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The Sequencing of Land and Credit Market Reforms in Developing Countries: A Theoretical Perspective

Karla Hoff[1] and Andrew Lyon[2]

University of Maryland, Department of Economics[1,2]

and

Junior Research Fellow[1]
Institute for Policy Reform

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This paper proves two theoretical results that serve to qualify the orthodox view that privatizing land 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, the ability of the social group to exercise some control over land transfers can be efficiency-enhancing through its effect on the performance of segmented, informal finance markets. Second, we show that financial or physical collateral in credit markets is not limited to land or other pre-existing endowments. We analyze a novel mechanism that creates a bootstrap form of collateral that can substitute for mortgageable land as collateral. The mechanism entails a tax on labor output that finances a transfer to each individual equal to the average tax payment made. Individuals can pledge the transfer payments as collateral in the formal credit market. We show that this bootstrap collateral has the potential to make every individual better off.

A

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B

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 the extension of formal credit institutions in the rural sector.

The orthodox view is that the first policy improves efficiency and is virtually a prerequisite to the second policy of extending formal credit institutions. Because of high screening 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 can make land mortgageable. Thus, it has been argued that land tenure reform plays an indispensable role in the expansion of formal credit in rural areas.

This paper suggests a need to qualify 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 informal credit markets. The informal financial markets on which most farmers in sub-Saharan African and Asian developing countries 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 increases the ability of the informal credit market to mitigate the consumption and

production risk faced by each household. Group controls on land transfers can thereby enhance efficiency.

Second, this paper contributes to the emerging literature on substitutes for mortgageable land as collateral in the formal credit markets of developing countries. We show that financial or physical collateral in credit markets is *not* limited to pre-existing wealth endowments. 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 were pledged as collateral for loans. The mechanism we consider entails a tax on labor output to finance a transfer to each individual equal to the average tax payment made. The individual can pledge this transfer payment as collateral. In a simple setting of moral hazard in the credit market, we show that this bootstrap collateral has the potential to make every individual better off by mitigating information problems that create inefficiencies in investment. Numerical simulations illustrate the resulting welfare gains.

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

A Theoretical Perspective

Karla Hoff and Andrew Lyon

A common feature of the diverse 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 lineage group (see, e.g., Bruce, 1988; Migot-Adholla et al., 1991; and Sharma, 1985). Economists have advised governments of developing countries all over the world to replace such land tenure systems by Western-style freehold tenure. Two reasons are often invoked as justification. The first is that restrictions on individuals' rights to alienate land outside the family, lineage group, or community undermine efficiency. Outsiders who could make more productive use of the land may be denied the right to either rent or buy it.

A second reason often invoked to justify reforming a communal land tenure system is the "basic incompatibility between the land tenure system and the lending criteria of financial institutions"[1] (Sharma, p. 464). Because of high costs of screening borrowers, monitoring investments, and enforcing loan repayment, most formal lenders base their lending decisions primarily on the value of collateral, and not on the future profitability of the funded

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[1]The institutional 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.

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 would increase incomes.[2]

These two arguments for land reform might be called the "freer markets are better" argument and the collateral argument. The purpose of this paper is to qualify each of these arguments. The qualifications suggest that it may be neither necessary nor desirable to reform indigenous land tenure systems before extending the formal credit market into rural areas.

A basic proposition in economics is that, if it were possible to create well-functioning markets in all goods, then binding restrictions on one market --such as the land market--would be Pareto inefficient. By relaxing such restrictions, it would be possible to increase every person's real income. Earlier scholars called attention to the fact that insurance markets (and government-provided social insurance) are missing in most developing 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 increase distributional equity within and across generations (Platteau, 1992; and Blarel and Place, undated, pp. 5-22 - 5-33). This paper explores a different second-best reason that complements, but is distinct from, the "safety net/distributional equity function" viewpoint. We will argue that the ability of the social group to exercise some control over land transfers can enhance efficiency and welfare through its effect on the performance of segmented, informal financial markets.

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[2]As an empirical matter, the link between transferable land rights and investment, via the access that such land rights give to formal credit, is most clearly established for Thailand (Feder, Onchan, Chalamwong, and Hongladarom, 1988). For a brief survey of other studies, see Binswanger et al., 1993, pp. 67-68.

