delta]\; u'(c) = [1 + r]\int u'(W)\,dH(\theta_2)$$

and the first-order condition for k_1 is

$$(2) \qquad \int\left(u'(W)\,\frac{\partial f(k_1, \xi, \theta_2)}{\partial k_1}\right)dH(\theta_2) = [1+r]\int u'(W)\,dH(\theta_2)$$

The market-clearing interest rate is implicitly defined by

$$(3) \qquad \Sigma_i k^i = \Sigma_i s^i f(k_0, \xi, \theta_1^i),$$

where each household is indexed by i.

Ex ante, before the realization of period-1 incomes, the density function of r is $g(r;\xi)$, noting that *ex ante* identical households will make the same choice over land transfers and that their choice, because it affects the distribution of incomes (e.g. the sensitivity of outputs to environmental conditions) will affect the equilibrium interest rate (recalling that $\partial^2 f/\partial\xi\partial\theta_t \neq 0$).

In the rational expectations competitive equilibrium,[10] the household

[9]A notational convention throughout the paper is that parentheses denote arguments of a function, and square and curly brackets to denote expressions to be multiplied.

[10]By this is meant that each household takes the distribution of prices as given, and that the expected price distribution corresponds to the actual price distribution. This is a natural benchmark because it shows us the best that competitive markets could do; problems arising from incorrect expectations do not arise. Yet even with this best possible scenario we will see that the competitive equilibrium could be improved on by cooperation within the group over

solves, when the land market opens, the problem

$$\max_{\xi} \iint V(\xi,r)g(r;\xi)dr\ dH(\theta_1)$$

Assuming that the problem is concave and has an interior solution, ξ is implicitly defined by

$$(4) \qquad \iint [\partial V(\xi;r)/\partial\xi]\ g(r;\xi)\ dr\ dH(\theta_1) = 0$$

Now consider the Pareto optimal choice of ξ for the group of households, indexed by i, for the simplest case where we restrict all households to making the same choice of holdings of the two land types, that is, the same choice of ξ. Any such Pareto optimum will satisfy, for some set of welfare weights α^i,

$$(5) \qquad \sum_i \iint \left[\alpha^i \frac{\partial V^i}{\partial \xi} g(r,\xi) + \alpha^i \frac{\partial V^i}{\partial r}\frac{\partial r}{\partial \xi} g(r,\xi) + \alpha^i V^i \frac{\partial g}{\partial \xi}\right] dr\, dH(\theta_1) = 0$$

The first term is zero because individuals privately optimize with respect to ξ (from (4)). The second term is a pure distribution effect. If we abstract from interpersonal distributional considerations by setting all α^i equal to the same constant, then the second term is also zero (using (3) and the fact that $\partial V^i/\partial r$ is equal to $-[k_1^i - sy_1^i]\int u' dH(\theta_2)$). But in general, the third term is nonzero. That term reflects that fact that, given segmented financial markets, transfers of ownership of land outside the group affect the covariant risk within the group and thereby affect the distribution of the interest rate. Households in a competitive equilibrium treat the distribution of r as given and only consider the welfare effect of their choices through income effects, while the group as a whole considers the effect of changing the distribution of the price, r. If credit markets were not fragmented, or if insurance markets were complete, the price effects would cancel, leaving household behavior correct from the group's point of view.

To check the intuition behind this result, consider the case where

land transfers.

households are risk neutral: $u'' = 0$. In that case, using (1), the equilibrium interest rate would equal the marginal rate of time preference, δ. Shocks to first-period output would be entirely absorbed in adjustments to first-period consumption and would have no effect on the credit market. Since the interest rate would be independent of the choice of ξ, any expansion of either credit markets or risk markets in this economy would be redundant, and so the standard result that, given complete markets, households by privately optimizing achieve a Pareto optimum should apply. To see that it does, note that with r constant, the third term on the left-hand side of (5) is zero, so that if equation (4) holds, equation (5) holds as well.

But if changes in the risk-sharing and risk-pooling capability of the group credit market matter, freehold land tenure will not be efficient. Efforts by each household to diversify risk will be suboptimal because they will not reflect the benefits those actions provide to others in the group. Thus, restrictions on the alienability of land could be understood as the (not necessarily perfect) result of an attempt to ensure that risk is diversified within the group. Diversification of group risk expands the role that the credit market can play in mitigating each household's income risk.

The plausibility of this view is suggested by the evidence of other land-diversifying measures that rural households in low-income areas have taken to protect themselves against income fluctuations. McCloskey (1976) has argued that strip farming in England in the period 1300-1800 reflected an effort, at the level of the household, to reduce income fluctuations. Rosenzweig (1988) has argued that in rural India, insurance is provided through the extended family and that, as a result, the rural household attempts to match marital partners so that the transitory incomes of the origin households are negatively correlated. One testable implication of the view of communal tenure regimes presented above is that the social group controlling land allocation in a given area is the same as the social group

within which most credit transactions occur.[11]

II. A Mechanism to Substitute for Land Collateral

The preceding section treated an economy with only an informal credit market. In the past 35 years, many developing countries have actively promoted the extension of a formal, nationally integrated credit market in rural areas. A major obstacle to the expansion of the formal credit sector has been communal land tenure systems which, by restricting the transferability of land, makes land of little value as collateral.[12] The purpose of this section is to investigate a substitute form of collateral that could be pledged in exchange for a loan. Part A presents the model, part B sets forth the competitive equilibrium, and part C proves that in a setting of private information, a Pareto improvement can be obtained through a tax-transfer program, with the transfers pledged as collateral by a borrower in the formal credit market.

