14254

Sept. 1990

FILE COPY

Credit Markets in Northern Nigeria: Credit as Insurance in a Rural Economy

Christopher Udry

This article addresses the issues of incomplete markets and imperfect information in the context of credit markets in rural northern Nigeria. In much recent theoretical literature, the problems of moral hazard and adverse selection are assumed to be decisive for the organization of agrarian institutions. In contrast, it is found that in the four villages surveyed credit transactions take advantage of the free flow of information within rural communities. Information asymmetries between borrower and lender are unimportant, and their institutional consequences—the use of collateral and interlinked contracts—are absent. Credit transactions play a direct role in pooling risk between households through the use of contracts in which the repayment owed by the borrower depends on the realization of random production shocks by both the borrower and the lender.

The analysis of rural markets and institutions in developing countries has been transformed through the application of the theory of economic behavior under conditions of incomplete markets and imperfect information. Nowhere is this more evident than in the literature on rural credit markets.[1] This literature emphasizes that because complete insurance markets are absent, credit transactions take on a special role in allowing individuals to smooth income shocks over time (see, for example, Eswaran and Kotwal 1989). It also emphasizes that because moral hazard and adverse selection are especially prevalent in credit transactions, credit markets are likely to incorporate organizational features that serve to mitigate or accommodate the problems caused by these information asymmetries.

1. See Bell (1988) and Bardhan (1989) for comprehensive bibliographies.

Two organizational features have received particular attention in the literature on credit markets. The first is the pledging of collateral.[2] Collateral pledged in exchange for the receipt of a loan directly reduces the cost to the lender of a default on a loan; it can reduce the moral hazard associated with lending by providing an added incentive for the borrower to repay; and it can alleviate the problem of adverse selection by screening out those borrowers most likely to default.

The second institution is contractual interlinkage between markets. An interlinkage exists if two parties engage in transactions in more than one market and the terms of each transaction are set in a single contract.[3] The literature concerning this contractual form has grown to the point at which "the ubiquity of interlocking transactions is now widely acknowledged" (Hart 1986, p. 177). An interlinked transaction may be a disguised form of collateral. For example, the forward sale of standing crops (a product–credit market interlinkage) is often most easily interpreted as the pledging of those crops as collateral. Alternatively, the interlinkage may serve to reduce moral hazard or adverse selection by permitting the use of the contractual terms in one transaction to alter an agent's behavior in another.[4]

This article extends contemporary research on credit markets to rural credit in Africa by reporting findings from a detailed survey of 198 households in northern Nigeria. The survey yields two major findings. First, nearly all loans are transacted within a village or kinship group. I present evidence that information asymmetries within such groups are unimportant. The quantitative unimportance of collateral and contractual interlinkage is evaluated in section III of this article as part of a broader description of the information environment surrounding credit transactions in the survey villages.

Second, I establish (in section IV) that credit contracts play a direct role in pooling risk among households in the survey area: the repayment owed by a borrower depends upon the realization of production and consumption shocks by both borrower and lender.

In preparation for the discussions of information asymmetries and risk management in sections III and IV, section I describes the survey area and survey techniques. Section II outlines the procedure through which credit contracts are made and enforced in the study area and presents summary statistics on credit transactions among the sample households.

---

2. See Chan and Thakor (1987). For a different approach, see Gangopadhyay and Sengupta (1987).

3. "Interlinked transactions qualitatively differ from the anonymous and systemic interdependence of economic action in competitive general equilibrium theory, and are more in the form of package deals, with the terms of one transaction contingent upon the terms in another" (Bardhan 1989, p. 237). See Bell and Srinivasan (1989) for a recent empirical study.

4. Bardhan (1989, p. 86) describes one mechanism by which this might occur: "An interlinked system of personalized transactions may serve the function of reducing some of the market costs of work monitoring, contract enforcement, and of search by making the possible discovery of dishonesty or shirking by an agent in one transaction too costly for him in terms of spillover effects threatening other transactions."