In many parts of the developing world, farmers rely for credit primarily on highly segmented, informal markets (Udry 1990, Siamwalla et al., 1990, Townsend 1991, Lim 1992, Collier and Lal, 1980; and Feder et al. 1993). In Kenya, for example, rural credit markets are confined mainly to tribal and kinship groups. Within such groups, financial flows are extensive and may even be approximately efficient, whereas there is a notable absence of flows across such groups. 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 (Ben-Porath, 1985). 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 group's interest to pursue a risk diversification strategy to reduce the variability of the interest rate in the local financial market; yet each household within the group will have an incentive to deviate from the optimal group strategy.[3] In general, *a Pareto efficient risk diversification strategy at the level of the group requires group controls on land transfers.*

This result 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

[3]Newbery and Stiglitz (1981) present a series of examples in which, in an economy with missing risk markets, competitive equilibrium is not constrained Pareto efficient.

financial markets.[4]

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 developing countries.

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.[5] Here, we consider a novel form of financial collateral--the pledging of transfer payments as collateral for loans. The pledging of ration books appears to occur regularly in India. For example, Platteau et al. (1980, p. 1767) reported that 45 percent of households in one village in Kerala (India) had pledged the ration cards that gave them access to subsidized "fair-price" shops. In Sri Lanka, the pledging of transfers was officially sanctioned by government:

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[4]There is an analogy with sharecropping. Just as it is now well understood that sharecropping, while it appears to entail an inefficiency in the reward to labor effort, may in fact be an efficient response to imperfections in capital and insurance markets when the monitoring of labor is costly, so restrictions on land markets, while they appear to be inefficient, may be an efficiency-increasing response to the fragmentation of local financial markets. Efficiency may be reduced if sharecropping or indigenous land tenure systems are supplanted unless the failures in the financial markets are corrected first. For references to the large literature on sharecropping, see Hoff, Braverman, and Stiglitz, 1993, ch. 1.

[5]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.

> 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 the Sri Lankan 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. Without such institutions, land collateral is 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 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 question: 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 answer in an economy with moral hazard 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 creates a riskless source of income that can be used as collateral against debt. By increasing an individual's stake in the investment he undertakes, the provision of collateral improves the average quality of borrowers who are of heterogeneous ability but observationally identical to the formal lender. The resulting improvement in the performance of the formal credit market more than offsets the efficiency cost that arises because the tax on labor output distorts the labor-leisure choice. From the perspective of individuals who, at the beginning of their lives, do not yet have private information about their abilities, 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 the land market is perfect but the credit market is fragmented. 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 intuitively the reason for this result, suppose that a lineage

group, within which an informal credit market operates, occupies one end of a village. It reduces each 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 deciding on its own "portfolio" of landholdings, the household does not take account of the effect of its choice on the aggregate income risk of the group, which in turn determines the distribution of the interest rate in the next period. 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 suited to different crops, and when exposed to the same environmental conditions, yields of different crops are negatively correlated (Carter, undated, table 5). In choosing its landholdings, a household will consider only its comparative advantage and its output risk, and not the effects that its pattern of landholding has on the group via the transmittal of shocks to the interest rate in the next period.

For simplicity, suppose that the group of households within which the financial 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)[6].

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.[7] At the end of the first period, incomes are realized, savings and capital investment decisions are made, and the interest rate adjusts to clear the credit market and thereby reconcile the saving and borrowing decisions of the households in the group. The sequence is illustrated below:

Choose ξ	y_1 is realized Household chooses s, k_1 Financial market clears, fixing r	y_2 is realized

Household utility depends on consumption in the first period, c, and on terminal wealth, denoted W:

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

where $u' > 0$, $u'' < 0$, and $u(0) = -\infty$. The rate of time preference is δ, and E

[6]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, Lation's (1991) study of Burkina Faso.

[7]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.

In future work we will present examples of particular kinds of land transactions, which in this paper are represented abstractly by the household's choice over ξ.

is the expectations operator. The assumption that $u(0)$ is unbounded below means that a household will never choose to borrow more than it is feasible for it to pay back. This simplifies the model by reducing the number of ways that the income risk faced by one household affects others. The qualitative results of the model would only be strengthened by relaxing this assumption.

There are two sources of uncertainty. Each household faces output uncertainty in periods 1 and 2 because of household-specific risks (e.g., sickness of a member of the household) and environmental risks (rainfall, crop disease, infestation). And each household faces uncertainty about the interest rate, r, that will clear the market at the end of the first period. Uncertainty in r, as we will see, arises because of the uncertainty in first-period household incomes.

