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Abstract

The usufruct mortgage has received little attention from economists. This paper develops and analyzes a theoretical framework in which the borrower, who mortgages out, and the lender, who mortgages in, a parcel of land reach their decisions in a risky environment when credit and land markets function imperfectly. It yields some results concerning what conditions and factors govern the decision to contract in the first place and, subsequently, when and whether to repay or agree to a sale. These findings underpin and structure an empirical investigation of such contracting in upland Orissa, based on a panel survey of 279 households over the period 2000-2013. Almost 20 percent had contracts in 2013, the borrowers' chief need being to marry off a daughter, followed by coping with serious illness and bad harvests. The sums involved were quite large, indicating that such contracts expand households' opportunities beyond those offered by standard informal and formal credit transactions. Mortgage contracting also appears frequently to lead to the full transfer of ownership rights from relatively land-rich to land-poor households.

Keywords: usufructuary mortgage, agrarian contracts, Orissa

JEL Classification: D13, D14, D86, Q12, Q15

1 Introduction

In close-knit societies, where markets may be far from perfect, transactions in goods and services are often bundled together in so-called interlinked contracts (Basu, 1983; Bell, 1988). This practice may be a response to market failures, as the contracting parties seek ways of expanding the total surplus. Then again it may be a way for powerful agents to extract more surplus from weaker ones. Various labor-credit-product-land interlinkages are documented in the literature (Bardhan and Rudra, 1978; Bardhan, 1980). A laborer may get low-interest loans in the lean season against work below the market wage during the peak season (Mukherjee and Ray, 1995). A cultivator may get a production loan at a low or even zero interest rate against the sale of output below the ruling market price (Bell and Srinivasan, 1989). Landowners may subsidize the inputs applied by their sharecroppers, knowing that they will get some of the resulting increase in production (Braverman and Stiglitz, 1982).

In this paper we study usufruct mortgages, a contractual form that has received but little attention – from economists at least –, despite the fairly prominent place it sometimes finds in India's rural economy.[1] The owner of a parcel of land borrows a sum of money, and in exchange, transfers to the creditor all rights to its use and the resulting income until such time as the former repays the entire sum borrowed. The owner keeps the title deed, and thus the unrestricted option to recover the said rights when his financial circumstances permit. The lender may even lease the parcel back to the borrower under fixed-rent or sharecropping terms. The borrower's alternative is to take a normal loan and pay interest at regular intervals until repayment is complete. The lender may, in this case, rent in the land in question, perhaps even using the interest payments to meet the rent in a book-keeping transaction. In effect, the two parties have then de-linked the two contracts, paying the standard interest and rental

[1] Perrott (1909) provides an interesting discussion of informal credit at the beginning of the 20th century. More recent contributions are Shibli (1993) and the indirect discussion in Swaminathan (1991), where it is considered as just one of many sources of credit.

rates.

Why, then, do we observe these interlinked usufruct mortgage contracts? An important benefit from the borrower's point of view is that he is free to decide when to repay. But this option may also be available, at least to a degree, in standard loan contracts. The borrower also keeps the title document, which may already have been used as collateral to secure a formal loan. The other chief benefit arises from the fact that the sum involved is typically quite large, such as would be needed to deal with a very damaging shock or heavy unavoidable expenditure. Such a sum may not be obtainable as a standard loan, especially if intended to finance marriage or cope with a bout of serious illness or poor harvest. To obtain such a contract, however, the borrower must have available 'excess' land in relation to what is considered necessary, in some sense, to meet the family's essential needs.

For his part, the lender may be keen to cultivate a larger holding; but the rental market may be thin, and the land purchase market even thinner. Excess family labor in relation to the family's current holding not only makes mortgaging in attractive, but it may also provide the means to put together the amount necessary to make a satisfactory offer. It must be kept in mind that these households are usually relatively poor, as they do not normally own much land. Buying the land outright at once can therefore lie beyond their grasp, and thus make mortgaging in a good second-best solution. This option may be linked to an opportunistic motive: if the borrower experiences another negative shock, then the lender may expect to buy the land at a low price at some point in the future.

The object of this paper is, first, to develop and analyze a theoretical model of mortgage contracting in a risky environment, and then to apply it empirically in an investigation of households' behavior in upland Orissa, part of a very extensive semi-arid tract that is socially and economically quite backward. The data stem from a series of survey rounds, which started in 2001 and continued with two short breaks until the end of 2004. There followed a long pause until a single round was conducted in 2010. The most recent two rounds covered the calendar year 2013. The original sample comprised 240 households, 8 drawn from each of 30 villages themselves drawn from spatial clusters. Over the course of time, many households stayed intact, but others split, dissolved or migrated permanently. Of the original households, 216 were traced and interviewed in 2013. Joining them were another 59 households generated by the splitting of households in the interim, and four others added by the survey team that conducted the round in 2010, yielding a total sample of 279 households in the closing round. The market was quite active: 51 households had extant mortgage contracts in 2013, with both sides of the transaction almost equally represented.

The plan of the paper is as follows. The model is set out and developed in Section 2, with separate treatments of the borrower's and lender's decisions in Sections 2.1 and 2.2, respectively, an analysis of the effects of variations in non-random factors in Section 2.3, and a discussion of market equilibrium in Section 2.4. To complete the theoretical analysis, Section 3 deals with the possibility that the lender will, at some point, acquire ownership of the mortgaged parcel, which involves a step beyond enjoying the user rights indefinitely because the borrower never repays. Section 4 summarizes these findings in a form designed to structure and support the empirical analysis. Introduced by a brief account of the surveys and the sample, Section 5 provides, first, a descriptive analysis of the incidence and duration of contracts, as well as what sort of households contract, and second, in Section 5.2, a preliminary examination of the hypotheses, paying particular attention to households' motives and the adverse shocks they suffer. Section 6 complements the latter sub-section with an econometric analysis of the households' contractual choices and whether these led, in the course of time, to a redistribution of ownership holdings in favor of a particular group of households. The main conclusions are drawn together briefly in Section 7.

2 The Model

A risk-averse household endowed with labour and possibly land and other assets allocates them in production so as to produce a stream of income, which varies stochastically not only with the vagaries of the weather, pests and market prices, but also with the family members' state of health. Bouts of illness can put the workers out of action for some length of time, and any member's ailment may well require outlays on medical treatment. The same holds for the family's draught animals. In the worst case, a family member may die: the corresponding part of the family's total endowment of labour is lost, the funerary rites must be observed and the attendant, socially necessary expenditures incurred. Draught animals, too, are mortal, and theft is not altogether rare. If lost, an animal must be replaced or draught-power services hired. Both involve extra outlays relative to the *status quo ante*.

Marriages, especially of daughters, are also expensive affairs if families observe social custom, as they almost invariably do. That the event will occur is taken for granted, but the timing depends on the search for a suitable partner and subsequent negotiations, which can fail (Bailey, 1957). Here too, then, there is an element of uncertainty where the level of extraordinary, unavoidable expenditures in any particular period is concerned.

For simplicity, define income to be net of outlays on marriage and funerary rites, as well as those on the treatment of sick persons and animals. Income is derived from two sources. First, there are the plots of land to which the household has both title and full usufructuary rights, including those to rent out part or all of the said holding. To these must be added any further plots that have been mortgaged in with like rights. The sum of the two will be called the usufructuary holding. Second, there are all other sources, including, in particular, labour. Let λ_{ht} denote the total area of household h's ownership holdings, μ_{ht} ($\leq \lambda_{ht}$) the *net* area it mortgages out, and κ_{ht} its non-land endowment. Land unencumbered by an existing mortgage contract is necessary if the household is to mortgage out, and $\mu_{ht} < 0$ indicates that land is mortgaged in. The size of the usufructuary holding in period t is $\lambda_{ht} - \mu_{ht}$. Households that own no land may therefore cultivate by lending to acquire usufructuary rights through mortgaging in. They turn out to be an important sub-group in the data.

Let the variate Y_{ht} denote the household's total (net) income in period t, and let it be i.i.d. over all periods, so that Y_{ht} is stationary and serially independent. Given the endowments λ_{ht} and κ_{ht}, and the mortgaged area μ_{ht}, let Y_{ht} have the continuous, differentiable distribution function $F_h(y_{ht}; \kappa_{ht}, \lambda_{ht}, \mu_{ht})$, whose support $[y_h^1, y_h^2]$ depends, in general, on $(\kappa_{ht}, \lambda_{ht}, \mu_{ht})$. The following assumption is very weak.

Assumption 1. Distributions associated with larger usufructuary holdings and non-land endowments first-order stochastically dominate those associated with smaller ones. Formally, $F_h(y_{ht}; \kappa_{ht}, \lambda_{ht}, \mu_{ht})$ *first-order stochastically dominates* $F_h(y_{ht}; \kappa'_{ht}, \lambda'_{ht}, \mu'_{ht})$ *if* $(\kappa_{ht}, \lambda_{ht} - \mu_{ht}) \geq (\kappa_{ht}, \lambda'_{ht} - \mu'_{ht})$.

