

# Implicit interest rates, usury and isolation in backward agriculture

Kaushik Basu\*

## 1. The problem

The unusually high interest rates in many backward agricultural regions have been a source of some puzzlement to economists. Adding to this puzzle is the fact that these rates can take on a wide range of values, often within the same region. One important question is why arbitrage between sectors does not lead to more homogeneous and lower interest rates. The traditional answer to this is in terms of lender's risk. It is argued that moneylenders in backward regions face a great risk of default and, once this is taken into account, the *effective* interest rate turns out to be no higher than its counterpart in the organised sector. Consequently, there is no *real* room for arbitrage and the high interest rates are equilibrium prices.

While this explanation may be of use in some situations, it is in general inadequate and can even be misleading. The reason (which novelists describing rural India have repeatedly written about) is that in these financial transactions the lender's risk frequently ranges from minimal to non-existent, because the personalised relation between the borrower and the lender enables the latter to extract the defaulted loan in the form of asset transfers from the borrower. In a somewhat stylised manner these deals could be thought of as follows. A peasant takes a loan from his employer, keeping some of his assets, like land, a standing crop or even the promise of labour services, as security or collateral. A collateral price is then fixed. This is the conversion price used to calculate the amount of collateral that has to be relinquished to the lender given a certain amount of default. Clearly the lower the collateral price the larger the quantity of collateral that the peasant has to forfeit. Hence the underpricing of collateral amounts to the charging of an *implicit* interest.

A widespread feature of rural credit markets—reported in many diverse studies (Bardhan and Rudra, 1978; Myint, 1964; Raj, 1981; Roth, 1979; and Sivakumar, 1978, to mention just a few)—is the 'underpricing' of collateral. An interesting attempt to bring collateral explicitly into a model of usury was made by Bhaduri (1977; see also 1983) who argued that one of the reasons why landlords raise interest rates is, in fact, to *encourage* default and to claim ownership of the asset kept as collateral. A sharp contrast to the lender's risk model, this hypothesis has deservedly received much attention.<sup>1</sup>

\*The Delhi School of Economics. I have benefited from discussions with Amit Bhaduri, Nilotpal Chakravarty, Jacques Drèze, Jean Drèze and Jean Waelbroeck and from seminars at the Delhi and London Schools of Economics. A part of this work was done while I was a visitor at CORE and the Centre d'économie mathématique et d'économétrie in Belgium.

<sup>1</sup>Bhaduri's model (as also others of this genre, like Prasad, 1974; Borooah, 1980) is distinct from models based on the idea of interlinkage in factor markets (e.g. Braverman and Srinivasan, 1981). I discuss this below in Section 6.2.

Nevertheless, the hypothesis is incomplete in an important sense: while Bhaduri uses the undervaluation of collateral in a significant way, he does not provide any formal explanation of why collateral is underpriced, other than a casual mention of it being a consequence of the monopolistic position of the lender. Moreover, an attempt to explain the determination of collateral price within the framework of Bhaduri's model leads to some quite implausible conclusions (see section 4). It is this, and the shortcomings of the more traditional lender's risk hypothesis (section 2) which motivates the model in this paper (section 5).

The model is developed in two steps. First a 'dual' to Bhaduri's analysis is developed by assuming the interest rate to be fixed and the collateral price to be the only control variable with the lender. This shows that while it is conventional to assume the opposite, there is no *a priori* reason for that.

The simultaneous determination of collateral price and interest rate is taken up as a second step. This provides an endogenous explanation of the underpricing of collateral (that is, the existence of implicit interest rates). This has the important implication that the absence of high interest rates cannot be equated with the absence of usurious extraction because there could exist implicit charges. To quote from Kurup's (1976) detailed study of usury in Kerala:

... there exists, in this area, a variety of loan transactions which, on the surface, are interest-free but where heavy interest is in fact hidden under the rug... [T]he presence of such implicit charges entirely escapes the net of conventional surveys.

## 2. The lender's risk hypothesis and critique

This hypothesis has been discussed in many places (eg. Bottomley, 1975; Raj, 1979). To recapitulate briefly, assume that, on average,  $q$  is the fraction of the loan that is defaulted. If a lender gives a loan of Rs  $L$  at interest rate  $i$ , his expected earning (assuming that there is no collateral) is  $(1+i)(1-q)L - L$ . The *effective* interest,  $d$ , is obtained by dividing this by  $L$ :

$$d = i(1 - q) - q.$$

At equilibrium,  $d$  is equal to the interest rate in the organised sector, which is assumed to be exogenously given to this market. Hence  $i$  depends on  $q$  and clearly  $\partial i / \partial q > 0$ . For example, if the organised sector interest rate is 10%,  $q = 0.5$ , then  $i = 120\%$ . Therefore, to sustain an effective interest rate of 10% a nominal rate of 120% is needed. This is the crux of this hypothesis: the high rates observed are illusory.

The lender's risk hypothesis has been effectively criticised on the ground that thanks to the personalised relation in rural usury the borrower typically cannot get away without paying (see Raj, 1979, for some interesting evidence). If he does not have money, he has to pay in terms of assets or even bondage.

Out of this criticism emerged the 'default hypothesis' but, before discussing it, let us sketch the institutional and empirical basis of it, particularly because the present model is developed for broadly the same empirical set-up.