If we normalize the household's total land holdings at one, then its output at the end of period 1 can be written as $y_1 = f(k_0, \xi, \theta_1)$, where θ_1 is a random variable in period 1, identically distributed for all households. We assume $\partial^2 f/\partial\xi\partial\theta_1 \neq 0$, so that the sensitivity of output to the state of nature depends on the household's land transfer decision. We also assume that there are diminishing returns to capital on the land. At the end of period 1, values of θ_1 and first-period income are realized. The household chooses a level of consumption, $[1-s]y_1$, and a level of borrowing (or lending), k_1-sy_1, given the interest rate that clears the market. The household thus solves at the end of period 1:[8]

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

[8]Parentheses denote arguments of a function, and square and curly brackets denote expressions to be multiplied.

where $H(\theta_2)$ is the distribution function of θ_2.

Notice that the capital market in this simple model opens only once. It did not open in period 0 because, by assumption, all households were identical. But at the end of period 1, some households will have had good output draws, and some bad output draws, and the credit market allows for the good or bad shock to output to be spread over first- and second-period consumption, and for the intermediation of savings of households with good output shocks.

The first-order condition for s,

$$[1 + \delta]\ u'(c) = [1 + r]\int u'(W)\,dH(\theta_2) \tag{1a}$$

implicitly defines the household's savings function $s(r,\xi,\theta_1)$. The first-order condition for k_1,

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

implicitly defines the household's investment function $k_1(r,\xi,\theta_1)$. The market-clearing interest rate is the value of r at which aggregate borrowings in the informal capital market sum to zero:

$$\Sigma_i\left[k^i(r,\xi,\theta_1{}^i) - s^i(r,\xi,\theta_1{}^i)\,f(k_0,\xi,\theta_1{}^i)\right] = 0, \tag{2}$$

where each household is indexed by i.

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 ξ. Their choice, because it affects the sensitivity of outputs to environmental conditions, will affect the equilibrium interest rate.

In the rational expectations competitive equilibrium,[9] the household solves, at the beginning of the first period, the problem

$$(3) \qquad \max_{\xi} \iint V(\xi, r) g(r;\xi) dr \, dH(\theta_1)$$

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 simplicity, we will consider the egalitarian Pareto optimum. Differentiating (3), we have that this optimum satisfies

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

The first term is zero because individuals privately optimize with respect to ξ (from (4)). The second term is a pure distribution effect. Using the fact that $\partial V^i/\partial r$ is equal to $-[k_1^i - sy_1^i] \int u' dH(\theta_2)$, and then summing over i, it can easily be seen from (2) that the summation in the second term of (5) is also zero. But in general, the third term of (5) is nonzero. That term reflects that fact that, given segmented financial markets, transfers of ownership of land outside the group affect the social risk within the group and thereby

[9]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 land transfers.

affect the distribution of the interest rate. Each household in a competitive equilibrium treats the distribution of r as given; it ignores the effect of its actions on the distribution of the price, r. It is only if credit markets are not fragmented, or if the opening of insurance markets is redundant, that the effects of its land transactions on the price distribution are without consequences for efficiency.

To check the intuition behind this result, consider the case where households are risk neutral: $u'' = 0$. In that case, using (1a), the equilibrium interest rate would equal the 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 would achieve a Pareto optimum should apply. To see that it does, note that with r constant, the third term within the square brackets of (5) is equal to 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 do 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 and Stark (1989) have 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.[10]

II. A Mechanism to Substitute for Land Collateral[11]

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 nationally integrated credit market in rural areas. A major obstacle to the expansion of such an institutional (or *formal*) credit sector has been communal land tenure systems which, by restricting the transferability of land, makes land of little value as collateral. The purpose of this section is to investigate a substitute form of collateral that could be pledged in exchange for a loan. The model abstracts from the

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[10]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.

[11]This section draws on Hoff and Lyon (1993).

informal credit market, and focuses on the function that collateral serves in the formal credit market in mitigating moral hazard.

We present the model in section IIA, and set forth the competitive equilibrium in section II.B. In section II.C, we show 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.

