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SOME SURPRISING ANALYTICS OF RURAL CREDIT SUBSIDIES

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Abstract. This paper presents a model of an informal credit market with free entry into moneylending by large landowners, monopolistic competition, and strategic interaction among moneylenders. We show that an increase in government-subsidized funds to large landowners may lead to entry *or* exit by large landowners from the moneylending activity. If it leads to entry, and if lending costs (including enforcement costs) increase with the number of moneylenders recruiting borrowers, then an expansion of formal credit does not necessarily bring down informal interest rates, and could even raise them.

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1. Introduction

Throughout the developing world, governments have focused on the expansion of cheap agricultural credit as a primary instrument of agricultural development. These policies have funneled through banks and specialized credit agencies large amounts of credit at low, regulated interest rates (World Bank, 1989, ch. 4). Critics for a long time have pointed out that such lending has been heavily concentrated among large farmers, while small farmers continue to rely for credit primarily on the informal sector.[1] Advocates of cheap credit policies have taken comfort in the view that a transfer of funds to *any* set of agents in the rural economy will bring down interest rates for all. This is an implication of existing models of credit markets, whether characterized by perfect competition or perfect monopoly (other than perfectly discriminating monopoly).

This paper offers a less comforting view. We present a model of a monopolistically competitive moneylending market in which an expansion of cheap agricultural credit, intermediated through large rural landowners, does not necessarily bring down informal interest rates, and may even raise them. In the model--as we would argue in the economy--the cost function of each moneylender as well as the degree of competition among moneylenders are affected by the number of moneylenders in the market. The model is motivated by recent field studies of the micro-structure of such markets (especially Aleem, 1990, Siamwalla et al., 1990; and Floro and Yotopoulos, 1989), which provide convincing evidence of monopolistic competition among moneylenders.

In our model, an expansion of cheap formal credit lowers each moneylender's opportunity cost of capital and *initially* lowers the interest rate charged. But under two scenarios the long-run

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[1]For some recent evidence, see Iqbal, 1988, Table 1; Floro and Yotopoulos, 1989, table 3.5; Lipton and Toye, 1989, ch. 5; Siamwalla et al., 1990, table 3; and Sayad, 1984 (cited in Besley, forthcoming), who found that farmers with more than 10,000 hectares received loans in value equal to 75 percent of their agricultural output, while those with less than 10,000 hectares received loans in value equal to only 6 percent of their agricultural output.

effect of the expansion of formal credit partially--or even completely--offsets the initial decline in moneylenders' interest rates. The first scenario depends on the externality-like effects that new entry into moneylending may have on the marginal lending costs (including enforcement costs) of each moneylender. If the expansion of rural credit in the formal sector induces new entry into the moneylending business, then the resulting shifts in moneylenders' marginal transactions costs of lending may cause the equilibrium interest rates charged by moneylenders to *rise*. The increased transactions costs increase the wedge between the opportunity cost of funds to large landowners and the interest rate they charge. This effect may more than offset the decline in large landowners' marginal opportunity cost of funds. Funds are "bottled up" among large landowners because their marginal cost of enforcing loans has been driven up by entry.[2]

The second scenario depends on price competition among moneylenders. The initial effect of the expansion of formal credit is to lower the moneylender's own cost of funds (increasing his profits) and to lower the interest rates charged by all his competitors (reducing his profits). If the market structure is sufficiently competitive, the latter effect can be so large that moneylending becomes less profitable than it was before the expansion of formal credit, and so there is *exit* from moneylending. Exit will increase the market power of the remaining moneylenders; this, in turn, may offset much (but not all) of the initial decline in interest rates.

There are several reasons why it is important to investigate models with endogenous transactions costs. The moneylender's transactions costs are often substantial, both absolutely and

[2]The perverse result that an increase in the number of (monopolistically competitive) sellers increases the price also occurs--but for completely different reasons--in several models presented in Satterthwaite (1979). In those models, an increase in the number of sellers may cause an increase in consumer search costs.

relative to his capital costs.[3] While empirical work on interest rates charged by informal lenders is quite limited, evidence from Thailand indicates that interest rates paid by small farmers in the informal sector have been stable despite a massive expansion of bank lending in the rural sector (Siamwalla et al., 1990, p. 285; Onchan, 1992, p. 108). Siamwalla et al. conclude:

> From our analysis of the Thai rural credit market, we draw the implication that mere injection of funds into the rural areas does not lower informal sector interest rates or drive informal lenders out of business; funds are not the scarce factor. (p. 272)

Thus, a model of the informal credit market should admit this as a possible outcome. The model we construct in this paper, unlike the standard model, is consistent with their observation.

This paper contributes to the literature on the effects of cheap agricultural credit policies.[4] But unlike preceding studies, the analysis here focuses on the incidence of credit subsidies in a fully articulated sectoral equilibrium model. The paper does not address other important issues raised by cheap credit policies--their effects on savings or on production efficiency in agriculture, or the political economy problems to which intervention in credit markets gives rise.

This paper also advances the literature in two other respects. It is now generally recognized that standard competitive models, with perfect information, provide an inadequate basis for analyzing capital markets (Jaffee and Stiglitz, 1990). Most of the recent literature on capital markets has focused on differences among borrowers, on the asymmetry of information between borrowers and lenders, and on the self-selection and incentive effects of contract terms, including the implications for rationing. This paper focuses instead on enforcement and screening costs (as do Eaton and Gersovitz,

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[3]A recent study of 14 moneylenders in Pakistan (Aleem, 1990, tables 5 and 6) found that their average costs of search, monitoring, and enforcement were 39 rupees per 100 rupees lent, compared to their capital costs of 27 rupees per 100 rupees lent. The first category of costs includes costs of personnel and transportation, the opportunity costs of the lenders' time, and a pro-rated portion of their rent of warehouses to store debt repayments made in kind. The second category of costs includes the opportunity cost of funds lent, delinquency costs, and bad debt.

[4]For recent overviews of this literature, see Gonzalez-Vega (1993, sections 3 and 4) and Braverman and Guasch (1986, section 2).

1981, and Townsend, 1983, in quite different contexts). These costs are not like normal production costs; they have a profound effect on the structure of the equilibrium. For instance, typically, the same borrower will not be screened by more than one or two lenders, which necessarily creates a structure of imperfect competition among these lenders. Equally important, lenders differ in their ability to screen borrowers and enforce contracts, and these differences are often borrower-specific. This paper simplifies the analysis by focusing on three groups of potential lenders: large landowners who have invested in enforcement technology, large landowners who have not, and formal lenders.

Differences among lenders in the ability to screen borrowers and enforce contracts arise in both developed and less developed economies, and are manifested in the prevalence of trade credit. They explain why many firms are *both* borrowers and lenders. Specific information acquired in the process of production, buying inputs, or marketing outputs will put a firm in an advantageous position with respect to lending to a particular borrower or class of borrowers (Stiglitz, 1987a).

Depending on circumstances, government may have either advantages or disadvantages in lending. In more developed countries, government may be at an advantage, with its access to social security and tax records, particularly if it employs the enforcement powers of the tax authority.[5] But in less developed countries, government is typically at a disadvantage as a lender; government does not have either the enforcement or information capacities that are available to a local moneylender. This provides part of the rationale for government to focus its lending activity on large landowners, who can put up substantial collateral. From this perspective, failure of the government to lend to tenants and small landowners is not necessarily the consequence of the political influence of the large landowners; it may be part of a rational system of "delegated monitoring," an almost necessary consequence of the lack

[5]There may be economies of scope between collecting taxes and collecting money owed on debts.

of an effective court system to enforce contracts at the village level.[6] The analysis of this paper may thus be viewed as the analysis of equilibrium under one type of delegated monitoring.

This paper also contributes to the theory of monopolistically competitive market structures. The shifts in the cost function as a result of new entry most clearly differentiate our model from other models of monopolistic competition. The relationship between the monopolistically competitive sector and the rest of the economy is also modelled. In effect, we derive the supply function to the monopolistically competitive sector. Our model is related to that of our earlier paper (Hoff and Stiglitz, 1993) and also to the international trade model of Horstmann and Markusen (1986). But unlike those papers, in this paper there is price as well as entry competition in the monopolistically competitive sector. For that reason our paper obtains a richer set of comparative statics results. Subsidies may induce entry *or* exit; and the magnitude of the effects of government intervention and induced entry or exit depends on interaction effects among lenders.

Section 2 is a brief overview of the micro-structure of rural credit markets in developing countries. Section 3 describes the model. We present our results diagrammatically in section 4, which is the heart of the paper, leaving algebraic proofs to the appendix. Section 5 concludes.

2. Market Micro-structure

Ghate (1992) has suggested that in order to examine the pattern of interaction between the formal and informal credit sectors,

> it is useful to think of [their many] submarkets as constituting [a] continuum, arranged in declining order of degree of requirements [set by the formal sector that they meet]. Each submarket is defined by a complex of interrelated variables such as borrowing purpose, loan size, loan duration, the borrowers' income and asset position, and so on. [One end of the

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[6]In some cases, the issue is not just the existence of a court system. Where failure to repay loans is related to a failure of the harvest, there are political pressures for forgiveness of indebtedness. Moreover, in some places, there may be strong social pressures brought to bear against those who would buy foreclosed land, so that, at the very least, the amount that the government can recover upon foreclosure and resale is limited.