## 3. Evidence and the institutional framework

The salient feature of the credit market being considered here is isolation. The widespread prevalence of this in backward areas is well documented. Roth (1979) discusses this at

length in the context of some village studies in Bihar. Bardhan and Rudra (1978) also show that while professional moneylending no doubt exists, loans are taken by tenants and cultivators predominantly from their employers. In their study, in West Bengal 51% of tenants reported taking consumption loans from their landlords. In criticising Bottomley's (1963) lack of emphasis on the monopolistic elements in rural usury, Chandarvarkar (1965) has cited some unusual evidence on the lack of competition. He refers to a study by the Reserve Bank of India which showed that among 600 surveyed villages, 64% had no professional moneylender and 11.5% had only one resident moneylender. Moreover, even when moneylenders are involved, there is usually a personalised relation. As Bailey (1964) puts it in his anthropological study of Orissa:

Like the paddy loans, these small cash advances entail little risk. The sum involved is small: the parties have known one another for a long time . . .

In situations such as this, clearly the lender's risk hypothesis is inapplicable.

Both Bhaduri's model and the one developed here pertain to usury relations where loans are given against some form of security. And secured loans are important in rural usury. According to a Reserve Bank of India (1977) survey, 40% of the loans in 1971 were given against well-defined securities. Atiqur Rahman's (1979) detailed study of credit relations in two regions of Bangladesh reveal that more than 50% of the loans were against some security. Moreover, large fractions of these secured loans are against some 'immovable property'. This suggests the importance of physical proximity between the lender and the borrower. This, coupled with the fact that the collateral is often odd items like a fruit orchard or a standing crop, lends credence to Bhaduri's view that collaterals are frequently unmarketable in the organised money market but can be of value to the village landlord.

The present paper is written with consumption loans in mind (though with some adaptation it may be possible to consider production loans). Consumption loans are a significant component of credit dealings. For example, 38% and 30% of the loans in Phulpur and in Comilla were taken for consumption purposes (Rahman, 1979). Two additional things have to be kept in mind. These figures would be higher for poorer borrowers, and in general there is a tendency to under-report consumption loans because borrowers find lenders are more amenable to offering loans if they are for production.

The above features describe the situation where the model should be applied. There is therefore no attempt to claim that all rural credit markets are monopolistic and that all loans are secured and are taken for consumption. Instead, our analysis should be thought of as one which applies to markets with these traits, though hopefully the theory will, with greater elaboration over time, help us understand an increasingly wide range of empirical phenomena.

What the model is supposed to explain is (i) the underpricing of collateral, (ii) the existence of high interest rates, and (iii) the multiplicity of interest rates. All these features are widely prevalent in backward agriculture. For example, in West Bengal 68% of casual labourers take loans from their respective employers against the commitment of future labour. And in 80% of these cases the casual labourer works at a lower wage than the market rate at the time of repayment (Bardhan and Rudra, 1978). Similar facts are reported in many other works (see, e.g., Kurup, 1976; Sivakumar, 1978).<sup>1</sup>

<sup>1</sup>In reality, concealed interest charges take a variety of forms. As Myint (1964) observes, 'The high rates of interest which peasants have to pay are not only formal interest charges but also in considerable part concealed charges obtained through manipulating the prices of commodities which the peasants buy or sell'.

As far as interest rates go, both their enormous heights and diverse range have been widely reported (e.g., Rahman, 1979; Bhaduri, 1973; Griffin, 1974; Bailey, 1964). What has attracted a lot of attention recently is that in many cases zero interest is charged (see Rahman, 1979; Bardhan and Rudra, 1978; Platteau, Murickan and Delbar, 1981). There are alternative ways of explaining this: there could be implicit charges, which is the main contention of this paper, or this could be the consequence of factor market interlinkage (Basu, 1983A). It should, however, be admitted that the importance of the zero interest cases has been somewhat exaggerated. For example, a closer scrutiny of the data often reveals (see Rahman, 1979) that a substantial portion of the zero interest cases are those involving friends and relatives. And clearly such transactions lie beyond the realm of economic analysis, unless of course one believes in the economics of marriage.

#### 4. The default hypothesis and critique

In sharp contrast to the lender's risk hypothesis, in Bhaduri's (1977) model the lender uses the interest rate to encourage default, because he can then confiscate the collateral. This section briefly recapitulates Bhaduri's model or, as it is often referred to, the default hypothesis.

Consider a small peasant or a poor tenant who takes a loan of Rs  $L$  against some assets kept as security, i.e. some collateral. Because of his poverty he has a limited capacity to repay the loan. Thus there is a proportion of the loan,  $\bar{u}$ , which he is forced to default. This is supposed to depend on the interest rate,  $i$ , charged on the loan. Thus

$$\bar{u} = \bar{u}(i), \bar{u}' > 0 \quad (1)$$

This is the involuntary default function and it defines a feasible region. For any  $i$  the borrower cannot default less than  $\bar{u}(i)$  though he can default more if he so wishes. Of course, he has to compensate for the total default by giving the lender an equivalent amount of the collateral. The price of the collateral used to calculate this equivalent amount is denoted by  $p$  and referred to as the conversion price of the collateral or simply as the collateral price.

The asset used as collateral has a market and its market price<sup>1</sup> is  $\pi$ . But while the lender because of his superior position has access to this market the borrower does not. This, according to Bhaduri, enables the lender to undervalue the collateral. And hence his fundamental assumption that the collateral price is less than the market price, i.e.  $p < \pi$ .