I. THE GEOGRAPHICAL SETTING

From February 1988 to February 1989, I undertook a survey designed to extend contemporary research on economic behavior in the absence of perfect information and complete markets to the analysis of rural credit in Africa. A two-stage random sampling procedure yielded fifty households in each of four randomly selected villages near the city of Zaria in a semi-arid area of Kaduna State in northern Nigeria.[5] The size of the sample was kept small in an effort to ensure high-quality data on matters that are notoriously sensitive. The survey consisted of a series of monthly interviews with each of the household heads and (separately) his wives. The questionnaires were designed to yield a complete picture of each household's asset and debt position; an account of its credit, labor, product, asset, and asset-rental transactions over the previous month; and a range of demographic and background data. Consumption and income data were not collected. The demarcation of an appropriate unit of analysis is often difficult; this is particularly true in northern Nigeria.[6] I adopted the traditional approach of empirical researchers in northern Nigeria and defined the household as "those people eating from one pot" (Norman and others 1976, p. 7). To be a member of the household, an individual had to eat the household food for the six-month period between two demographic questionnaires included in the survey.

The Zaria area is in the heart of one of the most dynamic and promising agricultural regions of Africa. It receives an average of 1,100 millimeters of rain per year during a wet season that lasts approximately 160 days. Rain-fed agriculture predominates, though there is also dry-season irrigated farming on lowlands bordering streams (*fadama*). Over the past decade there have been significant changes in cropping patterns (in particular, a marked shift to the use of hybrid varieties of maize) and inputs (an expansion of the use of chemical fertilizers) (Balcet and Candler 1982). The use of bullock and tractor plowing has become more prevalent, though they are still used by a minority of farmers.[7]

There is a moderate degree of involvement in the market both for the purchase of agricultural inputs and the sale of output. A total of 73 percent of the sample households produce vegetables and nonfood cash crops for the market, and 53 percent of all labor used on the sample household farms was wage

5. Two households had to be dropped during the course of the survey, leaving a final sample size of 198 households.

6. There is a large literature on Hausa family structure in which the fluidity and indefiniteness of household boundaries are documented. See especially Watts (1983), Guyer (1981), Raynaut (1977), Nicolas (1974), Goddard (1973), and Buntjer (1969).

7. Neither animal traction nor tractor plowing was in use during Norman's 1966–67 survey of three villages in the same area (Norman 1972). Currently, 15 percent of cultivated area (7 percent of plots) is plowed at least once by a tractor, and another 14 percent (9 percent) by bullock plow. Longhurst (1985) found heavier use of animal traction (45 percent of cultivated area) in a 1976 survey of one village near this area.

labor. A total of 95 percent of cultivated land was treated with modern chemical fertilizers.

The area has a diverse population, with agricultural systems ranging from farmers who keep no cattle to semisettled herders. Every household in the research villages operates a farm, which is usually composed of multiple plots (an average of five plots per household) interspersed with those of other village residents. Two to five different crops are generally intercropped on each plot. A large variety of nonagricultural occupations also exists. These include trading, the provision of transport services (via vans, motorcycles, bicycles, or donkeys), and small-scale industries such as carpentry, house building, and tailoring. The settlements are nucleated rather than dispersed, and the

Table 1. *Summary Data for the Households Studied (n = 198)*

Characteristic of household	Sample mean	Standard deviation
Size	6.2	3.3
Males aged 10–60	2.5	1.6
Household head	1.0	
All children over 10	.9	1.3
Other males over 10	.6	1.0
Females aged 10–60	1.8	1.2
Wives	1.5	.8
Children over 10	.3	.7
Young children	3.1	2.3
The elderly	.3	.5
Age of head	41	12.6
Land		
Operational holdings (hectares)	3.8	4.3
Uplands	3.3	4.0
Fadama	.5	1.0
Owned (hectares)	3.6	5.1
Uplands	3.2	4.7
Fadama	.4	1.0
Value of livestock (naira)		
July	4,185	22,501
Excluding 2 Fulani households	2,700	7,884
Value of grain holdings (naira)		
August	597	114
January	5,058	978
Daily male agricultural wage (naira)	19	47[a]
Loan size (naira) (n = 821)	291	719
Household totals, over survey period (naira)		
Gross borrowing	352	1,015
Gross lending	596	2,679

Note: The exchange rate ranged from $1 = N4 in February 1988 to $1 = N7 in February 1989.
a. The high variability results from seasonal changes in the wage rate.
Source: Survey data, available at a nominal reproduction charge upon written request to the author.

four villages included in the study range in size from 138 to 916 households. See table 1 for summary data concerning land holdings and household demographics.