A. The Model

Consider an economy in which each individual has an initial (possibly zero) wealth endowment, $W < 1$, which may be invested either in a risky project or in a safe asset that yields a gross return of r. To undertake a risky project requires an investment of 1 unit of wealth. A project may either success or fail. If it succeeds, the payoff is that the individual's labor

[11]For purposes of financial exchanges, it is sometimes the village and sometimes the extended family or ethnic group, within or across villages, that is the relevant social group (see Townsend, 1991, and Grimard, 1992, and references therein). The social group that exercises communal authority over land sales and long-term land leases may also be the family, lineage group, or village. We are not aware of any empirical work that examines both questions together.

[12]In contrast, the absence of land titles does not appear to be an important barrier to exchange in informal credit markets. Here lenders often base decisions on personal knowledge of the borrower and can enforce repayment through social pressures and other means not available to institutional lenders. See, e.g., Hoff and Stiglitz, 1990, pp. 240-245.

productivity increases from w to αw ($\alpha > 1$). If it fails, the payoff is zero.[13]

Each individual's probability of success in the project, denoted p, is private information. However, p is drawn from a distribution function, H(p), that is common knowledge.

In order to abstract entirely from any social insurance motive for tax/transfer program, we assume that individuals are risk neutral. The expected utility of an individual is

$$U = Ey - v(\ell)$$

where Ey is expected wealth and $v(\ell)$ is the disutility of labor, with $v(0) = 0$, and v' and $v'' > 0$. Hence, the utility payoff from success in the project is

$$R = \max_{\ell} \alpha w \ell - v(\ell)$$

less the capital cost r and less the foregone surplus from alternative employment,

$$S = \max_{\ell} w\ell - v(\ell)$$

The focus of this model is the individual's investment choice. This decision can be formalized as a choice of a reservation success probability, denoted p*, such that only if his (privately known) success probability is p* or higher will he undertake a risky project. Given p*, an individual's net gain from labor is represented in fig. 1. With probability H(p*), an individual does not undertake a project and the his net gain from labor is S, the first terminal point in fig. 1.[14] With probability 1-H*, he undertakes a

[13]The assumption of a zero payoff in the case of failure greatly reduces the notational complexity of the model, without changing its qualitative results. The qualitative results require only that an individual whose project fails defaults on his loan.

[14]For future use, let h(p) denote the density function of p, and let h* and H* denote the functions evaluated at p*.

project. If it succeeds, his net gain from labor is R-r; if not, it is -r. In the figure, a solid circle indicates a decision point--the choice of p^*, and an open circle indicates a chance point where the next event is determined by a random mechanism according to probabilities shown on the branches from that point. It is evident from the figure that the social surplus from undertaking a risky project, given any p, is $\Delta(p) \equiv pR - r - S$. Thus, the efficient value of p^*, indicated by a subscript 0, is implicitly defined by $\Delta(p^*_0) = 0$, or[15]

$$p^*_0 R = r + S \tag{6}$$

B. Competitive Equilibrium

An individual whose non-labor endowment wealth, denoted W, is less than 1 will require external finance to undertake a risky project. If he faces a gross finance charge per rupee lent of *i*, the borrower's[16] choice of reservation probability, p^*, solves

$$\max_{p^*} \; [1-H^*]\hat{p}\left[R - i[1 - W]\right] + H^*[rW + S] \tag{7}$$

yielding a choice, p^*_b, implicitly defined by

$$p^*_b\left[R - i[1 - W]\right] = rW + S \tag{8}$$

At the borrower's reservation probability of success, his expected private benefit from the project (the LHS) is just equal to his opportunity cost (the

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[15]Formally, the solution to

$$\max_{p^*} \; H^*S + [1-H^*][\hat{p}(p^*)R - r]$$

yields equation (6), using the fact that $d\hat{p}/dp^* = h^*[\hat{p} - p^*]/[1-H^*]$. The second-order condition with respect to p^* is satisfied since $R > 0$.

[16]See Bernanke and Gertler (1990) for a similar characterization of competitive equilibrium, but in a one-factor setting. They prove that a pure debt contract is the optimal financial contract if the probability of success (possibly zero) is known to the prospective borrower at the time of contracting.

RHS).

Borrowing is channelled through a formal financial sector where perfect competition and the pooling of risk drive expected profits of lenders down to zero. Since a borrower is unable to repay any of the loan if he does not succeed in the project, to break even the lender will require a gross finance charge per rupee lent of

$$(9) \qquad i = r/\hat{p}(\bar{p}^*_b).$$

where $\hat{p}$ is the lender's expectation of an individual's success rate:

$$\hat{p}(p^*_b) \equiv E(p|p \geq p^*_b)$$

Whereas p is private information, p^*_b is not; it can be inferred from the individual's wealth level (using (8)).