The borrower's personal valuation of a unit of the collateral is  $\pi_B$ . Bhaduri quite realistically assumes that this will be very high, and generally,<sup>2</sup>  $\pi < \pi_B$ .

If  $1 + i > \pi_B/p$  a rupee defaulted is less costly than a rupee repaid, from the borrower's viewpoint. Thus in this case the borrower will default the entire loan. Similarly, if<sup>3</sup>  $1 + i \leq$

<sup>1</sup>Actually nothing in our analysis is affected if there is no market. In that case, instead of  $\pi$  we would have to use  $\pi_L$ —the lender's personal valuation of a unit of collateral. Bhaduri in fact uses  $\max\{\pi, \pi_L\}$ . While that is correct it may be unnecessary because since the lender has access to the asset market, he will buy the asset if  $\pi_L > \pi$  and will continue to do so till the values converge. Thus, if a market exists, then in any stable situation we would expect  $\max\{\pi, \pi_L\} = \pi$ .

<sup>2</sup>Again, this assumption is more a condition of equilibrium than an assumption. If  $\pi > \pi_B$ , the landlord would buy the asset from the poor tenant who has no access to the organised market and sell it on the organised market. Thus normally we would expect  $\pi \leq \pi_B$ . Our assumption merely restricts this to a strict inequality.

<sup>3</sup>Bhaduri uses strict inequality. Our use of weak inequality is conceptually harmless and has the advantage of ensuring the existence of a solution to the maximisation of equation (3) below.

$\pi_B/p$ , he tries to default as little as possible, given the constraint of equation (1). Thus, denoting the proportion of the loan *actually* defaulted by  $u$ , we have

$$u = u(i) = \begin{cases} 1, & \text{if } i > (\pi_B/p) - 1 \\ \bar{u}(i), & \text{if } i \leq (\pi_B/p) - 1 \end{cases} \quad (2)$$

Given an interest rate,  $i$ , the lender's net earning,  $D$ , from this loan is given by<sup>1</sup>

$$D = [i(1 - u) + (\pi/p - 1)u] L \quad (3)$$

This could alternatively be written as

$$D = \begin{cases} [i(1 - \bar{u}) + (\pi/p - 1)\bar{u}] L, & \text{if } i \leq (\pi_B/p) - 1 \\ (\pi/p - 1) L, & \text{if } i > (\pi_B/p) - 1 \end{cases} \quad (4)$$

The interest rate,  $i$ , in this model, is determined by the lender so as to maximise his earning,  $D$ . Many interesting propositions emerge from this model. For instance, the interest will be high and in particular,  $i > (\pi/p) - 1$ . But it is never set so high as to go beyond  $(\pi_B/p) - 1$ , which implies that the entire loan will not be defaulted. Further, and this is where the main distinction between the default hypothesis and the earlier theories lies, in this model there is no lender's risk because the collateral price is set below the market price.

This model has received a great amount of attention—including criticism, reformulation and field studies (see, for example, Rahman, 1979; Ghose, 1980; Rao, 1980; Borooah, 1980; Bhaduri, 1983; Bardhan, 1980). Despite this, what has received almost no scrutiny is the determination of the collateral price, and—as I argue in a moment—this is probably the most important weakness in Bhaduri's (1977) model. Clearly it is the underpricing of collateral which rules out lender's risk; and it is this same feature which pushes up the explicit interest rate. Hence without a theory of collateral price formation we cannot have a complete model of rural credit and interest.

To see the difficulty of explaining the collateral price,  $p$ , within the confines of the default hypothesis, consider first Bhaduri's own observation:

The personalised character of the unorganised credit market is reflected in the lender's ability to place on securities of his choice an arbitrary valuation, which, *needless to say*, typically results in their gross undervaluation (1977, p. 344, my italics).

Thus Bhaduri clearly regards  $p$  as chosen by the lender to aid usury. However, in his algebra he treats  $p$  as exogenously given (and less than  $\pi$ ). What happens if we rectify this and make  $p$  another control variable, like  $i$ , in the lender's hand. What value would  $p$  take?

Within the context of the above model, if  $p$  and  $i$  are both treated as the lender's control variables, it is easy to see that the lender will extract an indefinitely large amount of wealth from the borrower. He first has to choose a sufficiently high rate of interest such that the borrower is forced to default, i.e.  $i$  is such that  $\bar{u}(i) > 0$ . Then from (4) it is obvious that the smaller the  $p$ , the greater the lender's earning,  $D$ . Thus  $p$  will be set indefinitely small

<sup>1</sup>It is assumed here that a default of a part of the loan obliterates the interest charge on it. If this was not the case  $D$  would be equal to  $[i(1 - u) + (\pi/p - 1)u(1 + i)] L$ .

(i.e. close to zero) and the borrower will be divested of his entire asset holding. Notice further that this is true no matter how small the loan is. Thus even for an infinitesimal loan the peasant will lose all his wealth. This is the dilemma of the default hypothesis. Either we treat  $p$  as exogenous (it is difficult to see how this could be the case) or else we are led into the above absurdity.

On reflection it is clear that this dilemma follows from one characteristic of the default hypothesis: The peasant *has* to take a fixed loan of  $L$  from his landlord no matter what the terms. But clearly this is unrealistic. If the terms are *too* bad the peasant may well opt to flee or go on an empty stomach.