Let the household's preferences over lotteries conform to the expected utility hypothesis, with the strictly concave von Neumann-Morgenstern utility function $u(y_{ht})$. The expected utility of the lottery Y_{ht} is

$$\Omega(Y_{ht}) = \int_{y_h^1}^{y_h^2} u(y_{ht})\, dF_h(y_{ht}; \cdot) \equiv \Omega(Y_h), \tag{1}$$

where the assumptions on Y_{ht} imply $\Omega(Y_{ht}) = \Omega(Y_h)\ \forall t$. The present value of the stream of expected utilities arising from $\{Y_{ht}\}_{t=0}^{t=\infty}$ for any fixed $(\kappa_h, \lambda_h, \mu_h)$ is

$$V(Y_h) \equiv \sum_{t=0}^{\infty} \delta_h^t \cdot \Omega(Y_h) = \Omega(Y_h)/(1 - \delta_h), \tag{2}$$

where δ_h is the household's discount factor.

The state wherein a household never engages in this form of contracting ($\mu_{ht} = 0\ \forall t \geq 0$) is an important reference case. Such a household obtains $V(Y_h(\mu = 0))$, whereby $\Omega(Y_h(\mu = 0)) > \Omega(Y_h(\mu_h > 0))$ in virtue of Assumption 1. The shocks that time brings may, however, make a mortgage contract attractive. In any period, social custom and severe unexpected setbacks may force some households to seek funds to cover them. Some of those households that are not so currently burdened may have sufficient funds to lend, in which event, there will be a basis for trade. These two groups are indexed by i and j respectively, and their options will be taken up in turn.

2.1 Borrowers

Households may be able, from time to time, to put a little aside to deal with minor contingencies; but such a reserve will not normally serve to deal with the problem that arises when net income turns out to be very low in relation to essential current expenditures. One option is for the household's members simply to tighten their belts, but this fall-back may involve austerity to the point of real hunger and deprivation. Alternatively, the household may try to cope by taking out a loan on conventional terms, perhaps secured by some form of collateral if it has any acceptable to lenders. Yet such a loan may not be on offer, or if available, its terms unacceptably onerous.

A third option, if the household owns land and can find a contractual partner with enough funds, is to mortgage out a parcel of its land under the following terms: in exchange for the sum m_i, it gives up the right to cultivate a parcel of area μ_i until it has repaid the whole of m_i to the creditor who provides it. In the interim, the creditor will enjoy the usufructuary rights instead of interest. For its part, the borrowing household enjoys not only the immediate relief of having additional funds in the amount m_i, but also the option of reclaiming these rights whenever it is able to scrape together that sum at some point in the future, a task that will usually require a stroke of good luck, especially with an endowment effectively reduced by the mortgaged parcel in the interim.[2]

[2]Renting out a parcel in the usual way will also yield income, but it will not really fit the bill. So-called 'english' rental contracts, in which a fixed rent is paid in advance are rather rare in developing countries, and the payment is limited to the coming season alone, so its receipt is unlikely to cover a big expenditure. Sharecropping contracts are the usual form, though fixed rents payable after harvest

Suppose household i enters into such a contract at time $t = k$, having drawn $y_{ik}(\mu = 0)$. (In what follows, the index i and the corresponding endowments κ_i and λ_i are suppressed whenever no ambiguity would arise, and a zero in parentheses indicates no mortgaging activity.) If the household repays the loan in period $t = l\,(\geq k + 1)$, the contract will yield a stream of net income from period $t = k$ onwards that arises from the process

$$\{y_k(0) + m, Y_{k+1}(\mu), Y_{k+2}(\mu), \ldots, Y_l(\mu) - m, Y_{l+1}(0), \ldots\},\ \mu \leq \lambda_k,$$

whereby the realization $y_l(\mu)$ in period l must be sufficiently good to make the concurrent sacrifice of m worthwhile.

We proceed by backward induction. Let the household have an outstanding contract at $t = \tau$. It draws y_τ. If it pays off m, it will consume $y_\tau - m$ in the current period and resume the stationary stream yielded by $F(y; 0)$ thereafter. If it decides to continue the mortgage arrangement, it will consume y_τ in the current period and obtain a draw from the distribution $F(y; \mu)$ in the next period, at the close of which it will face anew the decision of whether to continue. Denote by y^r the smallest realisation of y_τ at which the household is indifferent between these two courses of action. Since the setting is a stationary one, y^r will be the critical value of y_t in all periods. The value, as assessed at $t = \tau$, of the stream of expected utilities yielded by continuing with the mortgage, given this choice of y^r, is $u(y_\tau) + \delta S_\tau$, where the value of the stream from $t = \tau + 1$ onwards is

$$S_\tau = \int_{y^1(\mu)}^{y^r} u(y)dF(y; \mu) + \int_{y^r}^{y^2(\mu)} u(y - m)dF(y; \mu) + \delta(1 - \pi_i)S_{\tau+1} + \pi_i \delta V(Y(0))$$

and $\pi_i \equiv 1 - F(y^r; \mu)$ is the probability that a loan outstanding at the close of the last period will be repaid at the close of the current period. Since the setting is stationary,

– albeit converted into sharecropping terms in the event of a generally poor crop – are also observed; they both suffer the salient, twin drawbacks that payment is made at the end of the season and its level is stochastic.

$S_\tau = S_{\tau+1}$, so that

$$S_\tau = \left[\int_{y^1(\mu)}^{y^r} u(y)dF(y;\mu) + \int_{y^r}^{y^2(\mu)} u(y-m)dF(y;\mu) + \pi_i \delta V(Y(0)) \right] \Big/ (1-\delta(1-\pi_i)) \ \forall \tau. \tag{3}$$

The alternative course of action is to repay m out of y_τ, which yields $u(y_\tau - m) + \delta V(Y(0))$. Recalling (2), the household will therefore be indifferent between repaying and continuing when the following condition holds:

$$u(y^r) - u(y^r - m) = \delta \cdot \frac{\Omega(Y(0)) - \Gamma}{1 - \delta(1-\pi_i)} \equiv \delta Q_i^m(m,\mu), \tag{4}$$

where

$$\Gamma \equiv \int_{y^1(\mu)}^{y^r} u(y)dF(y;\mu) + \int_{y^r}^{y^2(\mu)} u(y-m)dF(y;\mu) \tag{5}$$

is the expected utility of the lottery $Y_t(\mu)$ with the trigger value y^r inducing repayment of m. Eq.(4) implicitly defines y^r as a function of δ and (κ, λ, μ), which generate the distributions $F(y;0)$ and $F(y;\mu)$. The l.h.s. is the 'cost' of belt-tightening in order to repay out of current net income. The r.h.s is the gain from regaining $F(y;0)$ in the next period; its value is independent of t.

It is important to note that given $m, \mu, \delta, F(y;0)$ and $F(y;\mu)$, there may exist no $y^r \in [y^1(\mu), y^2(\mu)]$ that satisfies (4). If the only solution is smaller than $y^1(\mu)$, then repayment will follow with certainty in the next period. This will come about if the loan is sufficiently small in relation to the productivity of the plot that is mortgaged to obtain it, though the borrower's rationality places limits on how disproportionately large the latter can be, both magnitudes being known *ex ante*. If, at the other extreme, there is a unique $y^r > y^2(\mu)$, then repayment will never occur. As we shall see in Section 3, this does not necessarily imply that the borrower sells the plot for the sum m, though if m, as the price, is high enough, that will be the right option. The remaining possibility is that there exists a $y^r \in [y^1(\mu), y^2(\mu)]$ that satisfies (4).

Proposition 1. The trigger value y^r is unique for any offer (m, μ). It is increasing in

m, κ and λ, and decreasing in μ.

Proof: see Appendix.

The conditions for $y^r \in [y^1(\mu), y^2(\mu)]$ are also established therein. The larger is m, the greater becomes the attraction of waiting for a good realisation of net income, and in the limit, of effectively selling the plot in question for m by choosing $y^r > y^2(\mu)$ and never repaying. The larger is μ, the greater is the desire to get the plot back by repaying as soon as possible. Larger endowments imply lower probabilities of very poor realisations of net income, and hence make it less pressing to get back the plot in question.

Having established the critical value of y_t for repayment decisions that are time-consistent, the next step is to determine whether the said contract is attractive at the outset, at $t = k$. Given the draw y_k from $F(y;0)$, the household will be indifferent between accepting the contract and making do with y_k if, and only if,

$$u(y_k + m) - u(y_k) = \delta Q_i^m \,. \tag{6}$$

where the r.h.s. now represents the cost that is incurred by exchanging the superior distribution $F(y;0)$ for $F(y;\mu)$ until at least the trigger value y^r is realised, and thus m repaid, in some future period. Recalling that Q_i^m is independent of both t and the draw y_k, it follows from the strict concavity of u that given (m, μ), there is a unique value of y_k satisfying (6), which is denoted by y^m $\forall k$.

The level of m and the trigger values y^m and y^r are closely related. From (4) and (6), we have $u(y^m + m) - u(y^m) = u(y^r) - u(y^r - m)$, which yields at once

Proposition 2. The trigger value for repayment, y^r, exceeds that for entering into the contract, y^m, by the amount of the loan: $y^m + m = y^r$.

Mortgaging out is a way of smoothing the adverse shock expressed by a low realisation of y_k. Its (net) advantage over simply belt-tightening is

$$\Delta_i^m \equiv [u(y_k + m) - u(y_k)] - \delta Q_i^m(m, \mu). \tag{7}$$

The strict concavity of u implies that the relief provided by a loan of given size m, as expressed by $[u(y_k + m) - u(y_k)]$, is increasing and convex as y_k falls, that is, as the magnitude of the adverse shock increases. It is seen from (7) that if $u(y^1(0) + m) - u(y^1(0)) < \delta Q_i^m$, then the mortgage contract will be rejected in favour of belt-tightening; and if $u(y^2(0) + m) - u(y^2(0)) > \delta Q_i^m$, the contract will be accepted. The remaining possibility is that there exists an $y^m \in [y^1(0), y^2(0)]$, and the decision then follows according as the draw y_k from $F(y; 0)$ exceeds or falls short of y^m.