Substituting (9) into (8) yields

$$(10) \qquad p^*_b R = r\{W + [1-W]p^*_b/\hat{p}(p^*_b)\} + S$$

We will now show that the marginal borrower, who is just indifferent between undertaking or not undertaking a project, makes a negative present value investment: $p^*_b < p^*_0$ and $\Delta(p^*_b) = p^*_b R - r + S < 0$. He takes risks with other persons' money that he would not take with his own. This behavior results in a welfare loss to borrowers in every wealth class, but the loss is greater, the lower the wealth class. Formally, we have

Proposition 1. *An individual's likelihood of investing in a risky project is a decreasing function of his wealth, but his expected surplus from investing in a risky project is an increasing function of his wealth. Formally,* $dp^*_b/dW > 0$ *and* $d[1-H^*]\Delta\left(\hat{p}(p^*_b)\right)/dW > 0$.

Proof. By construction, $p^*/\hat{p}(p^*) < 1$ and $W < 1$. Hence the term in braces on the RHS of (10) is strictly less than one, which implies that

$$(11) \qquad p^*_b R < r + S$$
$$= p^*_0 R \quad \text{(using (6))}.$$

This means that $\Delta(p^*_b) < 0$: the borrower will choose to invest even when the expected total return is negative. Differentiating (10) yields $dp^*_b/dW > 0$, which means that a wealthier individual has a higher reservation success rate, below which he will not undertake a risky project, as was to be shown.

To evaluate the effect of endowment wealth on the expected surplus from investing in a risky project, substitute $\Delta(\hat{p}_b)$ into (7) to obtain

$$(12) \qquad \max_{p^*} \hat{p}_b(R - i[1-W]) - H^*\Delta(\hat{p}_b)$$

so that the first-order condition for an interior p^*_b is

$$(13) \qquad (R - i[1-W])d\hat{p}/dp^* = h^*\Delta(\hat{p}_b) + H^*d\Delta(\hat{p}_b)/dp^*$$

The rate of change of the expected surplus with respect to wealth is[17]

$$d([1-H^*]\Delta(\hat{p}_b))/dW = (-h^*\Delta + [1-H^*]d\Delta/dp^*)dp^*_b/dW$$
$$= \{d\Delta/dp^* - d\hat{p}/dp^*[R - i[1-W]]\}dp^*_b/dW \qquad \text{(using (13))}$$
$$= i[1-W][d\hat{p}/dp^*]dp^*_b/dW$$

which, by inspection, is strictly positive, as was to be shown.■

A borrower in this model is an issuer of a bond that is collateralized only by his future earnings. The lender perceives the quality of the bond differently according to the initial wealth of the issuer. Lower wealth brings in lower quality bonds with a lower probability of repayment, and which therefore command a lower price (a higher interest rate) in the market.

An individual could increase his stake in the project and, hence, the

[17]The proof uses the fact that, conditional on having learned that $p > p^*_b$, the *average* private gain from the investment is equal to the *average* social gain:

$$\hat{p}_b[R - i[1-W]] - [rW + S] = \hat{p}_b R - [r + S] \qquad \text{(using (9))}$$
$$= \Delta(\hat{p}_b)$$

Differentiating the above yields the last line of the proof.

perceived quality of his bond, if he could sell his labor forward in state-contingent markets. But it can be seen that such state-contingent labor markets are precluded by the fact that p is private information. An individual can gain from forward labor sales only if he needs funds to undertake a project. An individual would wish to sell labor forward only if his success probability exceeded his reservation rate, p^*--that is, only if he had already made his occupational choice—in favor of the risky undertaking. Knowing this, a buyer on the forward state-contingent market would not buy labor in the riskless occupation at any price, and would pay no more than $\hat{p}/r$ per rupee of future labor earnings in the risky undertaking. Thus an (incentive-compatible) market for state-contingent labor would be redundant--it would allow individuals precisely the same intertemporal reallocations as the credit market does, and a complete set of forward markets for labor cannot exist in this private information setting.

The next section will show that a partial substitute for the missing market in state-contingent labor is a labor tax whose revenues are returned in lump-sum fashion.[18]

C. Pareto-Improving Redistributions

Consider a labor tax at rate t and a lump sum grant G equal to the expected value of tax payments made by the individual, where the expectation is taken without knowledge of the individual's success probability. The lump sum grant permits the individual to finance a part of his project through a bond, issued in amount G/r, that is collateralized by his future transfer payment, G. Since G is riskless, the bond can be issued at the riskless rate of return.

Denote the after-tax utility payoffs to labor in the safe and risky

[18]An alternative policy, emphasized in a related model presented in de Meza and Webb (1987) is to tax credit and thereby reduce overinvestment by bad risks. It can be checked from (8) that $dp^*_b/di > 0$. But to achieve efficiency would require that individuals face a higher interest rate tax, the poorer they are. This mechanism will not be effective to the extent it thereby deters the poor from seeking formal credit rather than relying on the informal sector.

undertakings by

$$S_t \equiv \max_{\ell_s} [1-t]w\ell_s - v(\ell_s)$$

$$R_t \equiv \max_{\ell_r} [1-t]\alpha w\ell_r - v(\ell_r)$$

An individual's expected utility conditional on undertaking a risky project is now

$$\hat{p}\left[R_t - i[1-W-G/r]\right] - r[G/r] + G$$

so that his unconditional expected utility is

$$(14) \qquad U = \max_{p^*} H^*[S_t + rW + G] + [1-H^*]\hat{p}\left[R_t - i[1-W-G/r]\right]$$

His choice of p* is implicitly defined[19] from the first-order condition by

$$(15) \qquad p^*\left[R_t - i[1-W-G/r]\right] = rW + S_t + G$$

where the LHS is the expected benefit of undertaking a risk project at the reservation success probability; the RHS is the opportunity cost of the project.