Actually Bhaduri (1977) himself considered the possibility of the size of the loan depending on the terms under which it is offered, i.e.

$$L = L(i), L' < 0.$$

This case has been discussed at length by Borooah. Does this resolve our dilemma? Unfortunately, the answer is no. Let the lender choose an  $i$  such that  $L(i) > 0$  and  $\bar{u}(i) > 0$ .<sup>1</sup> Then once again by setting  $p$  indefinitely close to zero, the lender can make  $D$ , i.e. his net earning, indefinitely large.

What has gone wrong? The answer is simple: while the assumption that  $L$  responds to  $i$  is a step in the right direction, it is inadequate. What is the intuition behind this assumption? It tries to capture the fact that as the terms of the loan become worse we expect the peasant to try and manage with a smaller loan from the particular lender in question. But then a raising of  $i$  is not the only way in which the terms of a loan can deteriorate. A lowering of  $p$  has the same effect. Thus the same reasoning which makes us believe that  $L$  depends on  $i$  and  $L'(i) < 0$ , leads us to expect that  $L$  depends on  $p$  as well and as  $p$  falls,  $L$  decreases. To recognise this is the first step towards a theory of collateral price determination.

## 5. A theory of collateral price and interest formation

### 5.1 The framework

The total loan taken—in accordance with the above argument—is given by

$$L = L(i, p), L_i \leq 0, L_p \geq 0. \quad (5)$$

It is possible to impose some natural restrictions on (5). Notice that if  $u=0$ , then the cost of taking a loan does not depend on  $p$  and its lowering would thus leave  $L$  unchanged. A similar argument holds for  $u=1$  and the raising of  $i$ . We may therefore assume that (5) satisfies:

- (i) If  $u=0$ , then  $L$  is unchanged for decreases in  $p$ . But if  $u > 0$ , then  $L_p > 0$ .
- (ii) If  $u=1$ , then  $L$  is unchanged for increases in  $i$ . But if  $u < 1$ , then  $L_i < 0$ .

It will also be assumed that there exists a sufficiently small  $p$ , say  $p^0$ , at which the borrower takes a loan which is small enough not to entail any default and that  $u=0$ . Not only is this assumption realistic, its denial has quite absurd implications.

<sup>1</sup>In the absence of such an  $i$  the default hypothesis is itself trivial.

Apart from these, no other restrictions are imposed on (5).

It is, nevertheless, conceptually interesting to examine the factors which lend elasticity to the loan demand function. As  $i$  increases or  $p$  falls, there would typically be two factors leading to a lowering of  $L$ . Firstly, as already argued, the borrower will try and make do with a smaller loan. Secondly, he may turn to other sources like the local shopkeeper or professional moneylender, at terms which earlier were not sufficiently attractive, thereby implying a fall in  $L$  (i.e. the loan taken from the landlord). If the isolation of the credit market is complete then this second factor is absent and the loan demand function will be relatively inelastic. (It should, however, be emphasised that because of the existence of the first factor, it is wrong to claim that complete isolation implies complete inelasticity.) On the other hand, if the credit market is perfectly competitive—which is grossly unrealistic but unfortunately underlies a considerable amount of traditional thinking—then  $L$  will be perfectly elastic with respect to  $i$  and  $p$  at certain given values. Thus the extent of isolation of the credit market is captured by the extent of elasticity of  $L$ .

In Bhaduri's original model there was some confusion about the nature of the default function (1). Rao (1980) drew attention to this and later Bhaduri (1983) clarified that (1) represented an involuntary default function determined by the 'more or less constant level of income of the borrower' and thus 'his ability to repay the debt obligations must, in general, decrease with higher interest rates'. But if  $\bar{u}$  is determined by the limited liquidity of the borrower at the time of repayment, then clearly it should depend on  $L$  as well as  $i$ .<sup>1</sup> The larger the  $L$ , the larger is the proportion he is forced to default. This becomes clearer if we state formally what Bhaduri, Rao, Borooah and others write about casually: let  $K$  be the maximum amount of cash the borrower has at the time of repayment of the loan. The involuntary default function now takes the following specific form:  $\bar{u} = 0$ , if  $(1+i)L < K$  and  $(1-\bar{u})(1+i)L = K$ , if  $(1+i)L > K$ . This may be written as

$$\bar{u} = \bar{u}(i, L) = \begin{cases} 0 & , \text{ if } (1+i)L \leq K \\ 1 - \frac{K}{(1+i)L} & , \text{ if } (1+i)L > K. \end{cases} \quad (6)$$

The assumption of a given non-stochastic  $K$  which is independent of the other variables of the model is a strong assumption. However, this is nothing but the formal statement of what has been informally assumed in the existing literature. I continue to use this assumption here for simplicity and in order not to distract attention from the main purpose of this paper, leaving for section 6.1 a discussion of the alternative interpretations of  $K$  and their implications.

For the same reasons as in the default hypothesis, the actual proportion of default,  $u$ , is given by

$$u = \begin{cases} 1, & \text{ if } i > (\pi_B/p) - 1 \\ \bar{u}(i, L), & \text{ if } i \leq (\pi_B/p) - 1. \end{cases} \quad (7)$$

<sup>1</sup>This is a serious omission in Borooah's (1980) algebra, particularly since in his prose he is quite clear about the role of  $L$ . As he quite rightly points out, there could exist situations where landlords would lower the interest in order to encourage larger loans, and hence larger defaults.