The effect of a small increase in m on Δ_i^m, for a given plot μ, is

$$\frac{\partial \Delta_i^m}{\partial m} = [u'(y_k + m) - u'(y_k)] - \delta \cdot \frac{\partial Q_i^m}{\partial m} < 0,$$

where the negative sign follows from the strict concavity of u, Proposition 1 and $\partial Q_i^m / \partial y^r > 0$ (see the Appendix for a proof of the latter claim).

There remains the important question of how changes in the endowment λ influence $p(y^m, \lambda) = F(y^m; \mu = 0)$, the probability that the household will accept the offer (m, μ). We have

$$\frac{\partial p}{\partial \lambda} = f(y^m)\frac{\partial y^m}{\partial \lambda} + \left(-f(y^1)\frac{\partial y^1}{\partial \lambda} + \int_{y^1(\lambda)}^{y^2(\lambda)} \frac{\partial f(y)}{\partial \lambda} dy \right), \tag{8}$$

where $f(y)$ is the density function of y. The expression in parentheses is negative in virtue of Assumption 1. Against this, however, the trigger value y^m is increasing in λ, in virtue of Propositions 1 and 2. The same holds for changes in κ. Whether households with larger endowments are more or less likely to accept a given offer in the event of an adverse shock cannot be determined without recourse to much stronger assumptions. What happens in Orissa will be examined in the empirical sections below.

2.2 Lenders

Suppose household j enjoys such a good draw y_{jk} in period k that it considers lending the sum m_j in order to mortgage in a suitable plot of land if the opportunity arises. If it concludes such a contract, it will enjoy an augmented stream of net income with the distribution function $F_j(y_{jt};\mu<0)$ until the loan is repaid in full. $F_j(y_{jt};\mu<0)$ first-order stochastically dominates $F_j(y_{jt};\mu=0)$, and the advantage it confers will depend, *inter alia*, on the degree of complementarity in production of j's existing endowments and additional land. Cultivation is not the only source of risk, however; for the timing of repayment, and hence the length of the lease, is for the borrower to decide, and this is a random variable. Recalling Section 2.1, the probability that the loan will be repaid in any period after $t=k$ is constant, at π_i . Other than the plot associated with $F_j(y_{jt};\mu<0)$, this is the borrower's sole characteristic that matters to the lender, but it is certainly important. We assume that the lender is able to estimate π_i exactly.

Proceeding as in Section 2.1, the value of the resulting stream of expected utilities yielded by the contract, as assessed at $t=k$, is $u(y_{jk}-m_j)+\delta_j S_{jk}$, where

$$S_{jk}=\frac{\pi_i\Omega(Y_j(\mu<0)+m_j)+(1-\pi_i)\Omega(Y_j(\mu<0))+\pi_i V_j(Y_j(0))}{1-\delta_j(1-\pi_i)} \tag{9}$$

and $\Omega(Y_{jt}(\mu<0))=\Omega(Y_j(\mu<0))\ \forall t$. It should be noted how the borrower's choice of π_i weights the various branches of the lender's outcome-tree in which repayment occurs, whereby π_i is evaluated at $m_i=m_j$.

The alternative is simply to consume the windfall at once in period k, which yields a stream whose present value is $u(y_{jk})+\delta_j V_j(Y_j(0))$. Noting (2), it is seen that the lender will be indifferent between these two courses of action if, and only if,

$$u(y_{jk})-u(y_{jk}-m_j)=\frac{\delta_j[\pi_i\Omega(Y_j(\mu<0)+m_j)+(1-\pi_i)\Omega(Y_j(\mu<0))-\Omega(Y_j(0))]}{1-\delta_j(1-\pi_i)}, \tag{10}$$

where the r.h.s. is independent of t. It is proved in the Appendix that, for each m_j, there is a unique value of y_{jk} satisfying (10), which is denoted by $y_j^m\ \forall k$. The expression in brackets in the numerator on the r.h.s. is decreasing in each of the endowments κ_j and λ_j in virtue of Assumption 1 and the strict concavity of u. Inspection of the l.h.s. then reveals that y_j^m is increasing in κ_j and λ_j.

Analogously to (7), the net advantage of offering the loan is

$$\Delta_j^m \equiv [u(y_{jk}-m_j)-u(y_{jk})]+\frac{\delta_j[\pi_i\Omega(Y_j(\mu<0)+m_j)+(1-\pi_i)\Omega(Y_j(\mu<0))-\Omega(Y_j(0))]}{1-\delta_j(1-\pi_i)}. \tag{11}$$

A very favourable draw y_{jk} will evidently incline the household to lend, and perhaps a considerable sum, since u is strictly concave. For any given plot of land, an increase in m_j involves a direct cost, as represented by the term $[u(y_{jk}-m_j)-u(y_{jk})]$, but it also yields pay-offs in the future. First, when repayment does occur – if it ever does –, y_{jt} is very likely to be lower than the favourable realisation y_{jk} that induced the household to lend in the first place. Secondly, and more importantly, an increase in m_j will induce the borrower to choose a higher trigger value of y^r, and so a lower value of π_i. Not only does this lower the effective discount rate for outcomes in which repayment is made, but it also increases the probability of enjoying the augmented process $\{Y_t(\mu<0)\}$ for more periods. While these particular advantages are unlikely, by themselves, to offset the direct cost in full, they will certainly temper it.

It remains to establish how changes in the endowments affect the attractiveness of lending m for μ. Analogously to $p_i(y_i^m, \lambda_i) = F(y_i^m; \mu = 0)$ for a borrower to accept the offer (m, μ), we have $p_j(y_j^m, \lambda_j) = 1 - F(y_j^m; \mu = 0)$ is the probability that lender j will make it. Analogously to (8), the fact that the trigger value y_j^m is increasing in each of the endowments makes the signs of the derivatives $\partial p_j/\partial\lambda_j$ and $\partial p_j/\partial\kappa_j$ ambiguous.

2.3 Borrowers and lenders: non-random factors

The foregoing analysis concentrates on borrowing and lending decisions arising from shocks to net income, with the distinction between the distributions F_i and F_j involving, in particular, $\mu < 0$ and $\mu > 0$, respectively. Indeed, a household might borrow in need at some point, repay later, and then, after enjoying a particularly good draw, seek to lend, all the time with the same reference process $Y_t(0)$. Yet systematic factors are also at work in influencing whether a household borrows or lends. Let these express themselves as variations in net income such that each realisation of the variate Y_t is augmented by the parametric amount a_i or a_j as appropriate. We now examine how changes therein affect the attractiveness of borrowing and lending using the vehicle of a usufructuary mortgage.

Starting with putative borrowers, (4) becomes, on introducing the suffix i,

$$u(y^r + a_i) - u(y^r + a_i - m) = \delta \cdot \frac{\Omega(Y_i(0) + a_i) - \Gamma(a_i)}{1 - \delta(1 - \pi_i)} \equiv \delta Q_i^m(a_i). \tag{12}$$

Differentiating totally and rearranging terms, it is shown in the Appendix that y^r is increasing in a_i if, and only if,

$$\delta_i(\Gamma' - \Omega'(Y_i(0) + a_i)) > (1 - \delta_i(1 - \pi))[u'(y^r + a_i - m) - u'(y^r + a_i)]. \tag{13}$$

This condition states that the difference between the expected marginal utility of the lottery Γ and that of $Y_i(0)$ exceeds the difference between the marginal utility of net income evaluated at y^r with repayment and that without, the differences weighted by the discount factors δ_i and $(1 - \delta_i(1 - \pi))$, respectively. The l.h.s. will be large, *cet. par.*, if the plot mortgaged out is large, so that $Y_t(\mu = 0)$ is much superior to Γ, which relates to $Y_t(\mu > 0)$. The r.h.s. depends on the curvature of u over the interval $(y^r + a_i - m, y^r + a_i)$ and the discount factor adjusted for repayment. It is seen that the expressions on both sides of condition (13) attain a maximum when $y^r = y^1$. This observation leads to the following result.

Proposition 4. The trigger value y^r is increasing in a_i if

$$\delta_i[\Omega'(Y(\mu > 0) + a_i - m) - \Omega'(Y(\mu > 0) + a_i)] > [u'(y^1 + a_i - m) - u'(y^1 + a_i)]$$

and $u''' > 0$, that is, there is a preference for positively skewed distributions.

Proof: see Appendix.