> continuum] consists of submarkets which are catered to entirely by the formal sector, while those [at the other end] are catered to entirely by the informal. In between . . . is a range of submarkets which are catered to by both sectors. (p. 861)

A submarket served primarily by formal lenders is that for large loans to wealthy farmers who offer land as collateral; a submarket served primarily by informal lenders is that for production and consumption loans to small landowners.[7] In general, small landowners cannot get loans from the formal sector because they do not have secure, fixed collateral or because, given the much lower transactions costs per dollar lent, the formal institutions find it more profitable to lend to large landholders.[8]

Across these two submarkets there are substantial flows, intermediated by informal lenders. Aleem (1990, pp. 341-42) reports that about half of moneylenders' funds come from their own savings, 30 percent come from formal sources, and the remainder comes from other moneylenders and from clients who used them as a safe deposit (at zero interest). Floro and Ray (1993) and Ghate (pp. 862-63) cite studies from the Philippines and Bangladesh, respectively, that indicate that an even greater percentage of informal lenders' funds comes from the formal sector.

In some rural areas the dominant form of lending is by landlords to their tenants and employees, or by friends and neighbors to one another (generally at zero interest). But as agriculture becomes more commercialized and a greater number of farmers produce marketable surpluses, the *trader-lender* has become the dominant type of informal lender in a number of rural credit markets in

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[7]See, e.g., Donald, 1976; Siamwalla et al., 1990, especially table 3; and Floro and Yotopoulos, 1989, ch. 3.

[8]Both the lender's and the borrower's fixed costs of transacting a loan in the formal sector tend to be quite high, and this contributes to the inequality in access to formal credit by large and small farmers. In Fiji, Sharma (1985, table 1) estimated that the cost of applying for a one-year loan from the formal sector (the borrower's time lost, his legal fees, etc.) amounted to 31 percent of the average loan extended to a sugarcane farmer with a farm size below 2 hectares, compared to 13 percent for a sugarcane farmer with 6 hectares. Taking into account their risk of not getting the formal credit at all, or not getting it at the time that it was needed, small farmers might be served more cheaply by moneylenders than by banks.

the Asian developing countries. Recent surveys in Punjab, India (reported in Bell, 1990) and in Luzon, Philippines (Nagarajan 1992) have found that trader-provided credit represents 60 percent or more of total informal credit to cultivating households, while much of the remainder comes from non-commercial lenders (friends, relatives, and chit funds). These and other studies[9] also report a common mode of operation of the trader-lender. He requires the borrower to undergo an initial period of screening (lasting one or two cropping seasons) and to market his output exclusively through him. He collects the principal and interest in kind at the threshing floor. It is his enhanced ability to screen loan applicants (by observing the small farmer's output over many seasons) and enforce repayment (by collecting, from the harvest, crops that he can store in his own warehouse) that provides the trader-lender with his natural advantage in lending.

The information and enforcement structure of the market for trader-provided credit has consequences for its competitive structure. Trade-credit interlinkage provides a means of direct screening which, once undertaken, acts as a barrier to entry by third parties and is thus a source of monopoly power. But any market where the buyer and seller build up relationship-specific capital is likely to be characterized by monopolistic competition. The sunk investment in the relationship insulates the seller's market from competitors even when his charges exceed the marginal cost of lending.[10] New entry is possible, however, because many small farmers are not in the market for credit every year, and the ability of a moneylender to lend is subject to change. Aleem (1990, p. 338) reports for Pakistan that "on average a borrower remains a repeat customer for approximately four periods, beyond which the farmer generally moved to another lender or left the market until he again needed to borrow funds." We survey elsewhere (Hoff and Stiglitz, 1990; and see also Aleem, 1990) the evidence that the market for

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[9]See Aleem (1990) for Pakistan, Siamwalla et al. (1990) for Thailand; and Floro and Yotopoulos (1989) for a broad survey of the Philippines.

[10]This point is made in connection with product markets in Salop (1976). The role of market interlinkage in creating market power is emphasized in Bardhan (1989).

informal credit is monopolistically competitive, with profits driven down to zero by entry. The next section formalizes such a market with price and entry competition.

3. The Model

We consider an economy with three types of agents: small landowners, large landowners specialized in farming, and large landowners who allocate their funds between farming and the moneylending activity. State credit agencies and other formal lenders lend only to large landowners. Large landowners can on-lend these funds to small landowners, or can lend out of their own savings. But in order to be able to screen prospective borrowers and enforce repayment, lenders to small landowners must make an investment in enforcement capability, δ -- e.g., by buying a warehouse, hiring staff, and so on. That is, we assume that expanded opportunities to lend are what is "purchased" by the investment in screening and enforcement capability, δ.[11]

The flows of credit between agents are illustrated in fig. 1,[12] where G represents the formal sector credit ration provided to a large landowner at low, regulated interest rate; and K is the large landowner's initial endowment of liquid capital. The question we will ask is, Does an increase in cheap formal credit, G, reduce the interest rates charged by moneylenders?

A. The demand for informal credit

Assumption 1. Each small landowner's demand for credit is a function of the interest rate charged:

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[11]Similar results would obtain with any function for screening and enforcement costs that exhibited decreasing average costs over a range.

[12]We assume no lending among large landowners, but this assumption is stronger than we need to obtain our results. For instance, assume that large landowners *do* lend to other large landowners who are moneylenders, but that such lending requires collateral. Assuming there is a limit on the amount of collateral each moneylender can offer, an increase in formal sector lending, by increasing the amount of the moneylender's land mortgaged to the formal lender, would reduce the moneylender's ability to borrow from other landowners on a one-for-one basis. This would actually strengthen our results that the expansion of *formal* credit is of doubtful effectiveness in increasing the aggregate supply of *informal* credit. This argument should make clear why it is impossible for all landowners to funnel their funds through a single moneylender.

$z = z(i)$, with $z' < 0$.

His demand function reflects his production opportunities on and off the farm, and his opportunities to save by storing output or investing in fixed capital. But we do not model these explicitly.

Assumption 2. A moneylender's ability to recruit m creditworthy customers depends on the number of other moneylenders who are seeking out borrowers and on the interest rate they charge, in comparison with the interest rate he charges, $m = m(i, \bar{i}, N)$, where $\bar{i}$ is the interest rate charged by others. Letting subscripts indicate partial derivatives, the properties of m are:

(i) $m_i < 0, \quad m_{\bar{i}} > 0$

(ii) $m_{i\bar{i}} > 0,$

(iii) $m_{iN} < 0,$ and

(iv) $m_{ii} + m_{i\bar{i}} \leq 0.$

Taking each of these properties in turn, (i) states that a moneylender's ability to recruit borrowers is decreasing in his own interest rate and increasing in that of others. (ii) states that if other lenders increase their interest rate, the number of customers a given lender loses from raising his own interest rate falls. (iii) states that an increase in entry increases the number of borrowers a given moneylender loses if he raises his interest rate. These assumptions seek to capture the idea that borrowers face switching costs because of the need to undergo a new process of screening and to establish a reputation for trustworthiness vis à vis a new lender.[13]

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[13]If all borrowers had strictly positive switching costs, then the only symmetric equilibrium would entail each lender charging the "monopoly" interest rate. Raising interest rates a little results in no loss of customers. See Hoff and Stiglitz (1993) and, in a more general context, Diamond (1971). The analysis here can be thought of as entailing a distribution of screening costs, with a strictly positive density of borrowers with zero and near zero switching costs. By raising his interest rate, a moneylender always loses some share of the market. A formal model with this property is Stiglitz (1987b).

(iv), together with (ii), has two implications: first, that m_{ii} is negative, which means that the number of customers a moneylender loses by raising his interest rate increases at an increasing rate. This property helps to ensure that the moneylender's profits are a concave function of the interest rate he charges ((9) below). Second, (iv) implies that $|m_{ii}| \geq m_{i\bar{i}}$, so that the effect on a moneylender's loss of customers due to a change in his own interest rate is at least as great as that of a change in the interest rate charged by other moneylenders. This property helps to ensure that a stable equilibrium exists (in (12) below).

Letting ϵ denote the elasticity of demand facing a given moneylender,

$$(1) \qquad \epsilon \equiv -\frac{d\ln(mz)}{d\ln i} = -i\left[\frac{m_i}{m} + \frac{z'}{z}\right],$$

properties (i) and (ii) imply that an increase in $\bar{i}$ reduces a moneylender's elasticity of demand:

$$(2) \qquad \epsilon_{\bar{i}} = \frac{i}{m}\left[\frac{m_{\bar{i}} m_i}{m} - m_{i\bar{i}}\right] < 0.$$

We will see that an increase in the interest rate charged by other moneylenders increases a given moneylender's profits and induces him to raise his interest rate.