The lender's income from usury,  $D$ , is composed of interest and transferred collateral:

$$D = D(i, p) = [i(1-u) + \left(\frac{\pi}{p} - 1\right)u] L. \quad (8)$$

In this generalised framework the lender chooses  $p$  and  $i$  so as to maximise  $D$  subject to (5), (6) and (7). This gives us a theory of the formation of  $p$  and  $i$  in isolated credit markets and also sheds interesting light on the process of usury.

Note that the two components of  $D$  could be thought of as the explicit and implicit interest earnings. Since  $p$  is the only variable in  $(\pi/p) - 1$ , a theory of collateral price is, in effect, a theory of implicit interest.

A complete characterisation of the optimal  $i$  and  $p$  would entail cumbersome mathematical maximisation without providing any significant intuition. On the other hand, if we want to establish some economically meaningful properties of the optimal  $i$  and  $p$ , we can do this by assuming the existence of an optimum and using some simple reasoning.

We shall, however, not do this directly. Instead we first look at a special case of this model. There are two polar special cases of this generalised framework. Firstly,  $p$  may be treated as exogenous and this could be thought of as a theory of (explicit) interest determination. Secondly, it may be assumed that  $i$  is exogenous and we could have a theory of the determination of collateral price. Bhaduri's model is the first special case. In the next few pages the second special case is developed. The general case is taken up after that.

### 5.2 The dual case

In this section  $i$  is treated as fixed. The lender chooses the collateral price,  $p$ , so as to maximise his net income,  $D(i, p)$ . Assuming that an optimal  $p$  exists,<sup>1</sup> let us use  $\hat{p}$  to denote it. The principal aspect of  $\hat{p}$  which interests us is its relation with  $\pi$ . Is there reason to believe that collateral is generally undervalued, i.e.  $\hat{p} < \pi$ ? The question is of fundamental importance to Bhaduri's work, its subsequent extensions and discussions, and to the analysis of rural interest rates in general. Fortunately, a clear answer is possible: within the framework of this model *collateral is necessarily undervalued*.

This may be established as follows. From (6) and (7) it is clear that  $u$  could be equal to 1 or  $\bar{u}$  and  $\bar{u}$  could in turn be 0 or  $1 - K/(1+i)L$ . Hence the optimum situation could be of three types, depending on whether

Case I  $u = 1$

Case II  $u = \bar{u} = 1 - \frac{K}{(1+i)L}$ , or

Case III  $u = \bar{u} = 0$ .

<sup>1</sup>In fact, in many situations, a direct assumption about existence is methodologically no inferior to the more fashionable approach of making cumbersome assumptions and then deducing existence. In this case, however, it so happens that the existence of an optimum  $p$  is quite easily assured. It is easy to show that the optimum  $p$ , if it exists, cannot lie outside the closed interval  $[p^0, \pi_B]$ . The main problem arises from the fact that if we define the function  $D(i, \cdot)$  on this interval, there will exist a discontinuity at point  $\pi_B/(1+i)$ . This follows from (7). Notice that in reality if  $p = \pi_B/(1+i)$ , i.e.  $i = (\pi_B/p) - 1$  then the borrower is indifferent between defaulting and repaying. This means that at this point we could assume either  $u = 1$  or  $\bar{u}(i, L)$  (though in (7) I have assumed  $u = \bar{u}(i, L)$ ). This means that we could ensure that  $D(i, \cdot)$  is *upper semi-continuous* (as defined for a function as opposed to a correspondence). Hence, since  $[p^0, \pi_B]$  is compact,  $D(i, \cdot)$  must take on a maximum value somewhere within  $[p^0, \pi_B]$  (this is an immediate corollary of theorem 2 in Berge (1963, p. 76). I am grateful to Jean Waelbroeck for pointing this out to me.

In Case I,  $D = ((\pi/p) - 1)L$ . At the optimum,  $D$  must be greater than zero, because otherwise the moneylender would not indulge in usury. Hence  $((\pi/\hat{p}) - 1)L > 0$ , i.e.  $\hat{p} < \pi$ .

In Case II, by substituting  $u = 1 - K/(1+i)L$  into (8), we have

$$D = \frac{iK}{1+i} + \left( \frac{\pi - \hat{p}}{\hat{p}} \right) \left( \frac{(1+i)L - K}{1+i} \right)$$

The necessary condition for this to be the optimum is  $\partial D/\partial \hat{p} = 0$ : hence,

$$\frac{\partial D}{\partial \hat{p}} = \frac{K - (1+i)L}{1+i} \frac{\pi}{\hat{p}^2} + L_p \frac{\pi - \hat{p}}{\hat{p}} = 0.$$

Since in this case  $\bar{u} = 1 - K/(1+i)L$ , we know from (6) that  $(1+i)L > K$ . Hence (since  $L_p > 0$ ) for the above equation to be true,  $\hat{p} > \pi$ .

Finally, given Case III, (6) implies  $(1+i)L \leq K$ . This means that the entire loan is repaid in cash. Hence the price of collateral has no operational significance.

This establishes that whenever collateral is transferred it is underpriced. Moreover, the earlier literature was only considering cases where default invariably took place, i.e. Cases I and II, and in both cases  $\hat{p} < \pi$ . These results continue to hold in the general case as is shown in the next section. But before going to that, it is worthwhile spending a few moments on the implications of the above analysis.