Turning to the net advantage of borrowing over belt-tightening, (7) becomes

$$\Delta_i^m \equiv [u(y_{ik} + m + a_i) - u(y_{ik} + a_i)] - \delta_i Q_i^m(a_i). \tag{14}$$

The expression in brackets on the r.h.s. of (14) is decreasing in a_i, since u is strictly concave. It becomes arbitrarily close to zero as a_i becomes arbitrarily large; the same holds for $Q_i^m(a_i)$. Differentiating w.r.t. a_i, we obtain

$$\frac{\partial \Delta_i^m}{\partial a_i} = [u'(y_{ik} + m_i + a_i) - u'(y_{ik} + a_i)] - \delta_i \cdot \left(\frac{\partial Q_i^m(a_i)}{\partial a_i} + \frac{\partial Q_i^m(a_i)}{\partial y^r} \cdot \frac{\partial y^r}{\partial a_i} \right), \quad (15)$$

where

$$\frac{\partial Q_i^m(a_i)}{\partial a_i} = \frac{\Omega'(Y(\mu = 0) + a_i) - \int_{y^1(\mu)}^{y^r} u'(y + a_i) dF(y; \mu) - \int_{y^r}^{y^2(\mu)} u'(y + a_i - m_i) dF(y; \mu)}{1 - \delta_i(1 - \pi_i)} < 0$$

in virtue of the fact that $F(y; 0)$ first-order stochastically dominates $F(y; \mu > 0)$, and

$$\frac{\partial Q_i^m(a_i)}{\partial y^r} = \frac{[\delta_i Q_i^m(a_i) + u(y^r + a_i) - u(y^r + a_i - m_i)] \cdot \partial F(y^r + a_i; \mu)/\partial a_i}{1 - \delta_i(1 - \pi_i)} > 0.$$

Proposition 4 establishes sufficient conditions for y^r to be increasing in a_i; but the sign of $\partial Q_i^m(a_i)/\partial a$ renders that of $\partial \Delta_i^m/\partial a_i$ ambiguous. On balance, however, it is very likely that households that enjoy a large certain component of net income will resort to belt-tightening in the face of a bad draw y_k.

Putative lenders are concerned with

$$\begin{aligned} \Delta_j^m \equiv\ & [u(y_{jk} + a_j - m_j) - u(y_{jk} + a_j)] \\ +\ & \frac{\delta_j[\Omega(Y_j(\mu) + m_j + a_j) + (1 - \pi_i)\Omega(Y_j(\mu) + a_j) - (\Omega(Y_j(0)) + a_j)]}{1 - \delta_j(1 - \pi_i)}, \end{aligned} \quad (16)$$

where $\mu < 0$. The first expression in brackets on the r.h.s is negative and goes to zero as a_j becomes arbitrarily large. The second expression is positive. Differentiating w.r.t a_j, we have

$$\begin{aligned} \frac{\partial \Delta_j^m}{\partial a_j} =\ & [u'(y_{jk} + a_j - m_j) - u'(y_{jk} + a_j)] \\ +\ & \frac{\delta_j[\Omega'(Y(\mu) + m_j + a_j) + (1 - \pi_i)\Omega'(Y(\mu) + a_j) - (\Omega'(Y(0)) + a_j)]}{1 - \delta_j(1 - \pi_i)}. \end{aligned} \quad (17)$$

The first term on the r.h.s is positive, since u is strictly concave. Assumption 1 and the strict concavity of u imply that the second term is negative. It is seen that the strict concavity of u implies that lending in exchange for usufructuary rights becomes more attractive relative to immediate consumption as a_j increases provided m is sufficiently large. Those households that have sources of income that are rather substantial and fairly sure, such as government or regular employment, are more likely to offer loans of this kind.

2.4 Equilibrium

Households interested in a mortgage contract, whether as borrowers or lenders, must find suitable partners, and this is almost surely a more taxing task than closing a standard credit contract. In the nature of things, the pool of potential partners is largely confined to the village itself or those in the near neighbourhood. This implies, in turn, that these households' net incomes are positively correlated. Even so, sickness, deaths, marriages and the like will normally produce enough contemporaneous variation to yield a real chance of finding a potential partner, as the data themselves suggest.

Household i, having suffered a bad draw, seeks a sum in the neighbourhood of m_i and is prepared to mortgage out a particular plot in order to obtain it. Most landowning households have a few plots, but each is registered and is therefore legally indivisible, which is what counts for mortgage contracts. Household i therefore has only very few options in this regard. Household j, which has just enjoyed a good draw, contemplates lending m_j or some such amount. Villagers know much about their neighbours' business, so there is a good chance that i and j will come to discuss the possibility of a deal. For i, the offer of m_j must lie sufficiently close to m_i. For j, the essential point is whether the plot on offer will yield a sufficiently attractive $F_j(y_{jt}; \mu < 0)$ and its likely duration, which depends on the agreed level of m and the size of the plot. If m_i and m_j lie somewhat far apart and i possesses more than one plot, the parties can consider the other options where the particular plots are concerned. There will also be some room for varying the amount of the loan, but this is almost surely limited by i's immediate needs. At all events, there will be scope for bargaining.

If i and j fail to agree, they have the option of seeking out other prospective partners, though the respective pools of potential lenders and borrowers, respectively, will normally be quite small. Failing success there, i must attempt to get a standard loan or, worse still, resort to belt-tightening. For j, there is the choice between padding out the savings account and making merry in the present. These 'outside' options will play the usual role when i and j bargain over the precise terms of a usufructuary mortgage contract.

3 Selling as a Further Option

The possibility that the borrower is certain never to repay, as expressed by the rational choice of a trigger value y^r exceeding y_i^2, emerged in Section 2.1. We now pursue this further by introducing a formal sale, with a change of land title, as an explicit option. It is important here to distinguish between simply leaving the usufructuary rights with the lender and formally assigning him or her full ownership rights. For possession of the land title usually confers other advantages, the plot's value as a form of collateral being most prominent among them. If an unencumbered plot is sold outright for the amount v, then in a stationary environment, the same plot when already mortgaged for the amount m should command the additional amount $v - m$ in negotiations leading to the lender obtaining the title.

3.1 Borrowers

The argument proceeds as in Section 2. Household i draws y_τ at $t = \tau$ and, having mortgaged a plot for m earlier, is confronted with the decision of whether to repay, continue for another period, or sell for the additional amount $v - m$ and so settle for $\{Y_t(\lambda_i - \mu)\}$ thereafter. We conjecture that each of these choices is associated with a sub-interval of $[y_i^1(\mu), y_i^2(\mu)]$, whereby the union of the sub-intervals covers the whole support, but one or two the sub-intervals may be null. If a sub-interval is null, the corresponding choice will never be made. Intuition suggests that selling will occur, if at all, only for sufficiently bad draws (or very large sums $v - m$), repayment only for sufficiently good ones, and continuing for intermediate values. We therefore define

$$\Gamma^s \equiv \int_{y_i^1(\mu)}^{y^s} u(y_{it} + v - m) dF_i(y_{it}; \mu) + \int_{y^s}^{y^r} u(y_{it}) dF_i(y_{it}; \mu) + \int_{y^r}^{y_i^2(\mu)} u(y_{it} - m) dF_i(y_{it}; \mu), \tag{18}$$

noting that one or two of the sub-intervals $[y_i^1(\mu), y^s], [y^s, y^r]$ and $[y^r, y_i^2(\mu)]$ may be null, where $\mu \in (0, \lambda_i]$. The analogue of S_τ is

$$\Sigma_\tau = \frac{\Gamma^s + \delta[\pi_i^r V(Y_i(0)) + \pi_i^s V(Y_i(\mu))]}{1 - \delta_i(1 - \pi^r - \pi^s)} \equiv \Sigma \ \forall \tau, \tag{19}$$

where $\pi_i^r = \int_{y^r}^{y_i^2(\mu)} dF_i(y_{it}; \mu)$ and $\pi_i^s = \int_{y_i^1(\mu)}^{y^s} dF_i(y_{it}; \mu)$.

The value of continuing is $u(y_{i\tau}) + \delta\Sigma$. The value of repaying, and so reclaiming $F_i(y_{it}; 0)$, is $u(y_{i\tau} - m) + \delta V(Y_i(0))$. The borrower will be indifferent between these two courses of action if, and only if,

$$u(y_{i\tau}) - u(y_{i\tau} - m) = \delta \cdot \frac{\Omega(Y_i(0)) + \delta\pi^s[V(Y_i(0)) - V(Y_i(\mu))] - \Gamma^s}{1 - \delta_i(1 - \pi^r - \pi^s)}. \tag{20}$$

It should be noted that the r.h.s. depends on y^s as well as y^r; for if the choice is to continue, then the option of selling will be open in the next period. The corresponding condition for the choice between selling and continuing is

$$u(y_{i\tau} + v - m) - u(y_{i\tau}) = \delta \cdot \frac{\Gamma^s + \delta\pi^r[V(Y_i(0)) - V(Y_i(\mu))] - \Omega(Y_i(\mu))}{1 - \delta_i(1 - \pi^r - \pi^s)}. \tag{21}$$

That between selling and repayment is

$$u(y_{i\tau} + v - m) - u(y_{i\tau} - m) = \delta[V(Y_i(0)) - V(Y_i(\mu))]. \tag{22}$$

Given $(m, v, \delta, F_i(y_{it}; 0), F_i(y_{it}; \mu))$, there is a unique value of $y_{i\tau}$ that satisfies this last condition, though it need not lie in $[y_i^1(\mu), y_i^2(\mu)]$. Whether continuing with the contract is better or worse than selling or repaying at $y_{i\tau}$ is an open question.