II.A. The Model

Consider an economy in which each individual lives one period and consumes at the end of his life. He has an initial wealth endowment, $0 \leq W < 1$. Wealth may be invested either in a risky project or in a safe asset that yields a gross rate of return r. To undertake a risky project requires an investment of 1 unit of wealth. If the risky project is successful, the payoff is that the individual's labor productivity increases from w to αw ($\alpha > 1$). If it fails, the payoff is zero.[12] An individual's probability of success in the project is denoted p.

In order to abstract from any insurance motive for transfers, we assume here that individuals are risk neutral. Hence, if transfers are Pareto-improving in this model, as we will show, it cannot be because they smooth utility across states of nature. The ability of a tax/transfer program to improve welfare will arise instead from its value as a bootstrap form of collateral.

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[12]The assumption of a zero payoff in the case of failure simplifies the model without changing its qualitative results. The qualitative results require only that an individual whose project fails has a probability of defaulting on his loan. We relax this assumption in Hoff and Lyon (1993).

The expected utility of an individual is here assumed to be

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

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

$$R \equiv \underset{\ell}{\text{Max}}\ \alpha w\ell - v(\ell)$$

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

$$S \equiv \underset{\ell}{\text{Max}}\ w\ell - v(\ell).$$

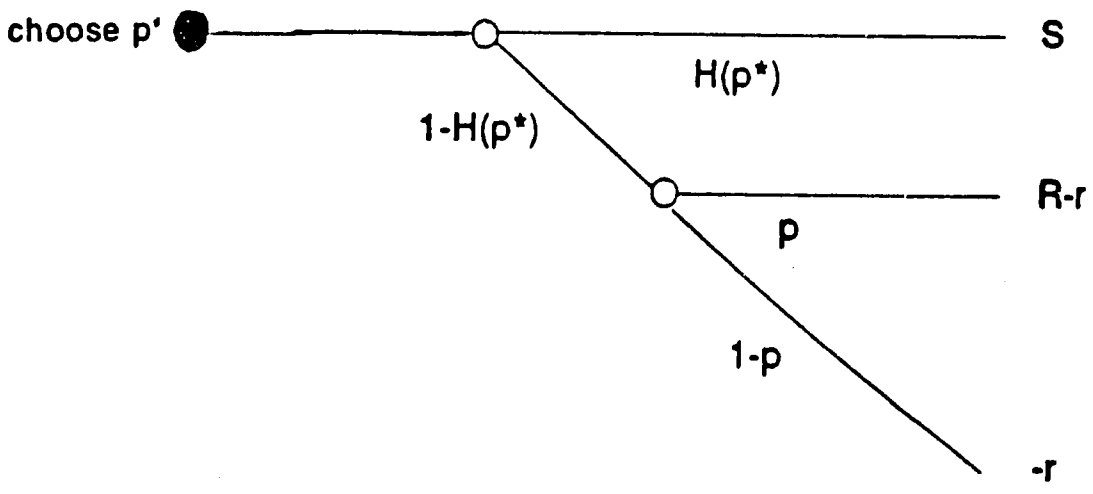
The focus of this model is the individual's investment choice, and it is convenient to formalize this as a choice of a reservation success probability, denoted p^*. In the population as a whole, the distribution of success probabilities is $H(p)$. We can think of each individual's success probability, which is his private information, as being drawn from the distribution $H(p)$. If an individual draws a $p > p^*$, he undertakes a risky project; if he draws a $p \leq p^*$, he does not. Thus, the individual's decision variable can be represented as a choice of p^*.

For any p^*, the expected net social product of an individual's labor is represented in fig. 1. With probability $H(p^*)$, an individual does not undertake a project and the net social product of his labor is S, the first terminal point in fig. 1.[13] With probability $1-H^*$, he undertakes a project.

[13]For future use, let $h(p)$ denote the density function of p, and let h^* and H^* denote the values of the density and distribution functions, respectively, at p^*.

Figure 1

The Net Social Product of Labor



If it succeeds, the net social product of his 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 can easily be seen in the figure that, given any p, the expected net social product of labor if a project is undertaken is $\Delta(p) \equiv pR - r - S$. The efficient value of p^*, indicated by a subscript 0, is implicitly defined by $\Delta(p^*_0) = 0$, so[14]

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

For future use, let $\hat{p}$ denote the truncated mean of an individual's success rate, conditional on p^*:

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

II.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 unit lent of *i*, the borrower's[15] choice of

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[14]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 $R > 0$.