A large majority of the population of the area is Moslem, as are all but one of the 198 sample households. This fact has particular importance for a study of rural credit because Islamic law prohibits the use of fixed interest charges on loans. Investment income is prohibited if the investor does not share in the risks of the enterprise. Hence an equity investment is legal, whereas lending with a fixed interest rate is not. Fixed repayment periods are also prohibited: "And if the debtor is in difficulty, then [there should be] postponement to a time of ease" (*Koran* 2:280). The vigor with which these prohibitions are enforced is not clear. As documented below, almost no loans between individuals are made with positive explicit fixed interest rates. When asked to explain this pattern, all the respondents referred to Shari'a law. Yet individuals display no reluctance to accept loans from banks at low (but positive) fixed nominal interest rates.

II. Credit Transactions

The survey data support the conventional wisdom concerning the scarcity of formal sector credit in rural Africa. Only 7.5 percent of all loans (by value) come from banks, companies, or projects. The most numerous of these were in-kind loans from the Nigerian Tobacco Company, which was promoting the cultivation of tobacco in one of the four villages. There is widespread participation, however, in both borrowing and lending in the informal credit market, as can be seen in table 2. On average, loans are held for just under three months (see figure 1). The peak borrowing period occurs near the start of the main growing season, and many loans are repaid after the first crops are harvested. The average amount of credit transacted per household over the survey year 1989–90 was approximately N1,000. This figure is of the same order of magnitude as the mean value of grain holdings when they reach their minimum just before harvest, N652. The loans, therefore, are of a scale and timing associated with short-term consumption and working capital needs. Both borrowing and lending tend to increase with wealth, as can be seen in figure 2.

Table 2. *Participation of Households in Borrowing and Lending*
(percent)

Household	Did not borrow	Did borrow
Did not lend	10	15
Did lend	25	50

Note: Proportion of households in each cell; $n = 198$.
Source: Survey data, available at a nominal reproduction charge upon written request to the author.
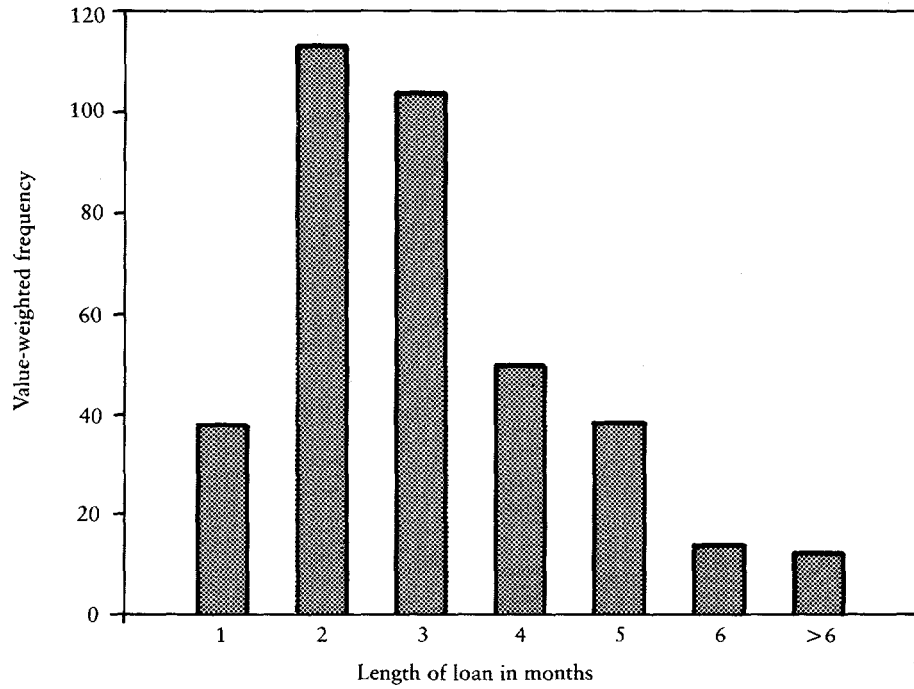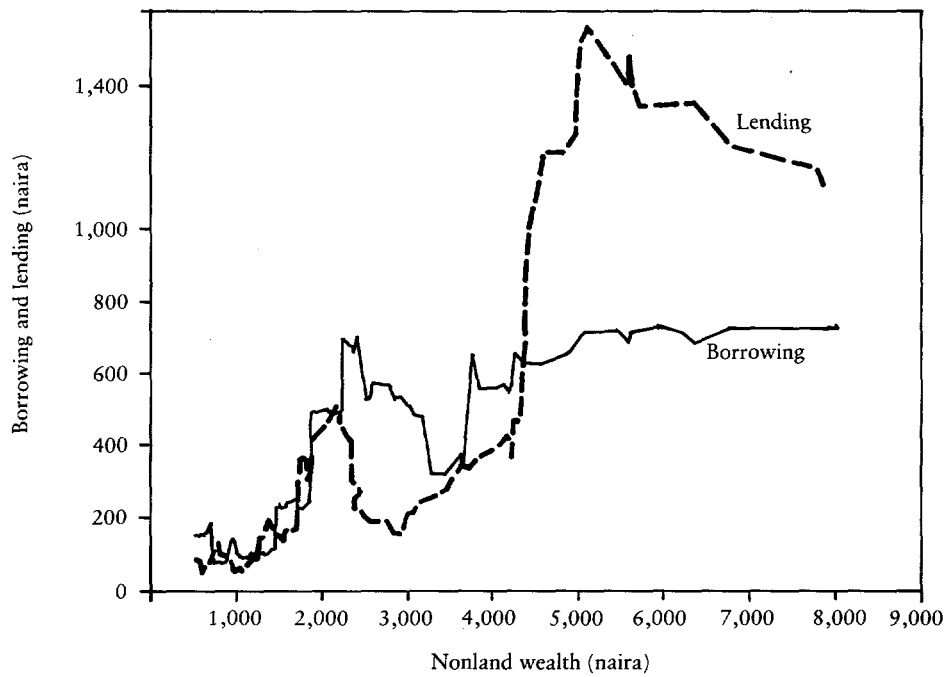
Figure 1. *Length of Loans*