Comparing (15) with (8), it is apparent that the tax/transfer policy will change p* through two channels. First, the tax funds a grant that allows the individual to increase his stake in the project by G/r in current rupees. In this way the tax/transfer scheme provides a substitute for collateral. With more wealth at risk, the individual is more selective in his choice of whether or not to undertake a project. Differentiating (15) with respect to W and G yields this ***collateral effect***:

$$(16) \qquad \partial p^*/\partial G = [1/r]\ \partial p^*/\partial W > 0$$

and the sign condition follows from proposition 1.

Second, the labor tax affects the *income premium* from the project for

[19]For ease of notation, henceforth the subscript b on p^*_b will be omitted.

the marginal investor, denoted D. Since $dR_t/dt = -\alpha w\ell_r$ and $dS_t/dt = -w\ell_s$, the tax reduces the *income premium* and thereby further reduces the incentive to gamble on a risky project if

$$(17) \qquad D \equiv p^*\alpha w\ell_r - w\ell_s > 0$$

D is ambiguous in sign in the general case, but is strictly positive if the disutility of labor is

$$(18) \qquad v(\ell) = \ell^\eta$$

with $\eta > 1$. This is the case of constant labor supply elasticity.[20]

Differentiating (15) with respect to t yields what we will call the ***relative price effect*** of the tax policy, as distinct from its *collateral effect*:

$$(19) \qquad \partial p^*/\partial t = D \Big/ \left\{ R_t + i[1-W-G/r][d\ln\hat{p}/d\ln p^* - 1] \right\}$$

where the denominator is strictly positive (noting (15)).

The ability of the tax/transfer scheme to mitigate the information problem in the capital market is illustrated numerically in fig. 2. In the simulation, the parameter η in (18) is set equal to 3, corresponding to a (compensated and uncompensated) labor supply elasticity of 0.5. The wage rate w in the riskless undertaking is 4.5 and the wage payoff to labor in a successful project is α times greater, with $\alpha = 3.4$. The cost of a project is one unit, and the gross riskless interest rate r over the period the loan is outstanding is 7.[21] Success probabilities p are assumed to be distributed

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[20]The labor supply elasticity given (18) is $1/[\eta-1]$. Utility maximization implies $\ell_r = \alpha^{1/[\eta-1]}\ell_s$, so that $R_t = \alpha^{\eta/[\eta-1]}S_t$. Noting (15), $p^*R_t > S_t$. Using the preceding expression for R_t, $p^*\alpha^{\eta/[\eta-1]}S_t > S_t$, or $p^*\alpha^{\eta/(\eta-1)} > 1$. Multiplying both sides of this inequality by $w\ell_s$ and substituting in the expression for ℓ_r, we have $p^*\alpha w\ell_r > w\ell_s$, as was to be shown.

[21]This interest rate is clearly unreasonable, even if one considers a very long-run project, and was chosen as an experiment to see whether high interest rates (and hence high externalities imposed by defaulters on non-defaulters)

according to the bell-shaped density function $h(p) = 6[p-p^2]$.

The shaded areas in the figure illustrate the magnitude of the "lemons" problem, i.e., the deviation of p^*_t from p^*_0, for wealth endowments in the interval [0,1]. The sum of the two shaded areas represents the distortion in p^* from first-best under *laissez-faire*, and the black shaded area represents that part of the distortion that is avoided under the Pareto-optimal tax/transfer policy. For example, for a-person with endowment wealth of one-half unit, the *laissez-faire* equilibrium yields $p^* = .409$, equilibrium under a Pareto-optimal tax/transfer policy yields $p^* = .434$, and the first-best threshold is $p^*_0 = .463$, independent of endowment wealth.

Of course, the tax/transfer policy has to be judged by its effect on welfare. The welfare effect of the tax/transfer policy is the sum of three terms[22]: the direct effect of the tax, the direct effect of the transfer, and the indirect effect of the tax/transfer policy via its influence on p^*:

$$(20) \qquad dU = \frac{\partial U}{\partial t} dt + \frac{\partial U}{\partial G} dG + \frac{\partial U}{\partial i}\frac{di}{dp^*}\left| \frac{\partial p^*}{\partial G} dG + \frac{\partial p^*}{\partial t} dt \right|$$

Differentiating the lender's zero-profit condition in (9) to obtain di/dp^*, and using (15), we have

$$(21) \qquad \frac{\partial U}{\partial i}\frac{di}{dp^*} = -h^*\Delta(p^*) > 0$$

Recalling that $\Delta(p) \equiv pR_t - S_t - r$, the sign condition in (21) follows from the result in Proposition 1 that the social payoff to the marginal project in competitive equilibrium is negative.