It will be useful to start by deriving conditions under which selling will never be chosen; for the setting then reduces to that analysed in Section 2. (The suffix i may now be dropped, since what follows concerns only the borrower, who can block any attempt by the lender to force a sale or repayment.) Suppose, therefore, that $\pi^s = 0$ and the corresponding contribution of selling to Γ^s is also zero. Recalling (5), (21) yields the following condition that continuing will be (weakly) preferred to selling:

$$u(y_\tau + v - m) - u(y_\tau) \leq \delta \cdot \frac{\delta\pi^r[V(Y(0)) - V(Y(\mu))] + \Gamma - \Omega(Y(\mu))}{1 - \delta(1 - \pi^r)} .$$

Since u is strictly concave, the l.h.s. attains a minimum at $y_\tau = y^1(\mu)$. Hence, if

$$u(y^1(\mu) + v - m) - u(y^1(\mu)) \leq \delta \cdot \frac{\delta\pi^r[V(Y(0)) - V(Y(\mu))] + \Gamma - \Omega(Y(\mu))}{1 - \delta(1 - \pi^r)} , \quad (23)$$

selling will indeed never be chosen over continuing, and a unique value of y^r will trigger the decision to repay, if at all. Denote this value of y^r by $y^r(c)$

Now suppose that condition (23) is just violated at $y_\tau = y^1(\mu)$ and that $y^r(c)$ is not in the immediate neighbourhood of $y^1(\mu)$. Then, by continuity, the gain from selling over continuing will be small and there will exist a y^s corresponding to $y^r(c)$ that is close to $y^1(\mu)$. It further follows that there exists a pair (y^s, y^r) close to $(y^1(\mu), y^r(c))$ such that the borrower is indifferent between selling and continuing, and prefers both to repaying. From (22), it is seen that this configuration will hold only if $u(y_\tau + v - m) - u(y_\tau - m) > \delta[V(Y(0)) - V(Y(\mu))]$. This involves relatively large values of m and $v - m$, and a plot that is not so productive as to involve a big difference between $V(Y(0))$ and $V(Y(\mu))$.

It is shown in the Appendix that y^s and y^r move in opposite directions where condition (20) is concerned. Hence, as condition (23) is more strongly violated, both π^r and π^s will increase, and the probability of continuing correspondingly reduced. Indeed, it is possible that there exists a $y_\tau \in (y^1(\mu), y^2(\mu))$ such that condition (22) holds: the borrower sells for all worse draws and repays for all better ones. This configuration is most likely to hold when the additional sum $v - m$ is sufficiently large and repaying m is not too onerous.

4 Empirical Modelling

To summarize Sections 2 and 3, borrowers and lenders have stochastic incomes that depend on the assets whose usufructuary rights they control. The lender's usufructuary landholding will increase through the mortgage contract, the borrower's will decline. Thus for the borrower, the immediate benefit of the loan must be purchased at the cost of an inferior distribution function of income in the future. In the model, the borrower considers taking up a loan when experiencing a negative income shock, whereas the lender manages to scrape together the loan thanks to a positive income shock. The conclusion of a mortgage contract will not, therefore, be a very common event, since a match is needed among neighbors. (The borrower's plot of land cannot be too far from the lender's house if the latter is to be in a position to utilize it.) Repayment will take place, in the model, when the borrower gets a sufficiently strong positive shock. Full transfer of property rights – an outright sale – will happen if the borrower suffers another sufficiently serious negative shock.

Based on these predictions, we can formulate a set of empirical hypotheses, all *ceteris paribus*.

- Larger endowments (of land and human capital) reduce the need to borrow to finance any given outlay, and hence the need to mortgage out.
- Households with relatively few assets are more likely to borrow, and hence to mortgage out; but they must own land in order to mortgage out.
- Successive negative income shocks will lead, first, to mortgaging out, and then to a transfer of ownership.
- A household needs a positive shock to become a lender.
- Those with little or no land are more likely to be lenders.

We now elaborate somewhat on both parties' motives and actions, leading to a set of more refined hypotheses.

The lender will finance the loan either from own savings, perhaps from work outside the village, or by taking a loan himself. In both cases, the informal credit market is available as the outside option. He can either lend some of his earnings, or he can repay an outstanding informal loan, or not take up a new one. Similarly, he may, in principle, either rent (or sharecrop) in the parcel of land. So the act of mortgaging in (and lending) is particular, in the sense that he has to come up with a relatively large amount of money up front. Given the relatively high interest rates in the informal loan market, he will probably do this by saving, rather than taking a loan. So the implication is that the lender, at some point in time, gets a relatively large amount of money which is invested in this way. This can be a planned event: for example, the family may spend the lean season as laborers in an urban area. We thus expect the following findings: (*H:La*), lenders (who mortgage in land) have small (or no) landholdings, in keeping with *Proposition 3*; and (*H:Lb*), they had a relatively large income just prior to closing the mortgage contract.

An alternative possibility is that lenders already have large land-holdings and have an opportunistic motivation for mortgaging in land, namely, the hope that the borrower will be unable to repay the loan. In this event, they will have the option of offering to buy the land – at a low price. As discussed above, there seems to be some evidence in the data for this kind of land accumulation. But as we shall see below, the lenders do not own much land at the outset; so they may well be opportunistic, but are not normally wealthy. Mortgage contracts may, in fact, work as a mechanism to redistribute land away from households with large ownership holdings.

Those who mortgage out, for their part, also decline the outside option. In choosing this contract, they may be motivated by possessing more land than they are able or willing to cultivate themselves, whether because of lack of labor or the availability of better income-earning possibilities for family members. But if so, it appears that a standard sharecropping or fixed rent contract would be the better option. A more likely motive, therefore, is the need for a large sum of money, with the possession of land satisfying only a necessary condition for getting it. If so, why do they choose this type of loan, instead of using the land title as collateral to obtain a bank loan and keeping the user rights? The bank may refuse to give (additional) loans for non-productive purposes; and standard informal loans carry very high interest rates. If, therefore, mortgaging out is the last resort, we should expect to find the following: (*H:Ba*), borrowers have relatively large land-holdings; (*H:Bb*), borrowers have existing loans; and (*H:Bc*), borrowers have an acute need for (even more) money.

5 The Data

The original sample comprised a total of 240 households in upland Orissa, with 8 households drawn from each of 24 villages in Balangir District and a further 6 villages in Kalahandi District.[3] The survey work involved the following rounds: several rounds during 2001-2004, covering most seasons in the period *kharif* 2000 through *kharif* 2004; a single round in 2010 covering *kharif* 2009, this time with a shorter questionnaire; and another in 2013, once more with a long questionnaire, with a follow-up in 2014, including equally extensive interviews with trading partner households and covering the calendar year 2013. In 2013, we found 216 of the original households. Many of them had split since the original rounds, and we interviewed all 59 splits that we found. For the split households, we try to avoid double-counting, particularly of land-holdings. For some parts of the analysis, we keep only the core household, which will have the largest landholding and whose head was normally the eldest son in the original rounds.

[3]For a description of the region, the villages and the survey design, see van Dillen (2008).

5.1 The incidence and duration of contracts

Of the 279 households in the 2013 round,[4] 50 (18%) are landless. Twenty-one of the latter farm, with a total of 35 plots of land under cultivation (median holding one acre, mean 1.6 acres); the other 29 do not. Twelve landowning households do not cultivate, so there are 238 (229+21−12) cultivating households. Landowning households cultivate a total of 538 plots, 408 of which are owned. Fifty of all owned plots are cultivated by others, 32 of which are contracted under usufruct mortgages. These 32 plots (35 acres in all) are part of the total of 26 mortgaged-out contracts, which are held by 24 households.

Seventy-two of the 573 (35 + 538) plots under cultivation are owned by others. Again, the usufruct mortgage is the most common arrangement: 33 plots (totalling 37 acres) are mortgaged in by 29 households (26 from the original sample[5]). The second most common contractual type is sharecropping, while pure fixed-rent contracts are rather few in number (six plots leased in and three out). Overall, there is more leasing in, mortgaging and sharecropping alike, than out. This is to be expected even in a fairly large random rural sample, as some landowners live in towns.

There are 59 (26 + 33) extant mortgage contracts in all, involving 51 households, of which 48 belong to the original sample,[6] with at least one of the said 48 present in 21 of the 30 villages (see Tables 1 and 2). In this group of 21 villages, the median and (rounded) mean number of contracts are both 3 (59/21 = 2.8); the median and (rounded) mean number of households is holding at least one contract is 2 (48/21 = 2.3). The distributions are shown in Table 1. Since the sample size is only 8 households per village, an average of two households having such a contract is not a small number,

[4]Four new households were added to the original sample in the 2010 round, so that the 2013 round comprised the 216 originals found in 2013, the 59 splits and the said 4.

[5]In the final sample, we end up with 25, since a split household that had a mortgage-in contract in 2013 is not that split of the original household with the largest landholding in 2013.

[6]There are 47 in the final sample, see above.

and it points to a rather active market in this kind of transaction.

This still invites the question, why are no contracts observed in almost one-third of the villages surveyed? One might suspect that this has something to do with location and commercialization: whereas conditions in remote villages might favor mortgages, they may have disappeared in centrally located ones. However, inspection of the spatial network and distances indicates that this is not the case. Kendumundi village, for example, is nearby the town of Titlagarh, and has two households that mortgage out land. One may argue that these households mortgage out precisely because they have urban occupations; but if so, then someone else (presumably a neighbor) must be willing to mortgage in land, and thus lend to a fellow villager with an urban job.

(Tables 1 and 2 about here.)

The duration of such contracts is of central interest, as is their frequency over time. Sixteen of the above-mentioned 48 households in the original sample having a contract in 2013 also had extant contracts at some stage during the early period from *kharif* 2000 to *kharif* 2004 inclusive. The reported starting dates of contracts indicates how quickly they are repaid. In 2013, this date was reported for 57 out of the 59 contracts. The mean date was 2010, the median was 2011, and the earliest date was 2001, with only four loans taken up in 2004 or earlier. Extant contracts in 2013 having already lasted an average of 3 years, one might hazard the guess that loans are repaid, on average, after about 6 years, but the true value depends on the actual (stochastic) process. In the rounds covering the period 2000-2004, both the median and mean starting years were 2001. Most of the contracts seem to have been recorded already in the first 2001 round, which canvassed both seasons of the agricultural year 2000-01. Among those contracts, the median starting year was 2000 and the mean 1999, which seems to point to a shorter period until repayment, on average, at that time. Only half of the 2001 loans were recorded as repaid in 2004, but this may be due to gaps in information on repayment in the final round. The data convey the general impression that people mortgage the land for some years, and in some cases it changes ownership.