[15]See Bernanke and Gertler (1990) for a similar characterization of competitive equilibrium, but in a one-factor setting. The proof of Proposition 1(i) below follows the lines of Bernanke and Gertler.

reservation probability, p^*, solves

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

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

$$(8) \qquad p^*_b\left[R - i[1 - W]\right] = rW + S$$

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 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 unit lent of

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

Substituting (9) into (8) yields the incentive constraint that defines the borrower's choice of p^* that is consistent with the lender's break-even rate of interest:

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

where $\hat{p}(p^*_b)$ is denoted by $\hat{p}_b$.

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, and his expected surplus from investing in a risky project is an increasing function of his wealth. Formally, (i)* $dp^*_b/dW > 0$ *and (ii)* $d\{[1-H^*]\Delta(\hat{p}_b)\}/dW > 0$.

Proof. (i) 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.

(ii) 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[16]

$$d\{[1-H^*]\Delta(\hat{p}_b)\}/dW = \{-h^*\Delta + [1-H^*]d\Delta/dp^*\}dp^*_b/dW$$

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

$$= i[1-W][d\hat{p}/dp^*]dp^*_b/dW$$

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.

The next section will show that a government transfer policy, financed by a tax on labor, can provide a bootstrap form of collateral that reduces the zero-profit interest rate for each wealth group and increases individuals' expected utility.[17]

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[16]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:

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

$$= \Delta(\hat{p}_b)$$

Differentiating the above yields the last line of the proof.

[17]The expected utility is computed before the individual has learned his own success probability, p. An alternative policy, emphasized 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 pay 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.

II.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 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[18]

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

so that his unconditional expected utility is

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

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

$$p^*\left[R_t - i[1-W-G/r]\right] = rW + S_t + G \tag{15}$$

---

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

where the LHS is the expected benefit of undertaking a risky 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 changes p* through two channels. First, the transfer allows the individual to increase his stake in the project by G/r in current units of account. 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 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.[19]

---

[19]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

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*:

$$\text{(19)} \qquad \frac{\partial p^*}{\partial t} = \frac{D}{R_t - i\left[1-W-\frac{G}{r}\right]} \gtreqless 0 \quad \text{as} \quad D \gtreqless 0.$$

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. Labor productivity w in the riskless undertaking is 3 and labor productivity in a successful project is α times greater, with $\alpha = 2$. The cost of a project is one unit, and the gross riskless interest rate r over the period the loan is outstanding is 1.6. Success probabilities p are assumed to be distributed according to the bell-shaped density function $h(p) = 6[p-p^2]$.

The shaded areas in the figure illustrate the deviation of p^* 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 $p^* = .576$, equilibrium under a Pareto-optimal tax/transfer policy yields $p^* = .614$, and the first-best threshold is $p^*_0 = .636$, independent of endowment wealth.