Assumption 3. The market size of the informal sector is fixed in the sense that the total number of borrowers, denoted $\bar{Z}$, is independent of small changes in the number of moneylenders, N.[14]

At a symmetric equilibrium, where

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[14]This is an important assumption. The alternative assumption is that there is a some class of borrowers or some hinterland that is not served by moneylenders at low N, but would be served if N increased. The evidence that we are aware of largely supports the assumption in the text. For example, Siamwalla et al. (1990, pp. 289-90) and Aleem (1990, pp. 335-36) report in their surveys of informal lenders in Thailand and Pakistan, respectively, that the lenders perceive their lending to be limited by the lack of new good prospects to whom to lend, rather than by a shortage of funds. Yotopoulos and Floro (1991, p. 165) write, more cautiously given the absence of direct evidence, that "the [Philippine government's] policy of channeling formal credit to informal lenders...does not necessarily translate into wider credit accessibility and to increased financial integration of small farmers....any additional funds made available through informal conduits could possibly result in bigger loans for the same number of farmers." The results of the analysis would be similar if $\bar{Z}$ were a function of N, but the calculations would be considerably more complex.

(3) $$i = \bar{i} = \hat{i}$$

we thus have the identity

(4) $$Nm(\hat{i},\hat{i},N) \equiv \bar{Z}$$

which places two restrictions on the partial derivatives of m(î,î,N). Holding N fixed and differentiating (4) with respect to î, we have

(5) $$m_i(\hat{i},\hat{i},N) + m_{\bar{i}}(\hat{i},\hat{i},N) \equiv 0.$$

It follows immediately that the elasticity of the moneylender's demand curve when every moneylender makes the same adjustment to his interest rate,

$$-\frac{d\ln(mz)}{d\ln\hat{i}} = -\hat{i}\left[\frac{m_i + m_{\bar{i}}}{m} + \frac{z'}{z}\right] = \frac{-\hat{i}z'}{z},$$

is just equal to the elasticity of the individual borrower's demand curve, and is less than the perceived elasticity facing each moneylender (in (1)).

Holding î fixed and differentiating (4) with respect to N, we have

(6) $$m_N(\hat{i},\hat{i},N) \equiv -\frac{m}{N}.$$

(6) states that, for a *given* set of interest rates with $i = \bar{i} = \hat{i}$, a percentage increase in N reduces the amount of lending by each lender by that same percentage. Given an initial symmetric equilibrium, that is the intuitive consequence of the assumption of a fixed market size. Using (6), we have

(7) $$\epsilon_N(\hat{i},\hat{i},N) = -\frac{\hat{i}}{m}\left[\frac{m_i}{N} + m_{iN}\right] > 0$$

which states that an increase in entry increases the elasticity of demand facing each moneylender; exit

has just the opposite effect. We thus have, by assumptions 1 through 3, the conventional result that an increase in the number of entrants increases the effective degree of competition in the market.[15] In the next section we introduce an assumption that has an offsetting effect: we assume that a moneylender's cost of enforcing repayment of a given size loan is greater, the greater the number of other moneylenders in the market.

B. The moneylender's costs

Assumption 4. A moneylender's costs consist of three components: a fixed cost δ per period; his opportunity cost of funds; and a non-pecuniary cost of effort, denoted C, for screening, monitoring, and enforcement. C depends on the size of loan provided to each borrower (z), the number of his clients (m), and the number of other moneylenders (N), according to

$$C = m\,c(z,N) \qquad \textit{with } c_z \geq 0,\ c_N > 0,\ c_{zz} \geq 0,\ \textit{and } c_{zN} \geq 0.$$

These properties of the transactions cost function are meant to capture several effects. First, at any given values of z and N, the screening, monitoring and enforcement costs of lending are greater if the lender has more clients (more farms to visit). Second, the incentive not to repay a loan and the proclivity to engage in risky activities both increase with the amount due (see Eaton and Gersovitz, 1981). As more is lent, the marginal monitoring and enforcement costs will therefore tend to increase: $c_z \geq 0$ and $c_{zz} \geq 0$.

Now consider the effect of an increase in N for given loan size z and clients m. Each moneylender, in seeking to have first claim on the harvest of the borrower, tries to ensure that his clients borrow from no other moneylenders. The difficulty of ensuring such exclusivity is increasing in the number of other moneylenders. Moreover, as N increases, borrowers may perceive that if they were to default and lose access to further credit from their current lender, it would be easier to find

[15]These assumptions complete the conditions imposed on demand, except for the limits we place on the convexity of the demand curve in (9) and (12).

an alternative source of funds: the threat of cut-off from future loans has less value. With reduced incentives for repayment, the enforcement problem with respect to each borrower becomes more difficult (see Bolnick, 1992). The main purpose of this paper is to identify the various effects that arise from extending formal sector credit, and to show that observed patterns of responses are consistent with plausible cost structures. To do that, it suffices to employ the simplified cost structure in assumption 4. We simplify further by making an assumption that removes the problem of bad debt in equilibrium:

Assumption 5. There are only two types of prospective borrowers, "good" borrowers, who, with sufficient attention to repayment, always repay their loans, and "bad" borrowers, who, with any reasonable level of expenditures on enforcement, still would not repay their loans (e.g., simply because their output is too small). We assume that, with adequate screening activities, a moneylender can sort out good prospects from bad, and that it always pays moneylenders to incur not only those costs, but also the costs required to have debt contracts enforced.[16] Thus, in this simplified model, the probability of repayment is one.

C. Symmetric equilibrium: Constant cost of funds

Suppose for the moment that an individual has decided to become a lender. What interest rate will he charge? We start with the case where the lender's opportunity cost of capital is a constant, ρ, in order to isolate the reason why an increase in entry may lead to an increase in the informal interest rate.

The lender seeks to maximize his payoff from lending: $m\left[z[i-\rho] - c\right] - \delta$. Maximizing over i, with $\bar{i}$ taken as given, his first-order condition is

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[16]In other words, so long as the probability of repayment is less than one, the marginal return to an increase in screening, monitoring, and enforcement activities exceeds the marginal cost.

(8) $$mz + m_i\left[z[i-\rho]-c\right] + mz'[i-\rho-c_z] = 0$$

As he raises his interest rate, the number of his customers falls at the rate m_i, with a loss per customer of $z[i-\rho]-c$. And his customers borrow less, which reduces the volume of lending by mz' and results in a loss per dollar equal to $i-\rho-c_z$. The moneylender sets his interest rate so that these two losses from a marginal increase in i just offset the marginal increase in profits, mz.

The second-order condition requires

(9) $$\Delta \equiv 2m_i\left[z + z'[i-\rho-c_z]\right] + z'm[2-c_{zz}z'] + m_{ii}\left[z[i-\rho]-c\right] + mz''[i-\rho-c_z] < 0.$$

The first term of Δ is strictly negative since, by rearranging (8)

(10) $$z + z'[i-\rho-c_z] = -\frac{m_i}{m}\left[z[i-\rho]-c\right]$$

and the right-hand side is strictly positive. The second and third terms of Δ are also strictly negative, by inspection. Thus, the second-order condition is satisfied provided that z" is not "too positive"; that is, provided that the borrower's demand curve does not become too inelastic at high interest rates.

We now analyze the response of a given moneylender to a small increase in the interest rates charged by other moneylenders, for given N. Differentiating (8) and using the implicit function theorem, we have[17]

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[17] *Proof:* Differentiating the first-order condition in (8), we have

(10a) $$\left\{m_{\bar{i}}\left[z + z'[i-\rho-c_z]\right] + m_{i\bar{i}}\left[z[i-\rho]-c\right]\right\} d\bar{i} + \Delta di = 0.$$

$$\frac{\partial i}{\partial \bar{i}} = \frac{-\epsilon_{\bar{i}} \frac{m}{i}\left[z[i-\rho]-c\right]}{-\Delta} > 0. \tag{11}$$

An increase in $\bar{i}$ reduces the elasticity of demand facing a given moneylender. His resulting gain is proportional to his gain from lending per customer, $z[i-\rho] - c$.

Fig. 2 depicts the reaction function (for a given N). The symmetric equilibrium is the intersection of the locus with the 45° line. We assume that a stable equilibrium exists. This requires that the slope of the reaction function be less than one; i.e., that the effect on a moneylender's payoff function of a change in his own interest rate should dominate that of a change in the interest rate charged by other moneylenders. This condition is

$$-\Delta > m_{\bar{i}}\left[z + z'[i-\rho-c_z]\right] + m_{i\bar{i}}\left[z[i-\rho]-c\right]. \tag{12}$$

To see the plausibility of the condition, suppose first that $z'' \leq 0$. Then assumption 2.iv and equation (5) guarantee that (12) holds in a neighborhood of a symmetric equilibrium. If $z'' > 0$, then the stability condition implicitly sets a positive upper bound on z''.