5.2 The hypotheses: a preliminary examination

Table 3 reports summary statistics of ownership holdings for the three subgroups defined by households' usufruct contractual status in 2013, together with 95-percent confidence intervals and significance levels for comparisons of the means of contracting and non-contracting groups.[7] Two households mortgage both in and out, and some households have multiple contractual partners, so the numbers of observations in the table do not add up to 279. For completeness, we also report the statistics for those linked households that have mortgage contracts with households in our primary sample, that is, for those contractual partners not belonging to our sample whom we were able to identity and interview, though this group is not the focus of the present paper.

(Table 3 about here)

Starting with the original sample of 279 households, we use the 223 that have no mortgage contract as the reference group. As can be seen from Table 3, those that mortgage in land own less land on average, which is why they mortgage in, while those that mortgage out own more, which enables them to mortgage out: indeed, there is no overlap between the confidence intervals for the respective means of 1.4 acres and 3.4 acres. There are similar findings for the linked samples, i.e., those that have mortgage contracts with the original sample, except that those mortgaging out have even more land. This is not surprising, since households with more land are more likely to have multiple partners and thus have a larger probability of contracting with any randomly selected household. We thus have support for hypotheses *H:La* and *H:Ba*. This follows

[7] With only 30 clusters, the use of clustered standard errors has pitfalls. We report the larger standard error of the two, which in most cases is the clustered one, throughout the paper. In this table, the non-clustered standard error is larger for the two small mortgage-out samples, where there are, respectively, 18 (in 13 clusters) and 19 (in 10 clusters) observations, so the clustered standard errors are probably biased.

almost by construction: one must own land to be able to mortgage out, and those lacking land of their own may wish to mortgage in. It is, however, a finding with a twist, for it also implies that the land-poor lend money to the land-rich.

Returning to the possible motives of the land-rich to borrow from land-poor neighbors in exchange for such user rights, there is, in principle, the alternative of using the land title as collateral to secure a bank loan. One stratagem is to use the land as collateral twice, first, by depositing the title with the bank as collateral for a formal loan, and then transferring the user rights to the lending household to get an informal one. There is some evidence that points to such behavior. The 25 households that mortgage out have a total of 61 loans (with a median size of Rs.10,000) for which full details about the lender are available; all 25 must have at least one loan, and 17 of them reported having more than one. Of the remaining 254 households, 82 have no loans and 91 have more than one. Borrowers who mortgage out land have more loans than borrowers who do not, in the sense that the null of homogeneity of the distributions $(0 + 8, 17)$ and $(82 + 81, 91)$ is decisively rejected ($\chi^2 = 9.930, \chi^2_{0.01}(1) = 6.635$). This indicates some support for hypothesis *H:Bb*, that is, the usufruct mortgage is only one of many available options to which those mortgaging out resort. Borrowers who mortgage out also take out larger loans – the median is Rs.40,000, but only Rs.18,000 for the others (again, among those who have any loans at all).

The type of lender is known for 26 of the 32 usufruct mortgage-out loans. As expected, all are informal lenders: 16 loans come from relatives, friends or neighbors, seven from moneylenders, two from landlords and one from a trader. The 35 additional loans taken by the same borrowers come from more diverse lenders, similar to the other borrowers. Where purpose is concerned, the usufruct loans are over-represented when it comes to medical expenses and a daughter's marriage, but when all loans taken by these borrowers are examined together, the medical loans are not over-represented. Thus, only loans for a daughter's marriage are over-represented among borrowers who mortgage out land. Yet only 9 of the 26 usufruct loans have marriage as the declared purpose. If we construe marriage as a sudden need for credit, then there is some support for hypothesis *H:Bc*.

This brings us to the role of negative shocks, information on which is available only for the period 2000-2004. Six of the 26 households that mortgaged out (and thus took out the associated loan) reported no shocks at all. Of the other 20, 17 reported that the mortgage was linked to marriage, seven had health problems (the same proportion as other households), and 12 experienced bad weather (again similar to other households). Thus, these 20 households suffered, on average, about two misfortunes over the period in question. Among the 22 households that mortgaged in land (and thus granted loans), fully 13 reported no shocks at all. There were no marriages (just 3 in the remaining sample). Seven of the nine that did report suffering a shock had health problems, and only four reported bad weather (note that this group of 22 had less land). In the whole sample, a total of 22 marriages are reported, and 17 of these households mortgaged out land. We conclude that land is frequently mortgaged out to finance a daughter's marriage, but also that other adverse shocks play a role in forcing this option.

In what sense, however, can marriage be interpreted as a shock? One may argue that whereas a marriage is very likely to happen, its timing is uncertain. The family must find an appropriate groom, followed by the additional complication that, according to tradition, there are auspicious dates for marriage. While contemplating these tasks, there are two possible strategies to raise the funds. One can invest in assets that can be sold at the right time: gold and cattle are readily tradable, land less so. Or one can wait and then borrow – potentially through a usufructuary mortgage – when the time does come. But why is there this close link between mortgage and marriage? Marriage entails a large, one-time cost, and though there may be other large outlays during the lifetime of a family, marriage is still the most frequent such event in village economies. Thus the high correlation between marriage and usufruct mortgage contracts may just reflect the fact that marriage is an almost unavoidable rite of passage, and does not necessarily imply that mortgaging out is linked only, and then potentially by social custom, to marriage. There is, moreover, the mitigating effect that when the daughter leaves the household, it may need less land, if only for a while, which in turn makes mortgaging out more attractive.

6 Mortgages and Land Accumulation

We now turn to possibility that lending in order to mortgage in is an indirect means of accumulating land. We do not have direct information on this, but any household that mortgaged in land in the early period and owned more land in the closing period may be a candidate. Among the 22 panel households that mortgaged in land during the first rounds, 11 had accumulated one acre or more by the close, whereas among the 194 that constitute the rest of the original panel sample of 216 households, only 44 (not even a quarter) managed to do likewise. Indeed, the null of homogeneity of the distributions $(11, 11)$ and $(150, 44)$ for the two groups is rejected with a test of size 0.01 ($\chi^2 = 7.770, \chi^2_{0.01}(1) = 6.635$). The mean accumulations are -0.06 and 0.52 acres, with robust standard errors of 0.158 and 0.300, respectively; the difference of 0.58 acres is significant with a test of size 0.06. To complete the picture of those that had mortgaged in, four lost and 13 gained land in the interim. Ten were landless in 2001, and six of them had land in 2013. The normal gain was one acre.

It is less straightforward to compare declines in land holdings among those that mortgaged out, since the splitting of households – and of the original holding among brothers – is not a rare event, so any observed decline may result from a combination of causes. Among the 26 panel households that reported mortgaging out in the early period, 11 had lost one acre or more by the close, while among the remaining 190, 44 had done likewise. Once more, the null of the homogeneity of the distributions $(15, 11)$ and $(146, 44)$ is rejected at conventional levels ($\chi^2 = 4.419, \chi^2_{0.05}(1) = 3.84$). To complete the picture for those mortgaging out, 10 gained and 14 lost land. The median holding was 4 acres in 2001, and the median holding for the said 14 dropped from 5 to 1 acres. All 26 still owned land in 2013, the median having fallen to 2.8 acres. So from both sides of the transaction it appears that a mortgage contract may end up as a transfer of ownership, probably at a very good price for the 'buyer', depending on whether any further payments are made.

If this is the case, then we would expect to find that the land-poor lenders have good non-farm incomes, while the land-rich borrowers have particularly low incomes, or high costs. An examination of non-farm incomes during the three first seasons canvassed (*kharif* 2000 through *kharif* 2001) reveals that the 10 households that mortgaged out during the period 2000-04 and lost one acre or more up to 2013 had lower incomes in those three seasons than other groups. The middle seven of this group of 10 had lower non-farm incomes in 2000-01 than the 12 households that mortgaged in early on and had accumulated one acre of land or more by the close. If, however, we compare all those which mortgaged out with all those which mortgaged in, we find no difference. This pattern is consistent with mortgaging out being chiefly motivated by pressing and substantial financial need, and for relatively poor people with more land but limited non-farm income, it is also a potential way to for them lose land over time.

We will now test more systematically the idea that mortgage transactions indeed operated so as to redistribute landownership in the manner described above. Since a household's initial contractual status should affect its subsequent (net) accumulation of land, this needs to be investigated as a first step. To do this, we employ a regression framework, using information on the initial conditions and state variables reported in the 2001 interviews. All extant mortgages reported during the three seasons in question are included. We then use the 2013 data to measure households' subsequent accumulation of land. Excluding two outliers,[8] both the median and the mean landholding are the same, respectively, in 2001 and 2013. For the sample as a whole, therefore, there is no land accumulation. Thus households bought, sold and divided land, but without

[8]The 99-percentile for landownership in 2001 is at 12 acres. Two households had, respectively, 22 and 30 acres in 2001, and lost, respectively, 16 and 27 acres between 2001 to 2013.

altering the central measures of the distribution.