Note that this framework ensures that the price of collateral will not be indefinitely small. This is intuitively obvious once we appreciate the process of usury. Here  $p$  is the control variable with the lender. The lower he sets this the more he earns per rupee of defaulted loan. Thus it seems he would prefer to set it arbitrarily low. If, however,  $p$  is set below  $p^0$ , the borrower will ensure that he does not have to default. Hence, by assumption (i),  $p$  ceases to have any effect on  $L$ . Therefore, no further advantage can be reaped by setting it even lower.

In his model of interest determination, Bhaduri showed that it always pays the lender to push up the interest rate beyond  $(\pi/p) - 1$  but not past  $(\pi_B/p) - 1$ . Thus in the optimum situation (a)  $i > (\pi/p) - 1$  and (b)  $i < (\pi_B/p) - 1$ . Result (a) is, however, lost in Bhaduri's own extension of the simple default hypothesis from the fixed loan assumption to the case where the loan size depends on the interest rate (see Borooah, 1980). Result (b), however, remains valid. That implies, it is obvious from equation (7), that the borrower will not default the entire loan, i.e.  $u = 1$ . Hence Bhaduri's assertion that the lender's earnings comprise two parts: interest earnings and transferred assets.

In our model, (b) need not necessarily hold. There can exist situations where the optimal  $p$  is such that  $i > (\pi_B/p) - 1$ . This would, of course, lead the borrower to default totally. Thus in certain cases it is possible that the lender's income consists only of transferred assets. The possibility of the optimal  $p$  being sufficiently large such that  $i > (\pi_B/p) - 1$  (i.e. (b) is violated) is not difficult to establish. If  $\pi < \pi_B/(1+i)$ , then from the fact that collateral is always undervalued, we know  $p^* < \pi_B/(1+i)$ , where  $p^*$  is the optimal price (as before). Hence  $i < (\pi_B/p^*) - 1$ . Thus if  $\pi < \pi_B/(1+i)$ , (b) is necessarily satisfied. Hence a violation of (b) is possible only if  $\pi > \pi_B/(1+i)$ . Assume that this is in fact the case, i.e.  $\pi > \pi_B/(1+i)$ . Let  $D^0$  be the maximum the lender could have earned if  $p$  is restricted to satisfy (b). Now let the lender raise  $p$  to  $p_*$  such that  $1+i > \pi_B/p_*$ ; but let it not be so high that  $\pi/p_* \leq 1$ . At  $p_*$  there is total default and the lender's net earning is  $[(\pi/p_*) - i] L(i, p_*)$ . When  $p$  is

raised to  $\hat{p}$ ,  $L$  rises to  $L(i, \hat{p})$ . The model does not specify *a priori* the magnitude of this rise. Hence it is conceivable that  $L(i, \hat{p})$  is very large. So much so that  $[(\pi/\hat{p}) - i] L(i, \hat{p}) > D^0$ . In that case  $\hat{p}$  is better than the best  $p$  given restriction (b), from the lender's point of view. This ensures a violation of (b).

In a similar manner it can be shown that, unlike in the default hypothesis, here Case III can arise as well. Thus all possible cases which arise in reality can arise here depending on the parametric configurations. What is interesting is that in all cases  $p$  lies above a certain level and below  $\pi$ .

There are other features of this model which are worth examining. For instance, one would expect a relation between the elasticity of loan demand with respect to  $p$  and the lender's choice of the collateral price,  $p^*$ . In general, we would expect  $p^*$  to be higher the less elastic the demand. This has been observed empirically. Presumably  $L$  will be more inelastic the more urgent the demand for cash and more isolated the credit market. Sivakumar's (1978) study of some villages in Tamil Nadu leads him to observe

Most of these loans are accompanied by pledging of some amount of land. The amount advanced varies from 33 per cent to 70 per cent of the worth of the piece of the land, *depending upon the urgency of cash requirements* (my italics).

It would be interesting to establish theoretically a relation of this sort.

Many other details are worth looking into but to undertake that here would be somewhat tangential to the purpose of this paper.

### 5.3 The general case

Now consider the actual problem which entails the simultaneous determination of  $i$  and  $p$ . The lender will choose these so as to maximise  $D$ . Let the chosen values be denoted by  $i^*$  and  $p^*$ . A complete characterisation of this optimum is complex and, for our purpose, unnecessary. The fundamental question is again whether in this generalised framework there is reason to expect the underpricing of collateral, i.e. the existence of positive implicit interest? The answer is yes and it is surprisingly easy to show this.

Since  $i^*$  and  $p^*$  are optimal, by definition,  $D(i^*, p^*) \geq D(i, p)$ , for all  $i$  and  $p$ . This implies that  $D(i^*, p^*) \geq D(i^*, p)$ , for all  $p$ . Hence if the interest rate was exogenously fixed at  $i^*$ , then  $p^*$  is the optimal for the lender. But it was precisely in such a framework, i.e. where  $i$  was given exogenously, that the underpricing of collateral was proved in the previous section. Hence  $p^* < \pi$ .

This is the generalised framework which the earlier writers had in mind, though they ended up modelling a special case of it. The default hypothesis had caused a dilemma: either assume  $p$  to be exogenous (which is quite absurd considering that  $p$  enters only in this transaction) or its magnitude is indefinitely close to zero. The theory and the framework developed in this paper resolves this. The exogenous  $p$  in Bhaduri's model was *assumed* to be below the market price of the asset. It was argued above that this is a widespread feature of rural credit markets in less developed economies. In the present model it is shown analytically that the endogenously determined collateral price will end up below the market place.