Letting N denote an individual's expected pre-tax labor earnings,

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would yield large welfare gains. We are currently undertaking simulations with much lower interest rates. With a lower interest rate, the qualitative effects are unchanged, but their magnitude is reduced.

[22]We apply the envelope theorem to the variables ℓ_s and ℓ_r, but not to p^*. The individual is not optimizing with respect to p^* since he treats i as parametric; thus the term $\partial U/\partial p^*|_{i\ \mathrm{fixed}} = 0$, whereas the total derivative, dU/dp^*, will be seen to be positive, given (9).

$$(22) \qquad N \equiv H^* w\ell_s + [1-H^*]\hat{p}\alpha w\ell_u,$$

we can rewrite dU in (20), using (16) and (21), as

$$(23) \qquad dU = -Ndt + dG - h^*\Delta(p^*)\left\{[\partial p^*/\partial W]dG/r + [\partial p^*/\partial t]dt\right\}$$

The tax/transfer policy will be Pareto improving if $dU > 0$ when the net government cost of the policy is zero. The government budget associated with each person is, in expectation, $B = tN - G$. Diversification across taxpayers ensures that a transfer, G, that is feasible in expected terms will also be feasible in realizations *ex post*. Consider a balanced budget change increasing G and t such that $dB = 0$:

$$(24) \qquad dB = Ndt - dG + t\left\{\frac{\partial N}{\partial t}dt + \frac{\partial N}{\partial p^*}\left[\frac{\partial p^*}{\partial t}dt + \frac{\partial p^*}{\partial G}dG\right]\right\} = 0$$

The first two terms on the RHS, $Ndt - dG$, are the revenue effect of the policy at the initial tax base, while the terms inside the large brackets are the changes in the initial tax base, N, resulting from the tax/transfer policy. $\partial N/\partial t$ is the usual marginal deadweight loss of a labor tax, weighted by the share of the population in each occupation. It is always negative and proportional to the labor supply elasticity. $\partial N/\partial p^*$ $(= - h^*D)$ is the change in the tax base arising from changes in investment behavior and is ambiguous in sign. In turn, the change in investment behavior arises partly from the relative price effect ($\partial p^*/\partial t$, which is ambiguous in sign (noting (19)), and partly from the collateral effect ($\partial p^*/\partial G$, which is positive in sign, noting (16)).

To check whether the tax/transfer policy is Pareto-improving, it remains only to substitute the balanced budget condition (24) into the welfare expression (23):

$$(25) \qquad dU\Big|_{dB = 0} = - h^*\Delta \cdot p^*) \left\{ [\partial p^*/\partial W]dG/r + [\partial p^*/\partial t]dt \right\}$$
$$+ t \left\{ [\partial N/\partial t]dt + [\partial N/\partial p^*] \left\{ [\partial p^*/\partial W]dG/r + [\partial p^*/\partial t]dt \right\} \right\}$$

The RHS consists of two terms (each written on a separate line). The first term is the change in agency costs resulting from the change in p*. Agency costs are unambiguously reduced by the transfer dG (noting (16)), and will be further reduced by the *relative price effect* of the tax if, e.g., labor supply has constant elasticity (recalling (19)). The first term will thus be larger (a) the greater the density of persons who would no longer come forward to borrow from the formal lender if their alienable wealth were increased, as measured by h*, (b) the greater the distortion from the first-best, p^*_0, as measured by the negative social surplus $\Delta(p^*)$, (c) the greater the change in p* through the *collateral effect*, and (d) the greater the change in p* through the *relative price effect*.

The second line in (25) reflects the effect of the tax/transfer policy on the tax base. Starting from a zero tax rate, the government initially is collecting no money from labor taxes and so the change in labor earnings N does not affect the budget. The second term vanishes. Hence,

$$dU/dt\Big|_{\substack{dB = 0 \\ t = 0}} > 0$$

which proves

Proposition 2. *If the* income premium *D to the marginal investor, defined in (17), is positive, then there exists a Pareto-improving tax/transfer policy consisting of a labor tax whose revenues are returned to the taxpayer by a lump sum grant in an amount equal to the expected tax payment.*

The proof of this proposition is based on an infinitesimal tax rate. But for the proposition to have practical relevance, it must be true for finite values of t. Simulations provide a way of evaluating the proposition. Fig. 3 is based on the same parameter values described for fig. 2. The figure

shows the Pareto optimal wage tax rate as a function of the taxpayer's wealth The optimum occurs where the marginal deadweight loss in the labor market fro increasing the tax rate is just offset by the marginal utility gain from the induced increase in p*. For taxpayers with low wealth, marginal increases in collateral in the form of the future grant can lead to large gains in expecte utility. For these taxpayers, a relatively high tax rate on labor (11.8 percent for those with zero wealth) is Pareto optimal. The optimal tax rate is a declining function of wealth. For individuals with wealth greater than one unit, who would never choose to borrow, the optimal tax rate is, of course, zero.

Fig. 4 expresses the Pareto improvement from the optimal tax rate as a percentage of the difference between expected utility obtained under a first-best allocation and the competitive equilibrium. The effectiveness of the tax/transfer policy is important even as endowment wealth approaches one. Fo those with no capital endowment, the tax/transfer policy recovers more than 7 percent of the loss in utility created by agency costs. At wealth levels of .95, two-thirds of the loss in utility due to agency costs is recovered.