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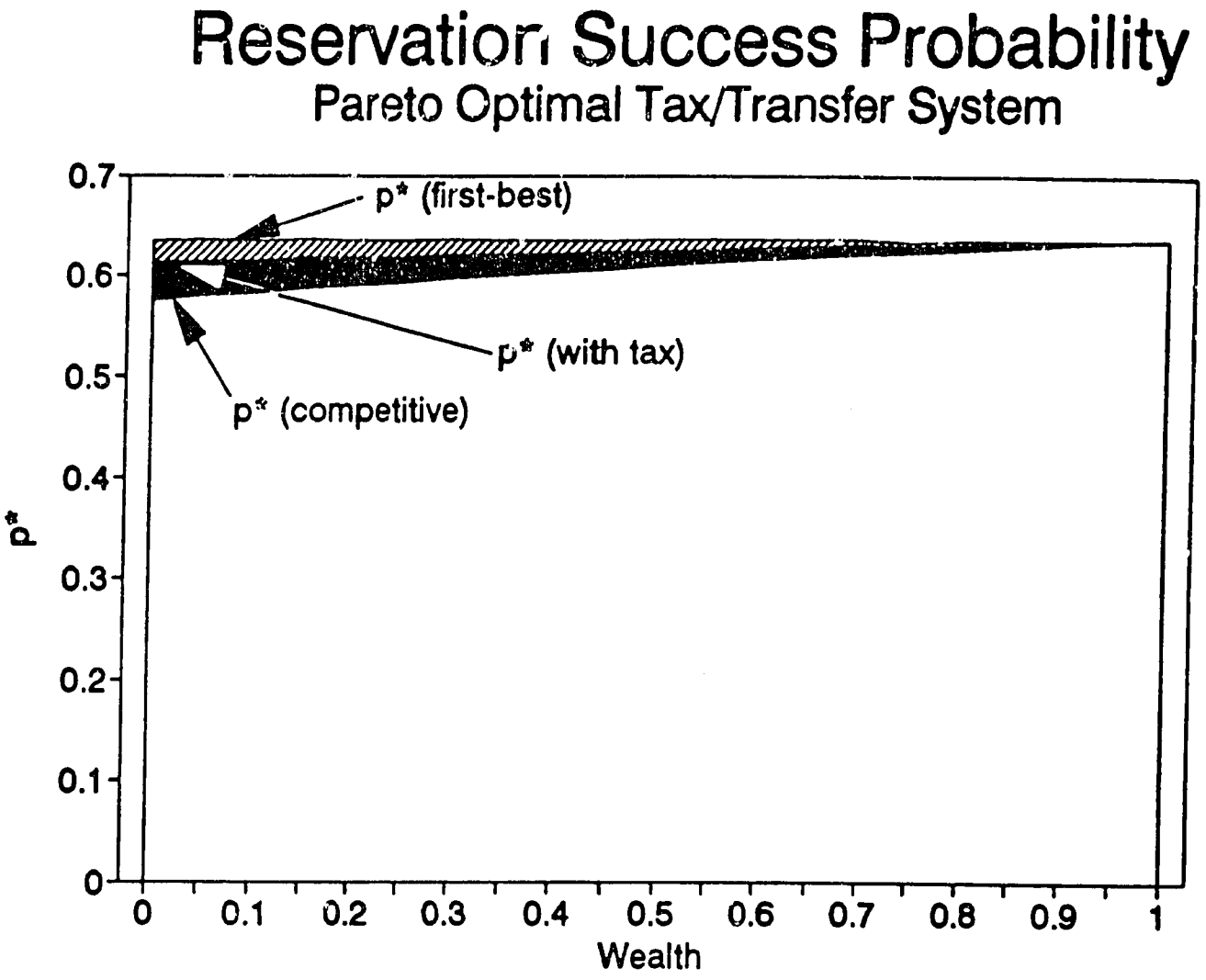
sides of this inequality by $w\ell_s$ and substituting in the expression for ℓ_r, we have $p^*\alpha w\ell_r > w\ell_s$, as was to be shown.

Figure 2


Reservation Success Probability
Pareto Optimal Tax/Transfer System
p* (first-best)
p* (with tax)
p* (competitive)
p*
0.7
0.6
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

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[20]: 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

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

where $\Delta_t(p^*) \equiv p^*R_t - S_t - r < 0$ and the sign condition follows by analogy with (11).

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

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

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

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

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

[20]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 $\partial U/\partial p^*|_{i\ fixed} = 0$, whereas the total derivative dU/dp*, will be seen to be positive, given (9).

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)

$$dU|_{dB=0} = -h^*\Delta_t(p^*)\left[\frac{\partial p^*}{\partial W}\frac{dG}{r} + \frac{\partial p^*}{\partial t}dt\right] + t\left\{\frac{\partial N}{\partial t}dt + \frac{\partial N}{\partial p^*}\left[\frac{\partial p^*}{\partial W}\frac{dG}{r} + \frac{\partial p^*}{\partial t}dt\right]\right\}$$

The RHS consists of two terms. 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 term on the RHS of (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. The following simulation, based on representative