This means that the lender's risk is indeed non-existent and one of the motives in raising  $i$  could be to encourage default. In other words, there will usually exist positive implicit interest charges. Hence the interest rate that is observed may not be a reflection of the full cost that the borrower incurs.

It may be useful briefly to sum up the findings of this section. It has been alleged that one way in which implicit charges are imposed in rural usury is by underpricing land or other assets used as collateral while granting loans. The underpricing of collateral has been observed empirically and it also plays a crucial role in a class of theoretical studies of rural usury. Despite this, there has hardly been any effort to explain endogenously the formation of collateral prices. This is the lacuna that the present section has tried to fill. A model is developed which explains *simultaneously* the determination of interest rates and collateral prices—in other words, explicit and implicit interest rates. It shows, further, that collateral will indeed be underpriced, thereby providing a theoretical counterpart to what had earlier been observed empirically.

The first step in constructing such a model is to recognise that a person's demand for loans depends not on the explicit interest charge,  $i$ , alone, but also on the price of collateral,  $p$ —the lower the  $p$ , the lower being the demand. Taking this into account, the landlord chooses  $(i, p)$  so as to maximise his earnings. For analytical simplicity, this optimal  $(i, p)$  is characterised in two steps. First, it was assumed that  $i$  is exogenously fixed, and we focused exclusively on the process of determination of the collateral price. This provides a dual to traditional theory which has been concerned solely with the formation of  $i$ . From this the generalised model is an easy second step. This model provides many new insights into the process of rural usury. It should also be possible to derive from it propositions in comparative statics, though that is a direction that I have not pursued here.

## 6. Extensions and related issues

### 6.1 Uncertainty and repayment capacity

The above model has been constructed without bringing uncertainty directly into the picture. But many of the features of the model have been chosen so as to acknowledge the important role of uncertainty. For example, it is not clear why in this model and the other earlier ones the borrower and the lender go through the exercise of having an interest rate and a *contingent* default agreement. Since they both know what the final outcome will be, why can they not simply agree that 'this is the loan and this will be repaid in terms of this much money and this much land'? Why go through the charade of having a collateral price and an agreement saying that *depending* on how much is defaulted, collateral will have to be transferred using the collateral price as the conversion rate? The reason, in reality, must be because each believes that he can do better by having a contingent agreement rather than one with the exact form and amounts of repayment specified. This could be explained by introducing uncertainty or an assumption of asymmetric information about  $K$ . While it is desirable to construct a theory which includes these features in its ambit, the present limited approach is, however, not methodologically flawed. Once we know why complicated contracts exist, we can analyse them in a certainty model in the same way that we analyse the effects of price-taking behaviour in the Edgeworth box because we know that if there were many agents, they would be price-takers, even though in the Edgeworth box there are only two.

Similarly, one of the factors which make the implicit and explicit interest rates distinct concepts is uncertainty. In this case, however, even in the absence of uncertainty these concepts would be separate. The reason is quite interesting. Because of the absence of a proper market for collateral, the borrower and the lender value the collateral differently. This means that a change in  $p$  is evaluated differently by the two agents (excepting in the

coincidental case of  $\pi = \pi_B$ ). On the other hand,  $i$  distinguishes itself from  $p$  by having the same impact on both agents.

The variable which is likely to be affected most seriously by uncertainty in reality is  $K$ , i.e. the borrower's repayment capacity. The simplest way to visualise this is to assume that the loan is taken in period one and repaid in period two, but in period two, two alternative states of the world could prevail: state 1 (poor rainfall) and state 2 (good rainfall). If state 1 occurs then the borrower has Rs  $K^1$  with which he can repay the loan. In state 2 he has  $K^2$ . And good rainfall being better for him,  $K^2 > K^1$ . Let  $q^i$  be the probability of state  $i$  occurring, with  $q^1 + q^2 = 1$ . Assume that in period one the agents do not know which state will occur in the next period, though they both know the values of  $q^1, q^2, K^1$  and  $K^2$ . It is at the time of giving the loan, i.e. in period one, that the implicit and explicit interest rates, i.e.  $p$  and  $i$ , have to be fixed. What will be the characteristics of the interest rate in this situation?

Even with this simplest formulation the problem is an extremely complex one and I do not intend providing a full answer here. Instead a few brief and suggestive remarks follow. Let  $\bar{u}^j$  and  $w^j$  ( $j=1,2$ ) denote the fraction of the loan the borrower is forced to default (because of limited repayment capacity) and the fraction he actually defaults, given that state  $j$  has occurred. The functional forms of these variables may be expressed in a manner similar to (6) and (7). Depending on the attitudes to risk of the borrower and the lender a variety of different interest rate structures could emerge. Let us consider one particular case. Suppose the optimum  $p$  and  $i$  are such that  $i > (\pi_B/p) - 1$ . Clearly then  $u^1 = u^2 = 1$ , i.e. irrespective of the state the borrower would default totally. Assuming for simplicity (this is not necessary) that the lender is risk neutral and he maximises his *expected* earnings,

$$D^e = \sum_{i=1}^2 q^i [i(1 - u^j) + (\pi/p - 1) u^j] L$$

we have in this case

$$D^e = \sum_{i=1}^2 q^i (\pi/p - 1) L.$$

Since a moneylender would cease to lend money if he was not making a profit on it, it must be that  $D^e > 0$ . Hence  $p < \pi$ , i.e. collateral is necessarily undervalued. Clearly this case is analogous to the one under certainty. Similarly in many other special cases it is possible to establish the undervaluation of collateral. But the possibility of a violation of this result cannot be ruled out altogether.