III. Conclusion

A standard explanation of communal land tenure regimes is that the cost of creating a land market (titling, registration, etc.) historically exceeded the gains in traditional, land-abundant societies (Feeny, 1988). The first objective of this paper was to argue that there is an additional reason why limits on the alienability of land may have arisen. Such limits can be seen as a response to externalities that land transfers create in a setting of fragmented credit markets. In this view, the limits on land markets under customary law are not an incomplete development reflecting the limited benefits of creating a land market in a traditional economy, but rather an instrument to control changes in risk-sharing capability that land transfers produce in societies with fragmented credit markets. As long as credit markets remain fragmented, there is no theoretical presumption that establishment of free land markets will increase efficiency.

The second objective of this paper was to contribute to the literature on substitutes for land collateral in rural areas of low-income countries. We showed, in a simple setting of adverse selection in the credit market, that a tax-transfer-mortgaging mechanism has the potential to substitute for land collateral and thereby make each individual better off.

We also suggested several avenues of further research. A testable implication of the view of customary land rights which we offered is that the social group within which financial exchanges are concentrated is the same as the social group for purposes of obtaining permission to rent or sell land. Other research areas are the administrative mechanisms to implement such a tax/transfer/mortgaging scheme (in Sri Lanka where it was actually adopted and in other countries where it might be tried), and the sensitivity of our welfare results to alternative specifications of investment opportunities and the cost of capital. We have taken up the last problem in ongoing work.