6.1 Econometric analysis

We have the following latent function:

$$z_i = z(\text{land ownership, family labor, education, caste}) + u_i.$$

The probability of mortgaging out we may write as $P(\text{mortgage out}) = P(z_i > K1)$, and the probability of mortgaging in as $P(\text{mortgage out}) = P(z_i \leq K0)$. The first specification involves estimating the two equations separately using OLS. This implicitly means that the group of observations formed by mortgage-out together with no mortgage is the combined control for mortgage-in. An alternative is to estimate the two equations jointly using a multinomial logit model, with no mortgage as the control. We report marginal effects, so that they can be compared to the OLS findings. Finally, we assume that the two equations are the same, but with $K0 < K1$, which means that we estimate an ordered probit model. Again the marginal effects are compared to no mortgage. The ordered probit model implicitly assumes that the marginal effects have the same size, but opposite signs.

As a preliminary to discussing the findings, we summarize what the analysis of the preceding sections leads us to expect. Larger endowments (land owned, labor, education) induce a lower probability of borrowing (mortgaging out). That is to say, as land owned decreases, then *cet. per.* the probability of mortgaging out increases. This cannot continue without limit, however; for owning some land is a necessary condition for the action of offering to mortgage it. Hence, if the size of the holding is sufficiently small and the response function is continuous, the probability of mortgaging out must be decreasing in that endowment. Conversely, for sufficiently small ownership holdings, culminating in landless households, the probability of mortgaging in will be increasing therein. To sum up, there should be an inverse-U shaped effect of own land on mortgaging out and a U-shaped effect of own land on mortgaging in. Family labor and education will increase (decrease) the probability of mortgaging in (out); and caste may shift preferences for mortgaging (both in and out). Finally, mortgaging in may lead to accumulation of land.

The results for the mortgage decision are reported in Table 4. The findings are robust across the different econometric specifications and conform largely to expectations. For mortgaging out, the relation is concave and first increasing (see columns 2 and 5), with an implied turning point at about 9 acres,[9] close to the top end of landholdings. For mortgaging in, the function is convex and first decreasing (see columns 1 and 4), though the estimated coefficients are much less precise. The OLS estimates, the more precise of the two, imply a turning point of 11.5 acres. The ordered probit estimates (see column 3) are consistent with these findings, with an implied turning point of just over 10 acres. These turning points are not so precisely estimated as to warrant strong assertions that households with more than 10 acres or so are less likely to mortgage out; for only 12 of the whole sample owned 6 acres or more. Of the four owning 8.75 acres or more, one mortgaged out; but just one of the eight owning between 6 and 8.75 acres did so. We conclude that over the actual distribution of ownership holdings, and all else being equal, households with small to modest holdings are likely to mortgage out to neighbors with even smaller ones.

In contrast to the predictions, family size has no effect on these decisions, even when controlling for the number of dependants and working-age members. Human capital, as measured by educational attainment, however, appears to increase the probability of mortgaging in. This implies some support for the hypothesis of an opportunistic motive for mortgaging, if some education is needed to make and execute a long-term plan of acquiring full ownership. The finding that tribal people are less active on both sides of the market – particularly in mortgaging out – is consistent with received wisdom about social customs in the matter of land relations in upland Orissa.

[9] Both coefficients are significant at conventional levels in the logit specification. The turning point is $0.070/(2 \times 0.004) = 8.75$.

(Table 4 about here)

To close, we investigate whether mortgaging in land in 2001 appears to have been a stepping stone towards accumulating land. To test this, we estimate land ownership in 2013 as a function of landownership in 2001 and the area of land mortgaged in during 2001, adding the area mortgaged out for completeness (see Table 5). As a preliminary, it should be remarked that the descriptive statistics discussed above are richer in content than the following regression analysis. For a parametric relation between initial and closing landholdings in the latter only summarizes the changes in land distributions discussed above. Recall, in particular, that the land distribution within the panel stays basically the same: individual households just switch positions. Thus, we cannot interpret the estimated parameter for initial land (acres01), whose value is smaller than one, as indicating that there will be growing concentration of land ownership, which would indeed happen if the estimated function described the transitions of a single household. The estimated value only indicates that land in fact tends to stay in the family over time, but that there is also some trade in land.

Controlling for initial land ownership, the coefficient on the area mortgaged in during the early period is positive, quite large and statistically highly significant, which supports the hypothesis that mortgaging in is a long step on the way to accumulating land. This is the main finding, and it is robust to the introduction of other regressors. It is also reassuring that the coefficients on all three land variables vary relatively little across the specifications in Table 5. It should be mentioned that controlling for (administrative) block effects is important to this finding. Of the 22 households mortgaging in, 16 were residents of Titlagarh and Kesinga blocks, with the remaining 6 households spread over the other three. In the absence of block dummies as controls, the coefficient of land mortgaged in is both smaller and no longer statistically significant at conventional levels.

Where the other endowments are concerned, larger families in 2001 are associated with larger ownership holdings in 2013. There is, however, something of a surprise: controlling for all these factors, families with many adult men in 2001 have less land in 2013. Perhaps India's growing urban sector offered them better opportunities.

(Table 5 about here)

7 Conclusions

The usufruct mortgage offers some clear advantages over other forms of contracts in risky environments when insurance and credit markets are very imperfect, if at all present. These advantages are, however, double-edged in some respects. When mortgaging out a parcel of land, the borrower obtains a goodly sum to deal with an immediate need and can choose when to repay the loan; but future events may well turn out so adversely that he never does so. For his part, the lender enjoys the user rights until the loan is repaid in full, an action over whose timing he has no control; but there is always the possibility – and hope – that the borrower will eventually decide that repayment will be simply too painful and agree to a transfer of ownership, perhaps with the inducement of an additional payment. The theoretical framework developed and analyzed in this paper contains all these elements and yields some results concerning what conditions and factors govern the decision to contract in the first place and, subsequently, when and whether to repay or agree to a sale.

The situation on the ground, in upland Orissa, illustrates and substantially bears out these findings. By definition, a household must own land in the first place to be able to mortgage out land and thus obtain a loan so secured. The chief pressing need is to marry off a daughter, but those arising from serious ill-health and bad harvests are also important. Many of the households that mortgaged out in the early period had smaller ownership holdings at the close, and the losses were substantial, though none became landless. Those households that mortgaged in were mostly land-poor at the outset, though evidently able to raise the money needed to offer the required loan. They may indeed have had an opportunistic motive, as this group had accumulated land ten years later. In this connection, it is notable that of the 10 landless families that were mortgaging in at the outset, six had become landowners by 2013.

Almost 20 percent of the households in the sample had extant mortgage contracts in 2013, and complementing this strong level of activity, all the sums involved were quite large. These facts indicate that such contracts expand households' opportunities beyond those offered by the standard informal and formal credit transactions in which they also engaged. Mortgage contracts also appear to operate as a mechanism that frequently leads to the full transfer of ownership rights from relatively land-rich to land-poor households. There are, of course, other processes affecting the distribution of land, especially the splitting of holdings among brothers. In the villages surveyed, however, the overall distribution of ownership holdings has remained largely unchanged over time.

8 Appendix

Proof of Proposition 1. The uniqueness of y^r.

Define $\xi(y^r, m) \equiv u(y^r) - u(y^r - m)$. Since u is strictly concave, ξ is positive, decreasing, continuous and strictly convex for all y^r, with $\lim_{y^r \to \infty} \xi = 0$.

Now consider Q_i^m, which is clearly continuous in y^r. Differentiating w.r.t. y^r, we obtain

$$\frac{\partial Q_i^m}{\partial y^r} = \frac{\delta[Q_i^m + u'(y^r - m) - u'(y^r)] \cdot F'(y^r; \mu)}{(1 - \delta(1 - \pi_i))^2} > 0 \; \forall y^r \in (y^1(\mu), y^2(\mu)).$$

(i) If $\xi(y^1(\mu), m) < \delta Q_i^m(y^1(\mu), m, \mu)$, then ξ and δQ_i^m will not intersect in the interval $[y^1(\mu), y^2(\mu)]$, and the loan will be repaid for certain in the next period.

(ii) If $\xi(y^1(\mu), m) > \delta Q_i^m(y^1(\mu), m, \mu)$ and $\xi(y^2, m) < \delta Q_i^m(y^2, m, \mu)$, then ξ and δQ_i^m will intersect exactly once, at y^r, in the interval $[y^1(\mu), y^2(\mu)]$.

(iii) If $\xi(y^2(\mu), m) > Q_i^m(y^2(\mu), m, \mu)$, then ξ and δQ_i^m will not intersect in the interval $[y^1(\mu), y^2(\mu)]$ and the loan will never be repaid.

Turning to the behaviour of the trigger value y^r in relation to loan size m, differentiating (4) totally, holding μ constant, collecting terms and rearranging, we have

$$\left(u'(y^r - m) - u'(y^r) + \frac{\partial Q_i^m}{\partial y^r}\right) dy^r = \left(u'(y^r - m) - \frac{\delta}{1 - \delta(1 - \pi_i)} \int_{y^r}^{y^2(\mu)} u'(y - m) dF(\cdot; \mu)\right) dm.$$

It is seen that the expression multiplying dy^r is positive. That multiplying dm is also positive iff

$$(1 - \delta)u'(y^r) + \delta u'(y^r - m) \int_{y^r}^{y^2(\mu)} dF(\cdot; \mu) > \delta \int_{y^r}^{y^2(\mu)} u'(y - m) dF(\cdot; \mu),$$

which certainly holds in virtue of the strict concavity of u. It follows that y^r is increasing in m.