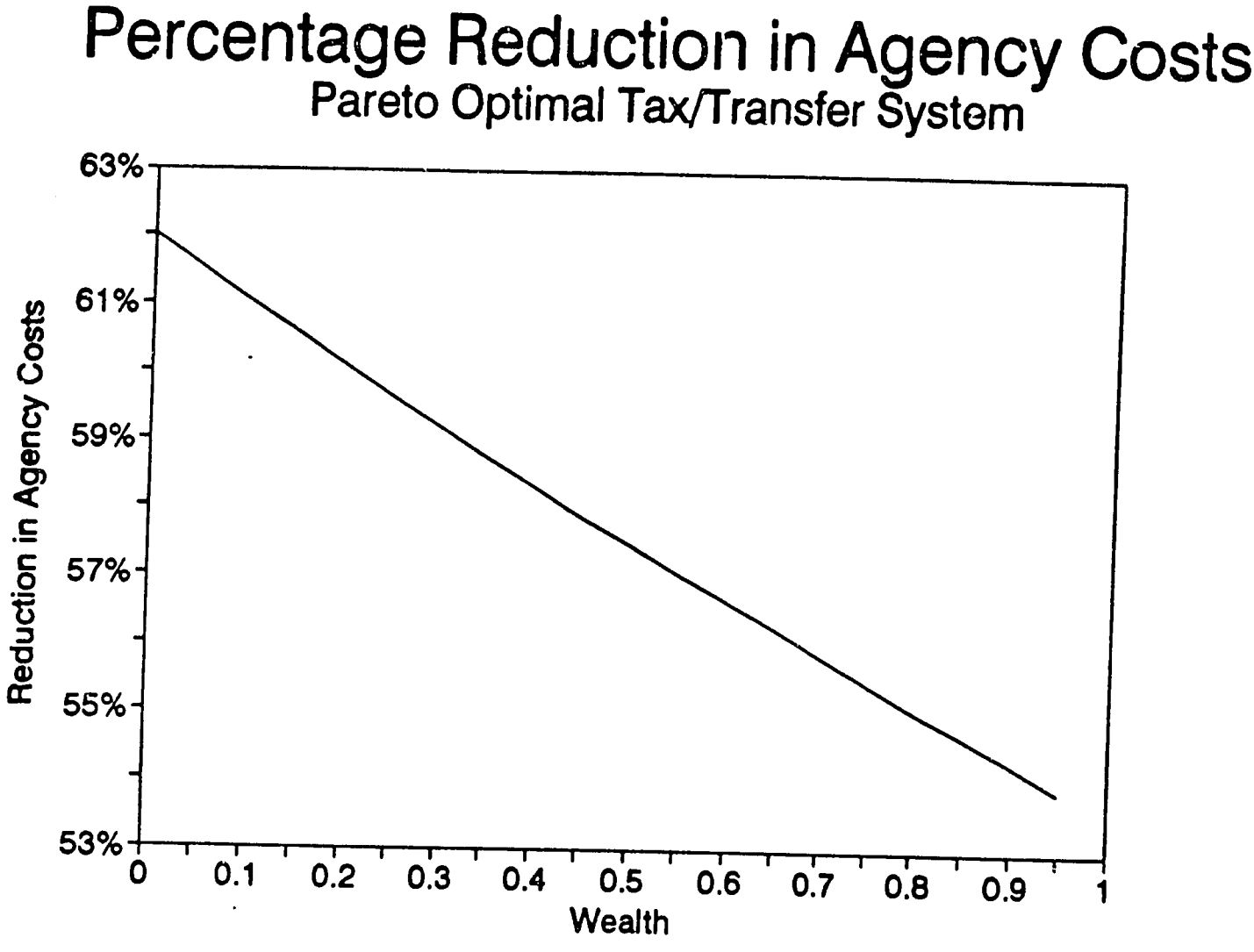
parameters, provides a way of evaluating the proposition.

The simulation uses the same parameter values used for fig. 2. The Pareto optimal tax rate occurs where the marginal deadweight loss from increasing the tax rate on labor is just offset by the marginal gain from the induced increase in p*. Given the assumed parameter values, a tax rate on labor of 5.8 percent is Pareto optimal for individuals with zero wealth. The optimal tax rate declines approximately linearly as wealth increases from 0 to 1. For those with wealth of at least one unit (who would never choose to borrow), the optimal tax rate is, of course, zero. Fig. 3 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. For those with no capital endowment, the tax/transfer policy recovers more than 62 percent of the loss in utility created by agency costs. The tax/transfer policy is effective even as endowment wealth approaches one.

III. Conclusion

A standard explanation of communal land tenure regimes is that the costs 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, restrictions on the tranferability of land 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

Figure 3



This measure is $\frac{U_T - U_C}{U_0 - U_C}$, where 0, C, and T indicate the first-best allocation, competitive equilibrium, and equilibrium with the Pareto optimal wage tax.

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 would increase efficiency.

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

These arguments cast doubt on the standard view that (a) the reform of indigenous land tenure systems, absent other reforms, will increase efficiency, and that (b) land tenure reform is essential to the expansion of formal credit markets where the borrower is required to pledge collateral.

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. We have taken up the last problem in ongoing work.

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