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Figure 1

The Net Social Product of Labor

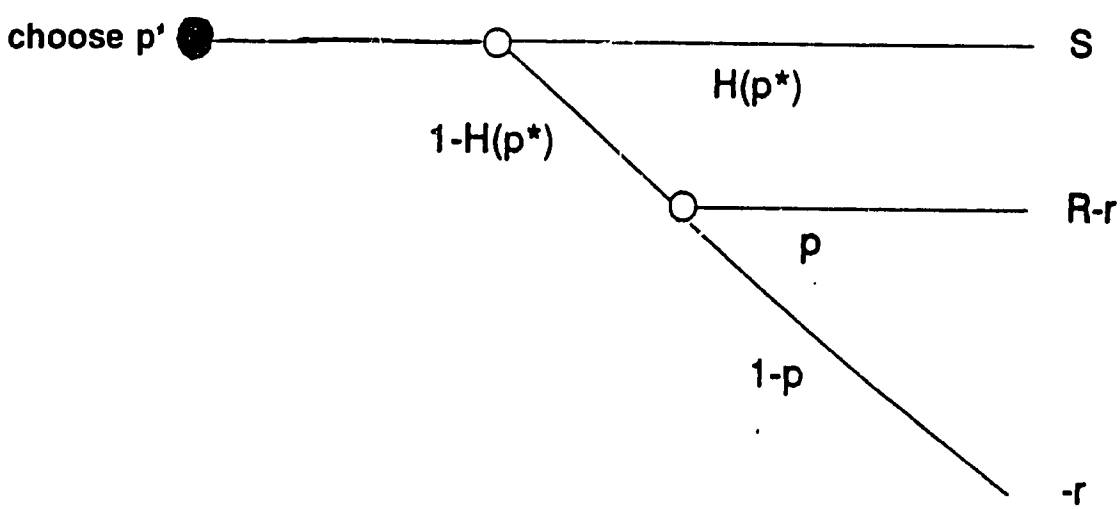


Figure 2

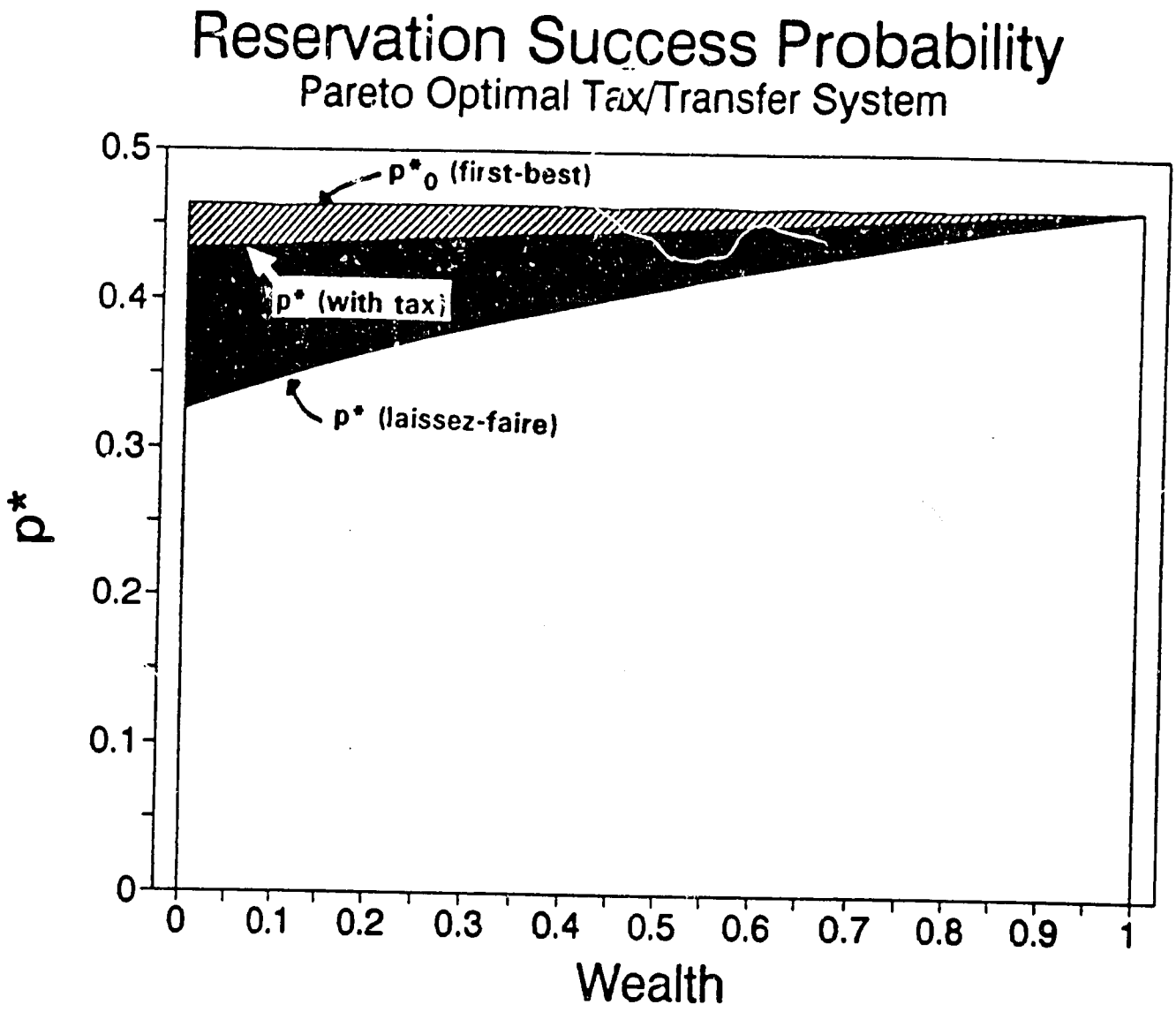

Reservation Success Probability
Pareto Optimal Tax/Transfer System
p*0 (first-best)
p* (with tax)
p* (laissez-faire)
p*
0.5
0.4
0.3
0.2
0.1
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
Wealth