Applying the implicit function theorem again to (8) tells us the effect on a given moneylender's interest rate of an increase in N, at fixed $\bar{i}$:

$$\frac{\partial i}{\partial N} = \frac{-\epsilon_N \frac{m}{i}\left[z[i-\rho]-c\right] - m_i c_N - mz' c_{zN}}{-\Delta} \tag{13}$$

using (6) and (10). The sign of (13) is that of the numerator, and depends on two distinct effects:

Substituting (10) into the first term and rearranging using (2) yields the desired result.

(a) *The market power effect of entry*, $-\epsilon_N < 0$. An increase in N increases the competitiveness of the market by increasing the elasticity of demand facing a given moneylender (lowering i).

(b) *The effect of entry on enforcement costs*, $-mc_N - mz'c_{zN} > 0$. An increase in N means that the moneylender's cost of enforcing repayment rises by c_N per customer and by c_{zN} for each extra dollar lent to a given customer. Both effects discourage lending (increasing i).

If in (13) the *enforcement cost effect* dominates the *market power effect* so that $\partial i/\partial N > 0$, then the moneylender's interest rate, for any given $\bar{i}$, will increase as N increases. This is reflected in an upward shift in the reaction curve depicted in fig. 2, and in the positive slope of $\hat{i}$ as a function of N drawn in fig. 3. (In the alternative case, where the *market power effect of entry* dominates so $\partial i/\partial N < 0$, $\hat{i}$ is a declining function of N--see the two lower curves in fig. 6C.)

If there were no strategic interaction among moneylenders, then the interest rate chosen by a given moneylender would be independent of that chosen by others. Then it is straightforward to see that if the interest rate chosen by a given moneylender increases, the equilibrium interest rate will increase. Under the assumption of strategic interaction among lenders (an upward sloping reaction function), if i increases, given $\bar{i}$, then $\hat{i}$ will increase even more because of the positive feedback. For if all other lenders kept their interest rates unchanged, suppose that each one would gain by increasing his interest rate. As each increases his interest rate, the others gain by increasing their interest rates even more: i and $\bar{i}$ are *strategic complements*.

D. Symmetric equilibrium: Variable cost of funds and endogenous entry

We now extend the model slightly so that the cost of capital is a variable. We find that it is still possible, although less likely, that an increase in entry leads to an increase in the interest rate.

We make the following assumption about the endowments and outside investment opportunities of large landowners:

Assumption 6. Each large landowner is endowed with liquid capital K and land. If he becomes a moneylender, he allocates his liquid capital between on-farm investment, R, and lending. His farm output depends on his land, labor, and on-farm investment, but since we will hold his land and on-farm labor constant throughout, we can write his production function as F(R), with $F' > 0$ and $F'' < 0$. A large landowner also has access to a rationed amount of subsidized formal credit, G, at a rate of interest below his opportunity cost of capital.

Each moneylender, in maximizing his end-of-period income less effort now solves:

$$(14) \qquad \underset{i}{Max} \left\{ m[zi - c] + F(K + G - \delta - mz) - rG \right\} \equiv V(\bar{i}, N, G)$$

where r and i are the gross charges of borrowing. (A large landowner who borrows G from a formal lender repays Gr; a small landowner who borrows z from a moneylender repays zi.) $K + G$ are the total funds available to the large landowner, and $\delta + mz$ is the amount spent on the lending activity, leaving $K + G - \delta - mz$ to be invested on the moneylender's own farm.

The first-order condition is

$$(15) \qquad \psi(i, \bar{i}, N, G) \equiv mz + m_i \left[z[i - F'] - c \right] + mz'[i - F' - c_z] = 0$$

Note that ψ is precisely the left-hand side of (8) evaluated at $\rho = F'$, the variable cost of funds foregone from the lender's own farm. Hence, the analysis of the comparative statics of the lender's behavior is identical to that given above except that we need to analyze as well the changes in his cost of capital.

Setting $\rho = F'$, (9) implies that the second-order condition is satisfied, since

$$\psi_i = \Delta_{i}\Big|_{\rho = F'} + F''[m_i z + mz']^2 \tag{16}$$

and the new term is negative, by inspection. The new term reflects the fact that as a given lender raises his interest rate, his lending falls by $m_i z + mz'$, reducing his cost of capital by $-F''[m_i z + mz']$. The loss from raising i (which is proportional to the loss in the volume of lending, $m_i z + z'i$) is thus higher than it was when the opportunity cost of funds was constant, and thus the payoff function is more concave.

Differentiating ψ with respect to $\bar{i}$, we obtain

$$\psi_{\bar{i}} = -\epsilon_{\bar{i}} \frac{m}{i}\left[z[i - F'] - c\right] + F'' m_{\bar{i}} z[m_i z + mz'] > 0. \tag{17}$$

The first term on the right-hand side is identical to the numerator of (11) evaluated at $\rho = F'$, but the second term (strictly positive by inspection) is new. Reasoning as above, it is easy to see that at a higher value of $\bar{i}$, a given lender's volume of lending rises by $m_{\bar{i}} z$, which raises his cost of capital by $-F'' m_{\bar{i}} z$. $\psi_{\bar{i}}$ is thus higher than it would be if the opportunity cost of funds were a constant.

Since the new term in (16) is larger in absolute value than the new term in (17), the stability condition in (12) ensures that the reaction function still has a slope less that one:

$$-\psi_i > \psi_{\bar{i}} . \tag{18}$$

Differentiating ψ with respect to N, we obtain

$$\psi_N = -\epsilon_N \frac{m}{i}\left[z[i - F'] - c\right] - m_i c_N - mz' c_{zN} - F'' \frac{mz}{N}[m_i z + mz'] \tag{19}$$

using (6). Comparing (19) with the numerator of (13), the only new term is the last, and it is strictly

negative: at a higher value of N, the volume of lending at any given interest rate falls by mz/N, which reduces the cost of capital by $F''mz/N$. In the model with a variable cost of capital, an increase in N induces a moneylender to raise his interest rate, for given $\bar{i}$, only if the *enforcement cost effect* exceeds the *sum* of the effects of increased N on the moneylender's market power and his marginal cost of capital. Thus we see that the introduction of a variable cost of capital makes it less likely that new entry leads to an increase in the interest rate.

To complete the analysis of equilibrium, we need to consider the decision by those who have funds to enter the lending activity. Recalling our assumption 6, a large landowner chooses whether to specialize in farming or to divide his capital between his farm and moneylending. If he specializes in farming, his income and utility are

$$H(G) \equiv F(K+G) - rG. \tag{20}$$

If he enters the moneylending activity, his utility at the symmetric equilibrium can be denoted by the indirect utility function:

$$\hat{V}(N,G) \equiv V(\hat{i}(N,G),N,G) \tag{21}$$

using (14). We assume (by choice of the parameter δ) that it pays for some, but not all, large landowners to enter the moneylending activity. Then (ignoring problems of discreteness) there is an equilibrium number of moneylenders, not necessarily unique, such that the two utilities are equal:

$$H(G) = \hat{V}(N,G). \tag{22}$$

and we postulate that a stable equilibrium exists.

Consider how the moneylender's utility changes with N. As N increases, there are direct effects on the size of the moneylender's market, which falls as N increases; and also on his enforcement costs. Both effects reduce his utility:

(23) $$V_N = -\frac{m}{N}\left[z[i-F'] - c\right] - mc_N < 0$$

where the sign condition follows by inspection.

There is also an indirect effect of entry on his utility. As we showed above, if $\psi_N > (<) 0$, then as N increases, each moneylender raises (lower) his interest rate. Each moneylender gains from a higher interest rate by other moneylenders, and loses from a lower one:

(24) $$V_{\bar{i}} = m_{\bar{i}}\left[z[i-F'] - c\right] > 0$$

where the sign condition again follows by inspection.

The assertion of stability requires that the *total* derivative of V with respect to N is negative in a neighborhood of the stable equilibrium, N^e:

(25) $$\hat{V}_N(N^e,G) = V_N + V_{\bar{i}}\frac{d\bar{i}}{dN} < 0$$

For if not, then as N increased, the return to being a moneylender would increase, and the equilibrium would be unstable. Fig. 4 is drawn under the hypothesis that the positive indirect effect of the increase in $\bar{i}$ dominates for small N, but eventually the direct effect dominates and $\hat{V}$ declines with increases in N.[18] That is, the utility of the moneylender is first increasing in N and then decreasing in N. But our results below do not depend on that hypothesis.

The interest rate in the symmetric equilibrium is simple to find. Given N and G, we read it off from fig. 5.

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[18]We know that $\hat{V}(N,G)$ is bounded by the cooperative solution, say V^+, and that V^+ declines with N. That is,

$$V^*(N,G) \equiv \max_{i^*}\left\{m(i^*,i^*,N)\left[z(i^*)i^* - c(z(i^*),N)\right] + F(K+G-\delta-m(i^*,i^*,N)z) - rG\right\}$$

and from (23), $V_N^* < 0$.