Analogously, y^r is decreasing in μ iff $\partial Q_i^m / \partial \mu > 0$. We have

$$\frac{\partial Q_i^m}{\partial \mu} = \frac{1}{1 - \delta(1 - \pi_i)} \left(Q_i^m \frac{\partial F(y^r; \mu)}{\partial \mu} - \frac{\partial \Gamma}{\partial \mu}\right).$$

It follows from Assumption 1 that $\partial F(y^r; \mu)/\partial \mu > 0 \ \forall y^r \in (y^1, y^2)$ and is zero otherwise. Γ is the expected utility of the lottery $Y(\mu > 0)$ with optimal repayment behaviour. It is surely decreasing in μ; for the usufructuary holding becomes smaller and the resulting F is first-order stochastically dominated. Thus, y^r is decreasing in μ.

The same argument applies, *mutatis mutandis*, to changes in the endowment λ with μ constant: y^r is increasing in λ. Q.E.D.

Proof of Proposition 4. The trigger value now relates to the variate Y_t, but with each realisation augmented by a_i, so that $\xi \equiv u(y^r + a_i) - u(y^r + a_i - m)$. We have

$$\frac{\partial \xi}{\partial a_i} = u'(y^r + a_i) - u'(y^r + a_i - m) < 0.$$

The response of $Q_i^m(a_i)$ to changes in a_i, holding y^r constant, is

$$\frac{\partial Q_i^m(a_i)}{\partial a_i} = \frac{\Omega'(Y(0)+a_i) - \int\limits_{y^1(\mu)}^{y^r} u'(y+a_i)dF(y;\mu) - \int\limits_{y^r}^{y^2(\mu)} u'(y+a_i-m)dF(y;\mu)}{1-\delta_i(1-\pi_i)} < 0,$$

since $F(y;0)$ first-order stochastically dominates $F(y;\mu)$ when $\mu > 0$. Hence, y^r is increasing in a_i if, and only if, $\delta_i \cdot \partial Q_i^m/\partial a_i - \partial\xi/\partial a_i < 0$, which condition may be written as (13):

$$\delta_i(\Gamma' - \Omega'(Y(0)+a_i)) > (1-\delta_i(1-\pi_i))[u'(y^r+a_i-m) - u'(y^r+a_i)].$$

The partial derivative of the l.h.s. w.r.t. y^r is $-\delta_i[u'(y^r+a_i-m)-u'(y^r+a_i)]F'(y^r;\mu)$. The corresponding expression for the r.h.s. is

$$-\delta_i[u'(y^r+a_i-m)-u'(y^r+a_i)]F'(y^r;\mu)+(1-\delta_i(1-\pi_i))[u''(y^r+a_i-m)-u''(y^r+a_i)];$$

so that the r.h.s. of (13) is decreasing more strongly in y^r than the l.h.s. if, and only if, $[u''(y^r+a_i-m)-u''(y^r+a_i)] < 0$, and this holds in turn if $u''' > 0$. Q.E.D.

References

Bailey, F.G. (1957). *Caste and the Economic Frontier: A Village in Highland Orissa*, Manchester: Manchester University Press.

Bardhan, P.K. (1980). 'Interlocking Factor Markets and Agrarian Development: A Review of Issues'. *Oxford Economic Papers*, 32(1): 262-80.

Bardhan, P.K., and Rudra, A. (1978). 'Interlinkage of Land, Labour and Credit Relations: An Analysis of Village Survey Data in East India', *Economic and Political Weekly*, 13, February: 367-384.

Basu, K. (1983). 'The Emergence of Isolation and Interlinkage in Rural Markets', *Oxford Economic Papers*, 35(2): 262-80.

Braverman, A., and Stiglitz, J.E. (1982). 'Sharecropping and the Interlinkage of Agrarian Markets', *American Economic Review*, 72(4): 695-715.

Bell, C. (1988). 'Credit Markets and Interlinked Transactions', in: Chenery, H.B., Srinivasan, T.N. (eds.), *Handbook of Development Economics*, Volume 1, Elsevier: 763-830.

Bell, C., and Srinivasan, T.N. (1989). 'Interlinked Transactions in Rural Markets: An Empirical Study of Andhra Pradesh, Bihar and Punjab'. *Oxford Bulletin of Economics and Statistics*, 51(1): 73-83.

Mukherjee, A., and Ray, D. (1995). 'Labor Tying'. *Journal of Development Economics*, 47(2): 207-239.

Perrott, H. R. (1909). 'Voices from the Indian Up-country: Banking and Money-Lending', *Economic Journal*, 19(75): 450-463.

Shibli, M.A. (1993). 'Usufructuary Mortgages in Rural South Asian Economies: Collateral Valuation and Internal Rates'. *American Journal of Economics and Sociology*, 52(2): 167-181.

Swaminathan, M. (1991). 'Segmentation, Collateral Undervaluation, and the Rate of Interest in Agrarian Credit Markets: Some Evidence from Two Villages in South India', *Cambridge Journal of Economics*, 15: 161-178.

van Dillen, S. (2008). 'Income and its Variability in a Drought-prone Region: Seasonality, Location and Household Characteristics', *European Journal of Development Research*, 20(4): 579-596. DOI: 10.1080/09578810802464912.

Table 1. Mortgage contracts per village in 2013

contracts	villages	hh	villages
0	9	0	9
1	6	1	8
2	4	2	3
3	4	3	7
4	4	4	2
5	1	5	1
6	2		
59	30	48	30

Table 2. Mortgage contracts in the panel

	2001-04 (N=240)		2013 (N=216)	(N=279)			
	Households (N=51)	Contracts (N=60)	Original hh (N=47)	Households (N=51)	Contracts (N=59)	Mort-in 2001-04	Mort-out 2001-04
Mortgage-in	24	30	25	29	33	7	2
Mortgage-out	28	30	24	24	26	(1)	7

The sample of 279 households in 2013 are the 216 + 59 splits from those households + four households added in 2009.

Table 3. Landholdings (acre) for sub-groups according to mortgage status in 2013

Group:	N	landless (%)	25-percentile	median	mean	75-percentile
Original sample:						
Mortgage in	33	15	0.5	1.0	1.4* (0.8-2)	2.1
and matched	17	12	0.5	1.0	1.4 (0.5-2.2)	2.0
Mortgage out	25	0	1.4	2.8	3.4** (2.2-4.7)	5.0
and matched	15	0	1.0	2.0	3.0 (1.5-4.5)	4.5
No mortgage (ref)	223	21	0.5	1.3	2.0 (1.6-2.4)	3.0
Linked sample:						
Match and mort-in	17	24	0.5	1.0	1.1** (0.5-1.7)	1.9
Match and mort-out	18	0	2.5	4.0	5.1*** (3.0-7.2)	6.0

Significantly different from reference category at ** 5%-level, * 10%-level.
95-% confidence interval in parenthesis.

Table 4. Mortgage decisions: contractual status in 2001

	(1)	(2)	(3)	(4)	(5)
	OLS	OLS	oprobit	mlogit	mlogit
VARIABLES	mort-in	mort-out	mortgage	mort-in	mort-out
acres	- 0.046*	0.073***	0.061***	- 0.034	0.070***
	(0.026)	(0.026)	(0.020)	(0.032)	(0.021)
acres-sq	0.002	- 0.004	- 0.003*	0.000	- 0.004**
	(0.002)	(0.003)	(0.002)	(0.005)	(0.002)
scheduled tribe	- 0.012	- 0.116**	- 0.051	- 0.014	- 0.121**
	(0.036)	(0.050)	(0.036)	(0.037)	(0.058)
education-head	0.015*	- 0.006	- 0.010	0.014**	- 0.005
	(0.008)	(0.009)	(0.007)	(0.007)	(0.007)
family-size	0.014	- 0.020	- 0.016	0.012	- 0.016
	(0.016)	(0.013)	(0.011)	(0.016)	(0.015)
workagefem	- 0.018	0.041	0.028	- 0.027	0.032
	(0.025)	(0.032)	(0.021)	(0.029)	(0.021)
workagemale	0.007	**- 0.038**	**- 0.022**	0.015	- 0.035
	(0.029)	(0.027)	(0.017)	(0.025)	(0.024)
Observations	214	214	214	214	214
R-squared	0.101	0.131	0.093	0.179	0.179

*** p<0.01, ** p<0.05, * p<0.1. Bold if familysize+workagemale is significant (column 5: significant at 12%-level).
Cluster-adjusted standard errors in parentheses. Block-dummies included. Marginal effects.

Table 5. Land accumulation

	OLS	OLS	OLS
variables	acres13	acres13	acres13
acres01	0.689***	0.677***	0.683***
	(0.078)	(0.079)	(0.080)
acres01-mortgaged-in	0.261***	0.234***	0.218***
	(0.091)	(0.081)	(0.076)
acres01-mortaged-out	0.281	0.360	0.330
	(0.404)	(0.364)	(0.371)
scheduled tribe	0.459(*)	0.359	
	(0.273)	(0.287)	
education-head	- 0.012		
	(0.028)		
family-size	0.225**		
	(0.083)		
workagefem	**0.263**		
	(0.182)		
workagemale	**- 0.625*** **		
	(0.150)		
Observations	214	214	214
R-squared	0.534	0.478	0.472

*** p<0.01, ** p<0.05, * p<0.1. Bold if familysize+workage is significant.
Cluster-adjusted standard errors in parentheses. Block-dummies included. Marginal effects.