Figure 3

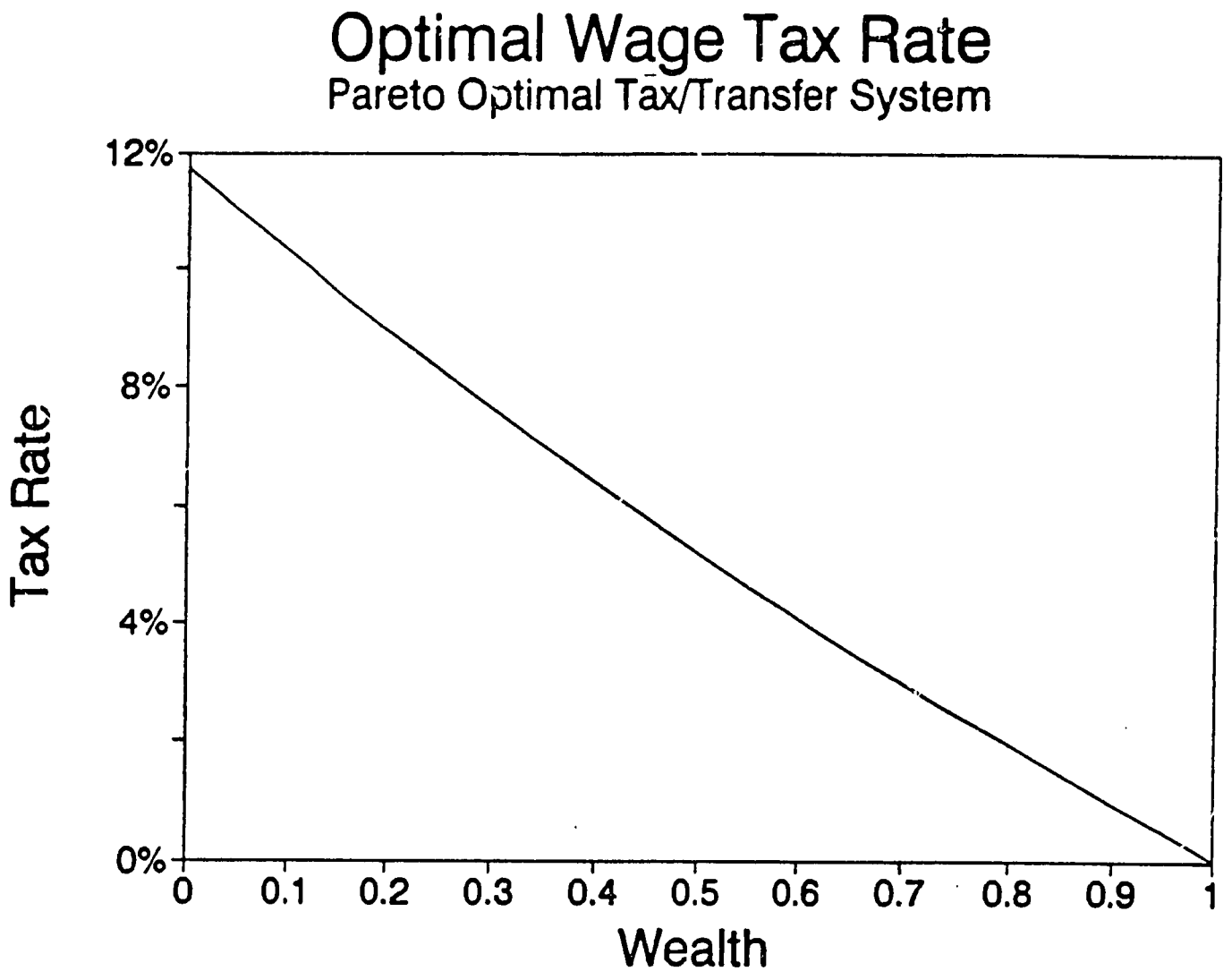
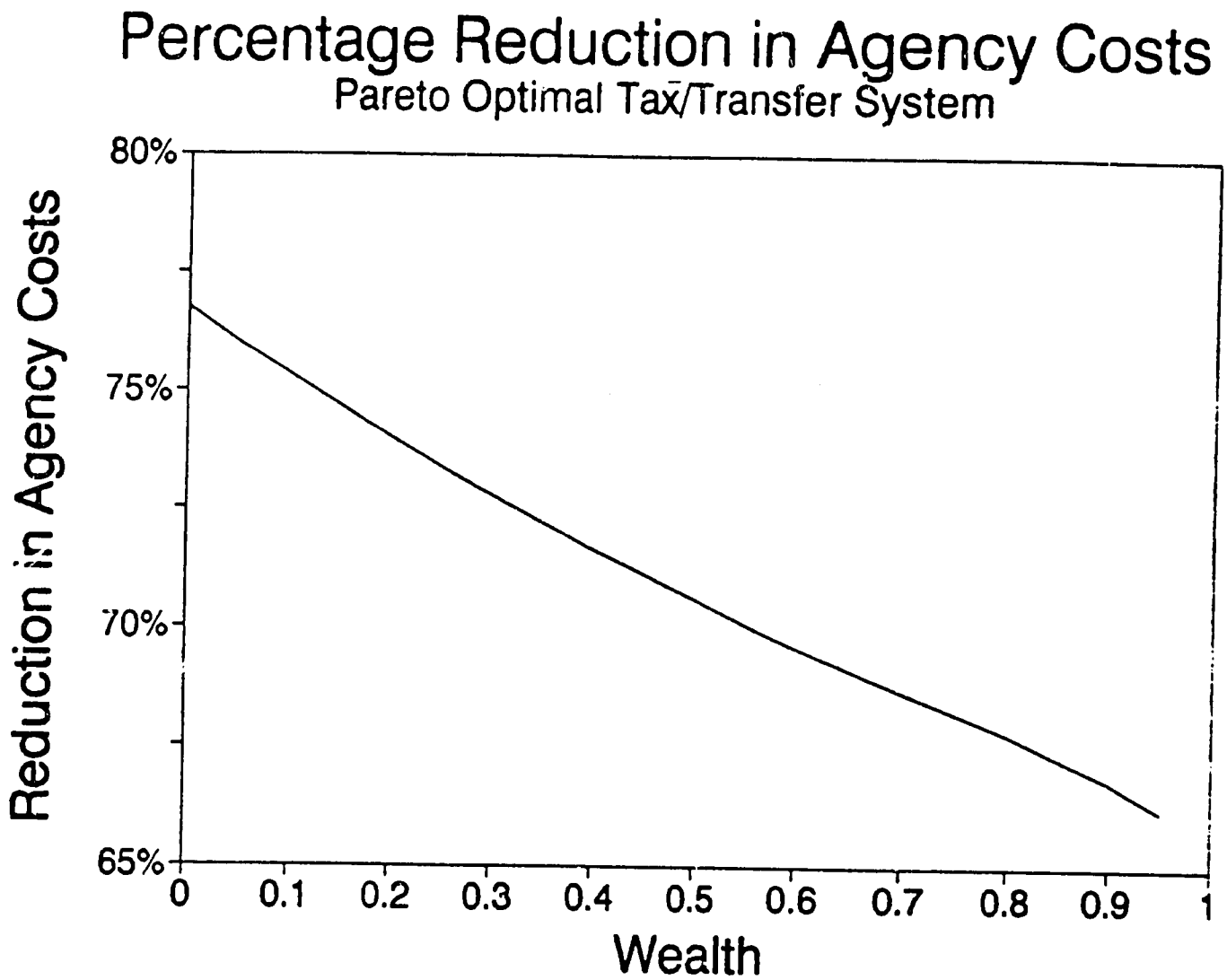

Optimal Wage Tax Rate
Pareto Optimal Tax/Transfer System
12%
8%
4%
0%
Tax Rate
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
Wealth

Figure 4


Percentage Reduction in Agency Costs
Pareto Optimal Tax/Transfer System
Reduction in Agency Costs
80%
75%
70%
65%
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
Wealth