4. Effect of an expansion of formal credit

This section uses the model to show that in response to the expansion of formal credit, informal interest rates may fall *or rise*, and hence the aggregate supply of informal credit may rise *or fall*.

Applying the implicit function theorem to the first-order condition in (15), we have

$$\frac{\partial i}{\partial G} = -\frac{\psi_G}{\psi_i} = \frac{F''[m_i z + mz']}{\psi_i} < 0 \qquad (26)$$

As intuition would suggest, an increase in G lowers i (and thus increases lending) for any given $\bar{i}$ and N. The dashed line in fig. 5 illustrates the effect on the moneylender's reaction function of an increase in G. As the reaction function in fig. 5 shifts down, it leads to a larger drop in the value of i. Thus, the curve (first shown in fig. 3) giving i as a function of N shifts down. This shift is depicted by the dashed curves in the lower part of each of the three panels of fig. 6.

How does the increase in G affect large landowners contemplating entry into the moneylending activity? For given N and $\bar{i}$, an increase in G increases $\hat{V}$ more than H. This reflects the fact that at the margin, moneylenders have better financial opportunities than non-moneylenders. These expanded opportunities to lend are what is "purchased" by the investment in screening and enforcement capability, δ. Formally, differentiating (14) and (20), we have $F'(K + G - \delta - mz) > F'(K + G)$, and so a marginal increase in funds, at a given N and $\bar{i}$, induces entry.

The upper part of fig. 6A shows a case where the upward shift in the utility of the moneylender is much larger than that of the pure farmer. The initial equilibrium is at points *a* and *a'*, and the short-run response to the expansion of formal credit reduces the informal interest rate as shown at point *b*. But the induced entry (shown by the arrow below the horizontal axis) is sufficiently large that the movement *along* the i curve offsets its downward shift, leading to an increase in the informal interest rate: the long-run equilibrium interest rate corresponding to point *c*

is above that corresponding to point *a*. *In this case, the expansion of formal credit to large landowners decreases the aggregate supply of informal credit, as the reduction in each moneylender's lending more than offsets the increase in the number of moneylenders* (see Proposition 1 below).

Panel B shows a case where the induced entry is small relative to the downward shift in the $\hat{i}$ curve, so that the equilibrium interest rate decreases. The interest rate at point *c*, the long-run equilibrium, is lower than the interest rate at point *a*, the initial equilibrium. Here the government subsidy increases the aggregate supply of credit to the small landowners.

Panel C shows a case which, in partial equilibrium terms, many might think to be more "normal": the *cost of capital* and *market power* effects of an increase in N dominate *the enforcement cost effect*, so that $\hat{i}$ is a decreasing function of N (resulting in a $\hat{V}(N,G)$ function that is everywhere downward sloping in N). The panel illustrates the case where an increase in G so reduces interest rates among a given set of moneylenders, which so reduces each moneylender's profits, that the utility of lending decreases relative to pure farming:[19] $\partial\{\hat{V} - H\}/\partial G < 0$, and there is exit from the moneylending activity (Proposition 2). Just as in Panels A and B, an expansion of formal credit lowers the $\hat{i}$ curve at each N. The initial equilibrium moves from point *a* to point *b* in Panel C. In the short-run, the fall in $\hat{i}$ is substantial. *But long-run adjustments will partially, though not completely, reverse this short-run effect.* The fall in the profitability of lending induces exit, and the exit of moneylenders increases the market power of those large landowners who remain lenders. The movement *along* the $\hat{i}$ curve from point *b* to point *c* for this reason offsets its downward shift, but now the offset is only partial: point *c* must correspond to an interest rate at least slightly below the initial interest rate at point *a* (Proposition 3 below). The possibility of exit is an interesting result because it means that a *greater* intensity of competition among moneylenders (a greater value of ϵ_N)

[19]That is, $n\bar{i}$ and $-\partial\bar{i}/\partial G$ (which, by symmetry, is identical to $-\partial i/\partial G$) are large.

can imply a *smaller* fall in the informal interest rate.

From an efficiency perspective, Panel C depicts a much more desirable case than Panel A. Fewer resources are dissipated in expenditures on "enforcement capacity," δ; and the long-run upward, offsetting movement in interest rates reflects an increase in moneylenders' market power and hence in their income, not an increase in transactions costs. But in terms of the criterion of benefitting the small landowner through lower informal interest rates, the two panels differ little.

In the Appendix, we prove three propositions:

Proposition 1. If the *enforcement cost effect* is sufficiently large in relation to the effect that entry has on the moneylender's opportunity cost of capital and his market power, then the informal sector interest rate will increase as formal credit increases.

Proposition 2. If there is no strategic interaction among informal lenders ($m_i = 0$), then an expansion of formal credit must induce new entry of informal lenders. If strategic interaction is important (m_i is large), an expansion of formal credit may induce exit of informal lenders.

Proposition 3. If the expansion of formal credit induces exit, then the informal sector interest rate must fall.

To see the intuition behind Proposition 3, consider the following thought experiment. Assume that $\hat{i}$ were to return to its initial level, say $\hat{i}^0$. Then at the initial level of formal credit G^0, but the lower level of moneylenders, $N^1 < N^0$, the utility of the remaining moneylenders would unambiguously exceed that of the large landowners specialized in farming: $V(\hat{i}^0,N^1,G^0) > V(\hat{i}^0,N^0,G^0) = H(G^0)$. For *given* $\bar{i}$ *and* N, an increase in the formal credit ration from G^0 to G^1 increases V more than H. It follows immediately that $V(\hat{i}^0,N^1,G^1) > H(G^1)$: the initial $\hat{i}$ cannot be an equilibrium and $\hat{i}$ must fall to restore equality between V and H. Evidently, the expansion in

formal credit leads each moneylender to lower his interest rate (expanding his lending) by enough that that expansion more than makes up for the reduced number of moneylenders in the market.

5. Conclusion

There were two motivations for undertaking the analysis of this paper. The first was to investigate whether a model with both free entry and strategic interaction among moneylenders could exhibit the property that an expansion of formal credit did not lower interest rates in the informal sector. We found that it could. The key parameters of our model are the *enforcement cost effect* that can cause new entry into moneylending to increase each moneylender's marginal costs of lending (raising the interest rate); the *strategic interaction effect*, which can be so large that a subsidy to moneylending, by lowering each moneylender's interest rate, actually reduces the profitability of moneylending and so leads to exit; and the *market power effect*, which implies that exit increases the market power of the remaining moneylenders (increasing interest rates).

Our model can thus explain the seemingly anomalous persistence of very high informal rural interest rates in many developing countries in the face of massive expenditures by governments and donor agencies on rural credit. But our model allows for a wide range of possible results from credit market intervention: there may be exit or entry; and informal interest rates may rise or fall. Our findings strengthen the case for skepticism about the effectiveness of credit policies that rely on "trickle down" effects from large landowners, among whom government-subsidized credit has been concentrated, to others in the rural economy.

The second motivation was to bring transactions costs explicitly into a model of a rural credit market in an economy where third-party enforcement may be absent. In such an economy, a moneylender's transactions costs often exceed his capital costs. This simple model serves to illustrate that consideration of the moneylender's transactions costs, which plausibly increase with entry, can reverse the implications of models that ignore transactions costs.

Appendix

The appendix proves the three propositions in the text. The symmetric equilibrium is determined by the first-order condition (15), the free entry condition (22), and the symmetry conditions (3) and (6). Substituting (3) into the first-order condition, the identity

$$\psi(\hat{\imath},\hat{\imath},N,G) \equiv 0 \tag{A-3}$$

results. Substituting (3) into the free entry condition, the identity

$$\Lambda(\hat{\imath},N,G) \equiv V(\hat{\imath},N,G) - H(G) \equiv 0 \tag{A-4}$$

results. We list below the six partial derivatives of ψ and Λ:

$$\psi_G = -F''[m_i z + mz'] < 0$$

$$\psi_i = \psi_{\hat{\imath}} + \psi_{\bar{\imath}} < 0$$

where the latter sign follows from (18);

$$\psi_N = -\epsilon_N \frac{m}{i}\left[z[i-F']-c\right] - m_i c_N - mz' c_{zN} - F''\frac{mz}{N}[m_i z + mz']$$

identical to (19) and ambiguous in sign;

$$\Lambda_G = F'(K+G-\delta-mz) - F'(K+G) \approx -[\delta + mz]F'' > 0$$

where the approximation is a first-order Taylor expansion;

$$\Lambda_i = V_{\bar{\imath}} = m_{\bar{\imath}}\left[z[i-F']-c\right] > 0$$

from (24); and

$$\Lambda_N = V_N = -\frac{m}{N}\left[z[i-F'] - c\right] - mc_N < 0$$

from (23).