One possible pathological case could arise if the fluctuation in repayment capacity is wide and it so happens at the optimum that if state 1 occurs the borrower is unable to repay his debt but if 2 occurs he has enough to repay, i.e.  $K^1 < (1+i)L < K^2$ . Then it may be possible to find overvalued collateral (i.e.  $\pi > p$ ). In this case, of course, the lender loses every time collateral is transferred to him, but he may nevertheless want to raise  $p$  to above  $\pi$  in order to encourage the borrower to take a larger loan and then make a big gain in the event of state 2 occurring (in that state his usurious income being  $iL$ ). This is a conjecture, a situation which, *a priori*, seems plausible. As stated earlier, a more certain answer would require a more complex and rigorous model of uncertainty.

This analysis, however, brings into focus some other features regarding  $K$  which could benefit from further analysis. Consider again the case where at the time of repayment the borrower finds himself with an inadequate amount of money. In this and related models it is assumed that he pays the balance by transferring collateral. In reality there is another

option which is frequently exercised. This involves taking another loan (often from the same lender) and repaying the debt. This is, of course, merely postponing the day of reckoning and could well result in the borrower becoming bonded. To model this would entail a dynamic framework and is consequently beyond the scope of the present paper. Nevertheless this aspect of the credit market is an important one and deserves further exploration.<sup>1</sup>

### 6.2 Interlinkage

Some of the features of rural credit markets (e.g. the diversity of interest rates) explained by the above model, can also be explained in terms of 'interlinkage' in factor markets. What is not always appreciated is that the underlying process in an interlinked market is a very different one.

Recently there has been a spurt of research on interlinkage. This has been prompted by an increasing pile of evidence from empirical and field studies by economists and anthropologists (e.g. Wharton, 1962; Bailey, 1966; Breman, 1974; Bardhan and Rudra, 1978; Platteau, Delbar and Murickan, 1981; Platteau, 1982; see Bardhan, 1980, for further references) suggesting that in primitive markets exchanges are often interlinked. A variety of explanations of interlinkage have been suggested but, as I have argued elsewhere (Basu, 1983A), the most plausible one is that interlinkage is a form of insurance against risk and moral hazard.

What is of interest to us here is that interlinkage can explain multiplicity of prices. For example, if the credit and labour markets are interlinked, then a person who finds that his landlord is charging him exorbitant interest rates, cannot turn to someone else for loans only. If he wants to move he has to take both his labour and credit relations elsewhere, i.e. become a tenant to another landlord and then take loans from him. This fragments the credit market, but the kind of usurious relations which this results in (discussed by Braverman and Srinivasan, 1981; Braverman and Stiglitz, 1982; Mitra, 1983) are very different from the model developed here and others of this genre (Bhaduri, 1977, 1982; Borooah, 1980). The present model pertains to imperfect or semi-formed markets, whereas interlinkage—somewhat surprisingly because this was not always clear even to those who initiated this idea—implies efficient markets. Interlinkage suggests that what appears imperfect may actually be perfect in a more fundamental sense.<sup>2</sup> Consider the fact that in rural areas one often finds adjacent regions paying different wages and persistently so. What the interlinkage argument suggests is that if we look deeper we will find offsetting factors. Thus a landlord offering a lower wage may be offering loans at lower interest rates. In other words, if we look at the market for the *whole package* and not just at interest rates or wages, we will find that the textbook claims of efficiency are satisfied.

Interlinkage is an important idea but clearly it is not applicable everywhere (see Khasnabis and Chakravarty, 1982). Rural markets abound with situations where real aberrations exist (no matter how deep we look). This arises from isolation caused by 'barriers to mobility'. For example, if landlords in a village only trust and give loans to those with whom they have hereditary connections (e.g. if the tenant's father has been the landlord or the landlord's father's tenant), then if landlord *i* gives a better deal to his tenants than does landlord *j*, there is no way that tenants of *j* can shift to *i*, because hereditary

<sup>1</sup>If we were to adapt the above model to allow for production loans, we would have to treat  $K$  as a function of  $L$ , i.e.  $K=K(L)$ . This is because now a loan could be thought of as a factor enhancing the borrower's income and hence liquidity in the next period.

<sup>2</sup>I spell this argument out in greater detail elsewhere (Basu, 1983A, B).

connections, unlike guns and butter, cannot be traded. Thus hereditary connections, caste and community links and a multitude of intricate human relations, the outcome of decades or even generations of history, fragment and isolate markets in a fundamental way. It is to an imperfect market of this kind that the present model pertains.

### 7. A disclaimer

A large number of criticisms of ideas like interlinkage, semi-feudalism or isolation have taken the form of citing empirical evidence showing that these are not typical features. But this is equivalent to asserting that an analysis of the consequences of monopoly is wrong because all markets are not monopolistic.

To guard against such criticism I emphasise that the present model is an analysis of credit relations in a market characterised by isolation (emanating from the 'barrier to mobility'). The importance of attempting such studies is based on the belief that isolation is an important phenomenon in backward agriculture (see section 3 above). There is, however, no attempt to claim that isolation is all pervasive or even the most dominant market structure, in the same way that an analysis of monopoly does not have to be justified by the claim that monopoly is the typical industrial form.

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