Total differentiating (A-3) and (A-4) with respect to the policy variable, G, and writing these equations in matrix form, we get

$$\begin{bmatrix} \psi_{\hat{t}} & \psi_N \\ V_{\hat{t}} & V_N \end{bmatrix} \begin{bmatrix} \frac{d\hat{t}}{dG} \\ \frac{dN}{dG} \end{bmatrix} = \begin{bmatrix} -\psi_G \\ -\Lambda_G \end{bmatrix}$$

Using Cramer's rule and substituting in from (25), the comparative statics relations dî/dG and dN/dG are implicitly defined by

(A-5) $$\psi_{\hat{t}} \hat{V}_N \frac{d\hat{t}}{dG} = -V_N \left\{ \psi_G + \psi_N \left[\frac{\Lambda_G}{-V_N} \right] \right\}$$

and

(A-6) $$-\hat{V}_N \frac{dN}{dG} = \Lambda_G + V_{\hat{t}} \left[\frac{\psi_G}{-\psi_{\hat{t}}} \right].$$

In these expressions, the multiplier of dî/dG and the multiplier of dN/dG are strictly positive (from (17) and (25)).

The proofs will refer to five distinct effects on which the comparative statics relations depend:

(a) The *differential effect* of an increase in the subsidized credit ration, G, on the moneylender and the large landowner specialized in farming, $\Lambda_G \approx -F''[\delta + mz] > 0$;

(b) *Cost of capital effects*, $-F'' \frac{\partial(mz)}{\partial i} < 0$ *and* $-F'' \frac{\partial(mz)}{\partial N} < 0$;

(c) The *enforcement cost effect of entry*, $-m_i c_N - mz' c_{zN} > 0$;

(d) The *market power effect of entry*, $\epsilon_N > 0$; and

(e) The *strategic interaction effect* among moneylenders, $m_{\hat{t}} > 0$.

Proof of Proposition 1. The first term within the curly brackets of (A-5) is a direct *cost of capital effect*, $\psi_G = -F''\partial(mz)/\partial i < 0$, which tends to reduce i. The second term within the curly brackets of (A-5) has the same sign as ψ_N. The sign of ψ_N depends on the relative magnitudes of three effects: an indirect *cost of capital effect*, $-F''\partial(mz)/\partial N$, the *enforcement cost effect*, and the *market power effect of entry*. If the indirect *cost of capital* and *market power effects* dominate so that $\psi_N < 0$, then the RHS of (A-5) is negative, which implies $di/dG < 0$. See fig. 6C, where $\psi_N < 0$ is reflected in the fact that i declines with N. In the alternative case the *enforcement cost effect* dominates so $\psi_N > 0$. See figs. 6A and 6B, where $\hat{i}$ is increasing in N. The result $d\hat{i}/dG > 0$ obtains if the product of ψ_N and the induced entry, $\partial N/\partial G = \Lambda_G/[-V_N]$ (which is always strictly positive) dominates the direct *cost of capital effect* on the moneylender's choice of i, $\psi_G < 0$:

$$\psi_N\left[\frac{\Lambda_G}{-V_N}\right] > |\psi_G| \quad \Rightarrow \quad \frac{d\hat{i}}{dG} > 0$$

--see fig. 6A. ■

Proof of Proposition 2. If there were no strategic interaction among moneylenders (i.e., $m_{\bar{i}} = 0$ so $V_{\bar{i}} = 0$), each moneylender's profits would be independent of the interest rate set by others. Then the only non-zero term in the RHS of (A-6) would be the *differential effect* on the moneylender and large landowner specialized in farming, $\Lambda_G > 0$, which would imply $dN/dG > 0$.

But with strategic interaction among moneylenders, we have $V_{\bar{i}} > 0$ and so $V_{\bar{i}}\psi_G/[-\psi_i] < 0$. (For given i and N, $\bar{i}$ falls as G expands, and the lower value of $\bar{i}$ that other moneylenders choose lowers V.) If the latter effect is larger in absolute value than the *differential effect*, it follows from (A-6) that moneylenders exit as formal credit expands. See fig. 6C, where the *strategic interaction effect* implies a smaller shift up in $\hat{V}$ than in H. ■

Proof of Proposition 3. Exit from the lending activity implies that the expansion of formal credit has increased the welfare of moneylenders by less than it has increased the welfare of large landowners specialized in farming, or equivalently,

$$\frac{d\Lambda}{dG} = \Lambda_G + V_{\bar{i}} \frac{d\hat{i}}{dG} < 0 .$$

Since the *differential effect* ($\Lambda_G > 0$) always favors the moneylender, and since $V_{\bar{i}} > 0$, exit implies $di/dG < 0$. ■

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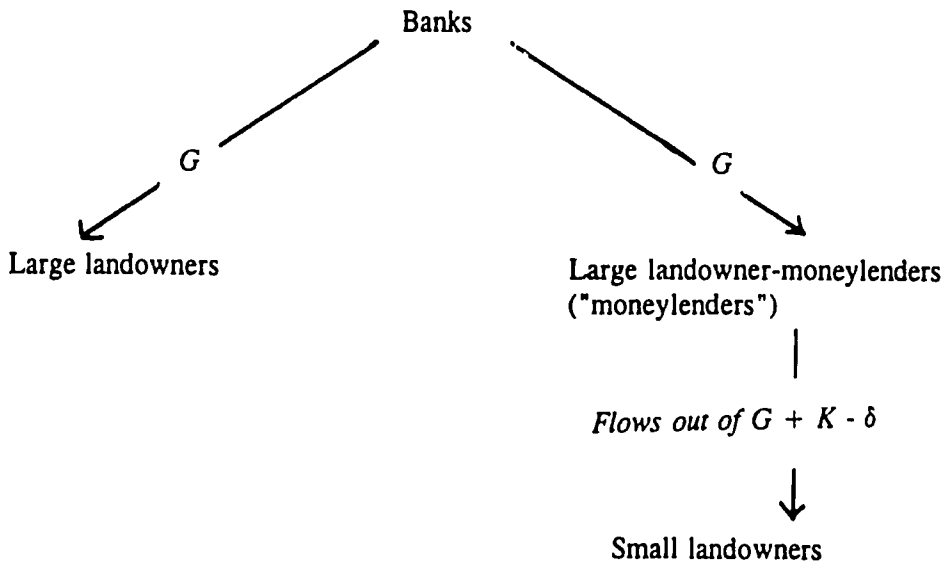


Figure 1. Schema of a formal and informal credit market.

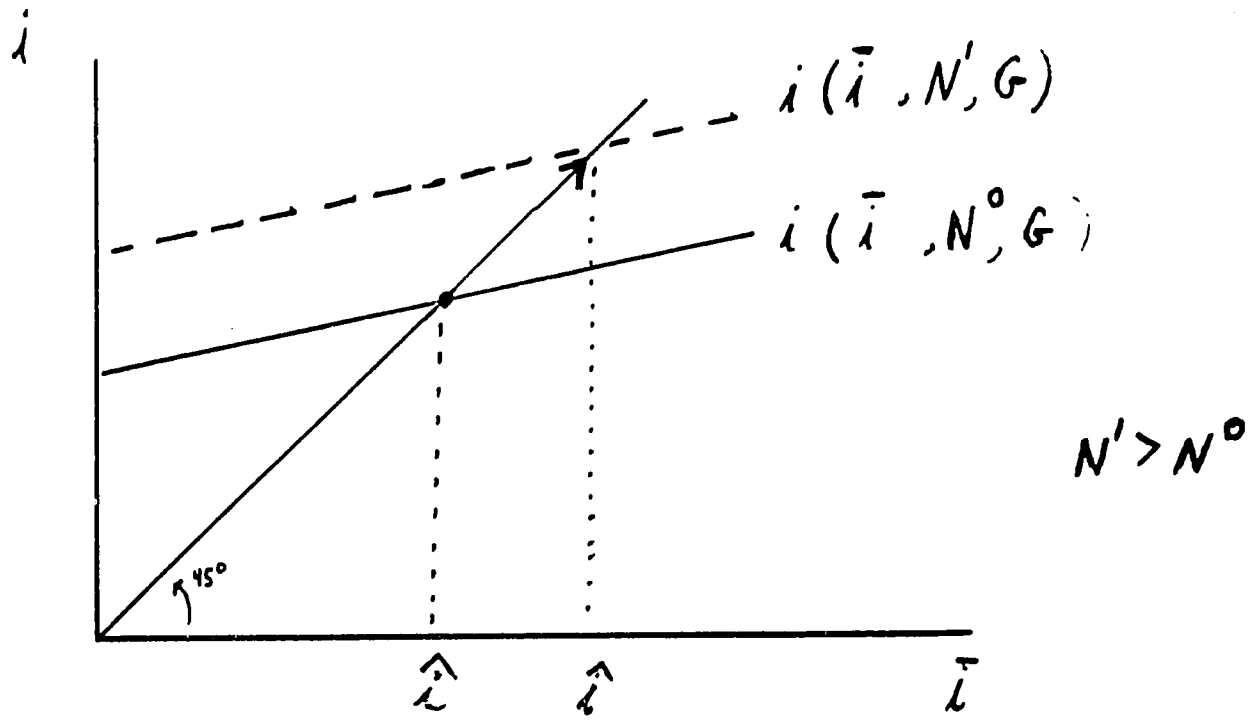


Fig. 2. An increase in N may lead to an increase in i at a fixed value of $\bar{i}$. Feedback reactions lead to a further increase in the equilibrium rate of interest, $\hat{i}$.

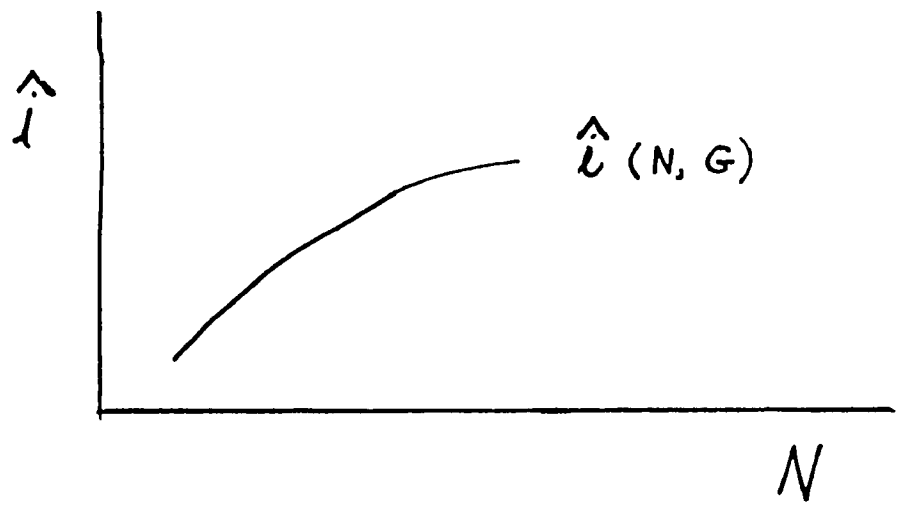


Fig. 3. An increase in N may lead to an increase in $\hat{i}$.

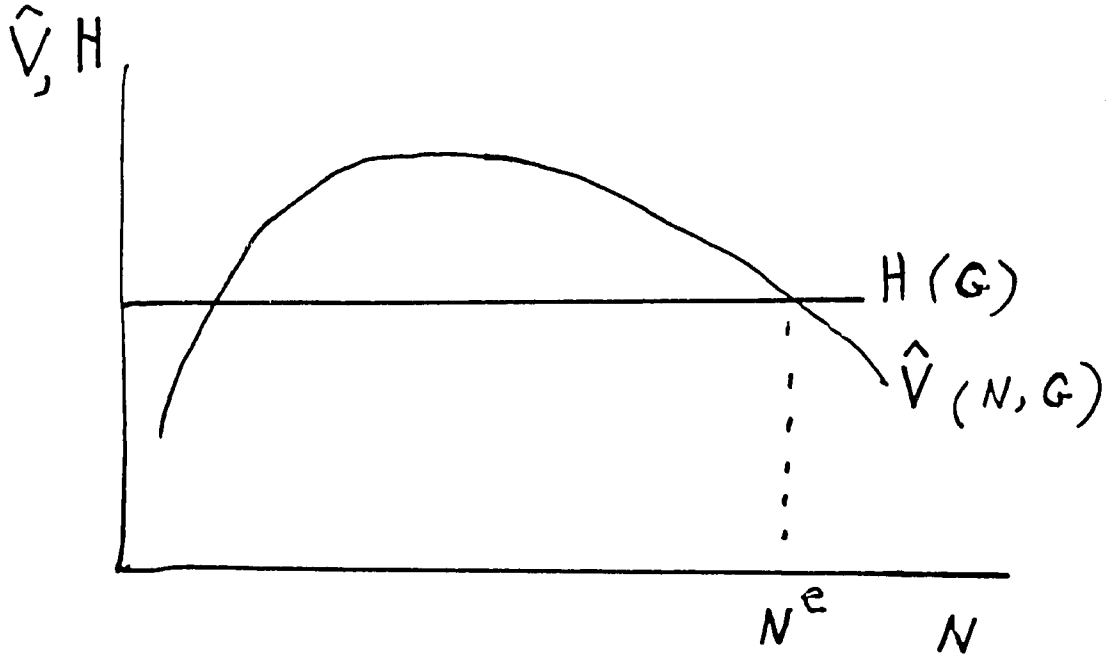


Fig. 4. The equilibrium N occurs where the utility of the moneylender is the same as that of the large landowner who is specialized in farming. Stability implies that at the equilibrium, $\hat{V}$ is decreasing in N.

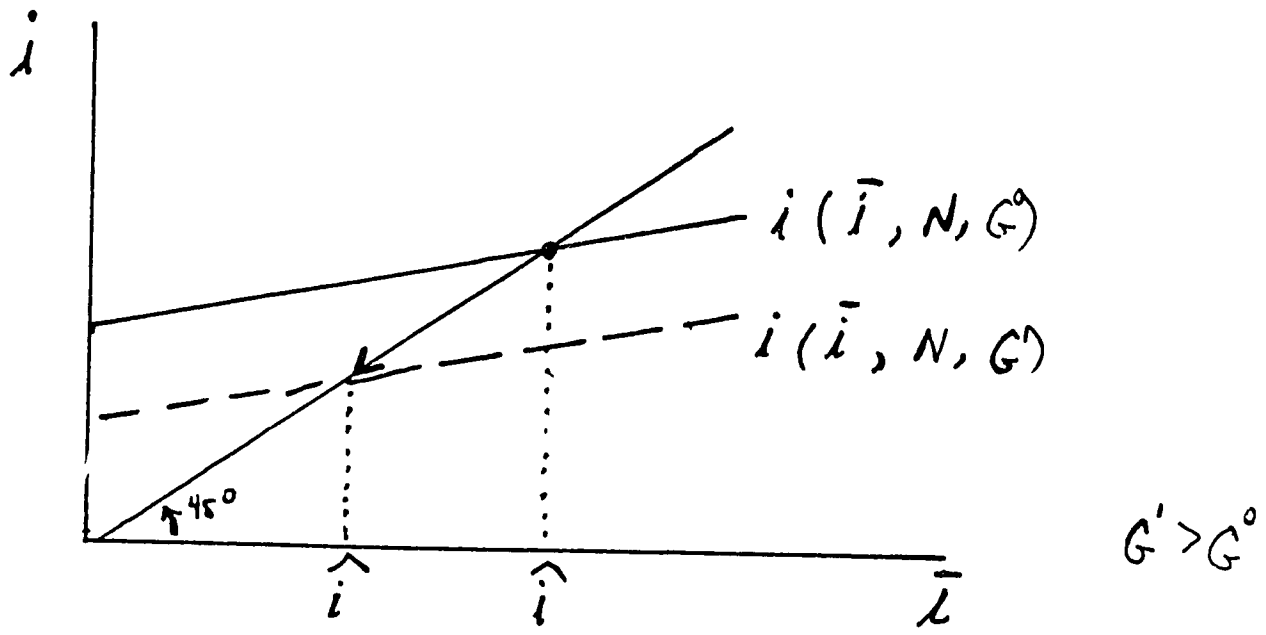
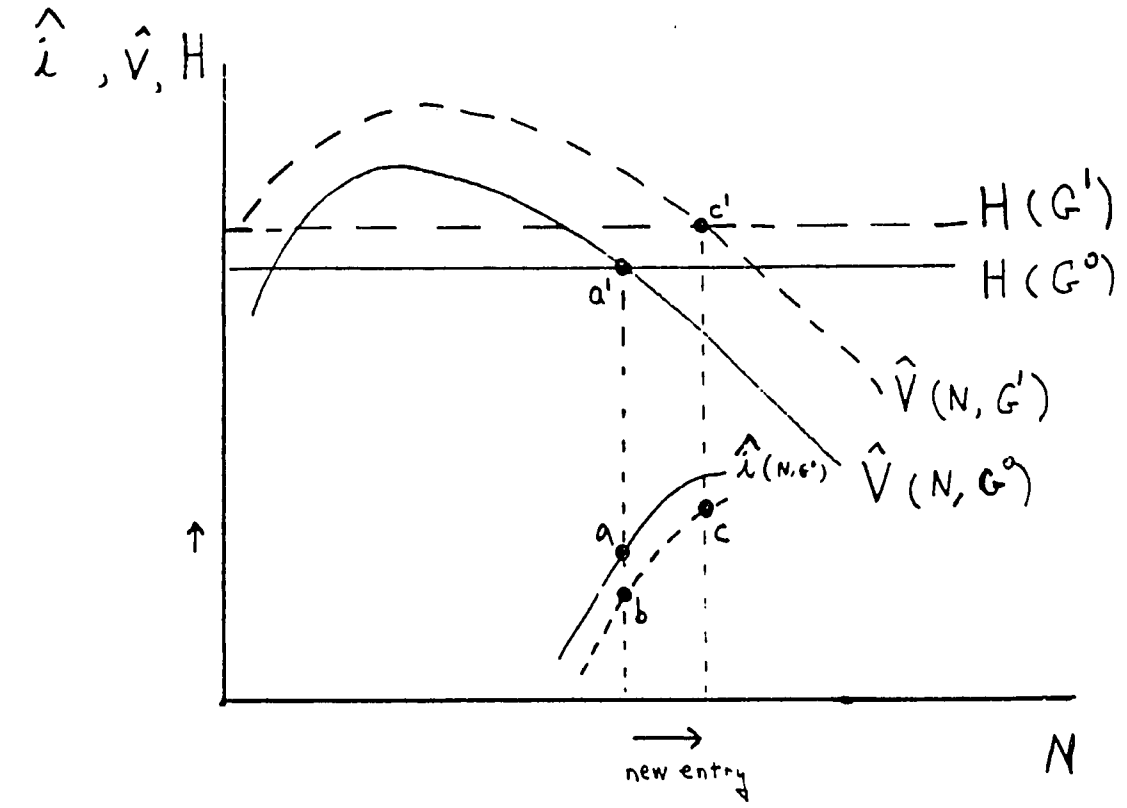
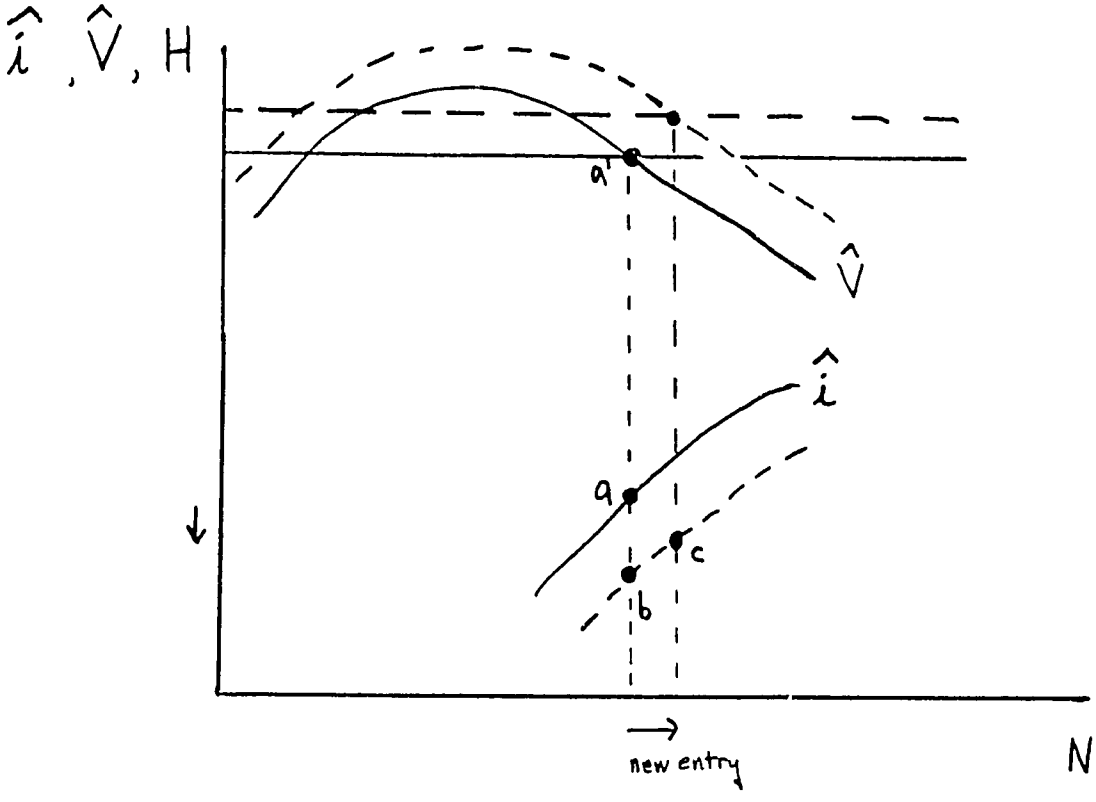
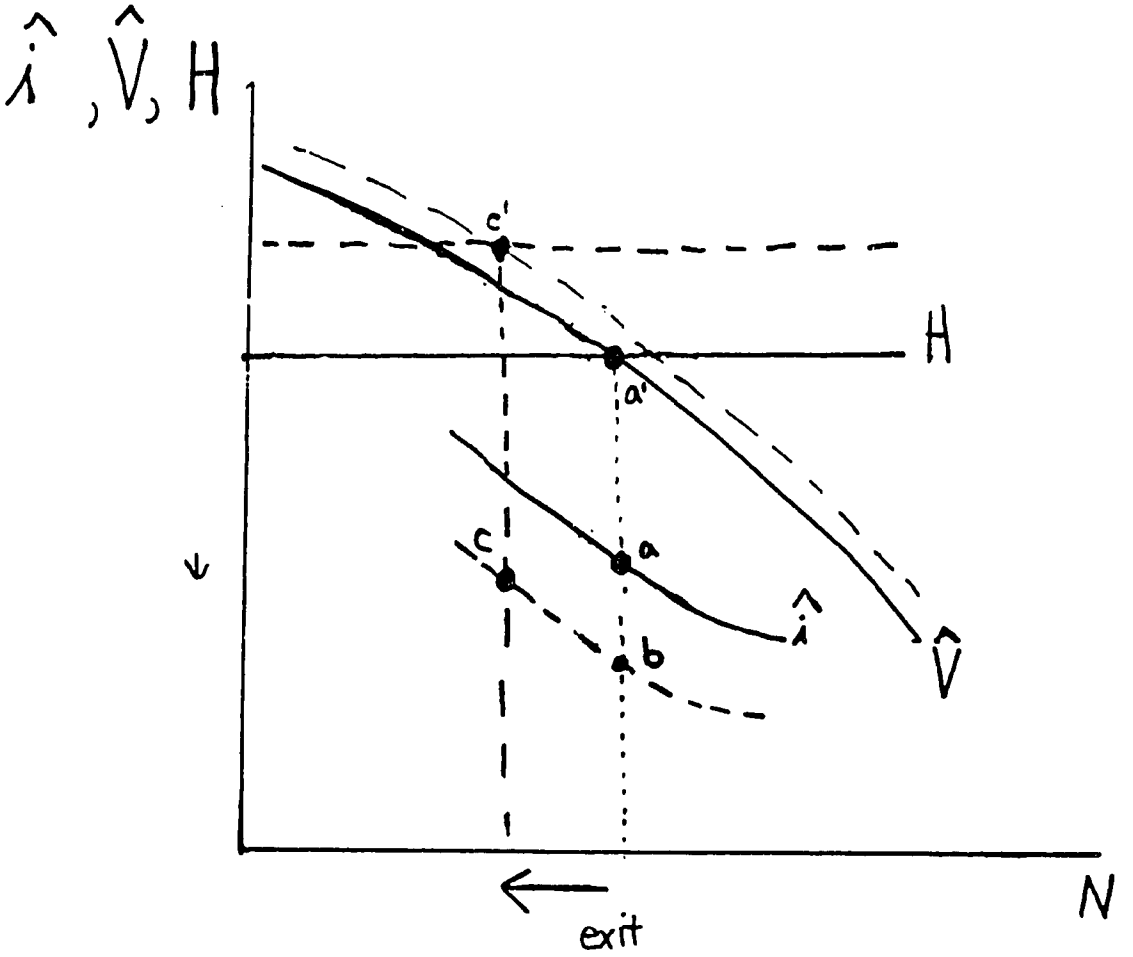


Fig. 5. An increase in G *at a fixed N and* $\bar{i}$ results in a lower interest rate, as the supply of funds increases. With i endogenous, $\hat{i}$ is reduced even more, as a result of feedback effects.


$\hat{i}$, $\hat{V}$, H
H(G')
H(G°)
c'
a'
$\hat{V}$(N, G')
$\hat{V}$(N, G°)
$\hat{i}$(N,G')
a
c
b
N
new entry

$G' > G^o$


$\hat{i}$, $\hat{V}$, H
a'
$\hat{V}$
$\hat{i}$
a
c
b
N
new entry



(6C)

Fig. 6. This figure incorporates the effects of a change in G on three different curves: $\hat{V}$, H, and $\hat{i}$. An increase in G unambiguously shifts the $\hat{i}$ curve down and the H curve up, as shown in each panel. The short-run effect (from point *a* to point *b*) is always to lower the informal interest rate. But the long-run effect on interest rates (point *c*) is ambiguous.

(A) Here, entry is induced and this more than offsets the short-run fall in $\hat{i}$.

(B) Here, though entry is induced, it is not sufficient to offset the short-run fall in $\hat{i}$.

(C) In the more "normal" case where the *cost of capital* and *market power effects* outweigh the *enforcement cost effect*, so that as N increases $\hat{i}$ decreases, an increase in G may lead to exit from the moneylending business. As in Panel B, the long-run adjustment partially offsets the short-run fall in $\hat{i}$.