Length of loan in months

Figure 2. *Credit and Wealth*

Nonland wealth (naira)

The median (nominal) realized monthly rate of return on loans is zero, and the mean nominal monthly return (weighted by value) is -3.8 percent.[8] After excluding those loans for which there is evidence that a default has occurred, the mean (nominal) rate of return rises to only -3.0 percent. Average monthly inflation in Nigeria over the relevant period was 3.7 percent,[9] so the average real monthly return on these loans was -7.5 percent.

These figures, however, obscure large variations in realized interest rates. Figure 3 reports the distribution weighted by loan value. It shows that on about one-fifth of the amount lent, realized nominal monthly interest rates exceeded 7.5 percent (or 3.8 percent in real terms). There is no statistically significant difference between the returns realized on loans between relatives and on other loans. There is also no clear relationship between the length of time over which the loan was held and the monthly interest rate (see figure 4).

These loan transactions appear to be extreme in their informality. They generally occur in private, with no witnesses and no written record. They are almost always made and repaid in cash. Although the borrower and lender negotiate over the size of the loan, most (84 percent of transactions) are made without setting an explicit (nominal) interest rate or repayment date. When an explicit interest rate is set, it is almost always set at zero (15 percent of all loans). The realized rate of return on these putatively zero (nominal) interest loans, however, is no more likely to be zero than on other loans and is often quite high.[10] The borrower and lender, therefore, only implicitly agree on the terms of the loan.

The fact that these transactions are loans is explicitly acknowledged, and mechanisms exist which serve to enforce the implicit obligations of both parties. The simplest and most direct penalty for a default is the exclusion of the defaulter from future opportunities to borrow from the lender. This type of mechanism has been analyzed extensively in the literature on repeated games, and it is implemented in the case of defaults on these loan transactions (see Kreps 1990, chap. 14, for an introduction). There is more than one lender available to most borrowers, however, so this particular penalty may have little force. Alternative mechanisms for enforcing credit obligations are available through appeal to community authorities. The respondents reported that the response to a perceived default was negotiation with the borrower's family, a religious leader, or the village head. Recall that the terms of the loan are only

---

8. The monthly return is calculated only for those loans on which some repayment has been made and for which there is no explicit promise to repay more. Returns are calculated for 71 percent of the 821 recorded loans.

9. Data from the first quarter of 1988 to the first quarter of 1989, from IMF (1989).

10. Respondents who reported an interest rate explicitly set at zero seem to have been victims of an insufficiently flexible questionnaire. Several such respondents explained to me that, as they had told the enumerator, the amount to be repaid would be exactly the amount borrowed. After further questioning, however, they acknowledged that under different future circumstances, repayments would either exceed or fall short of the initial loan value.
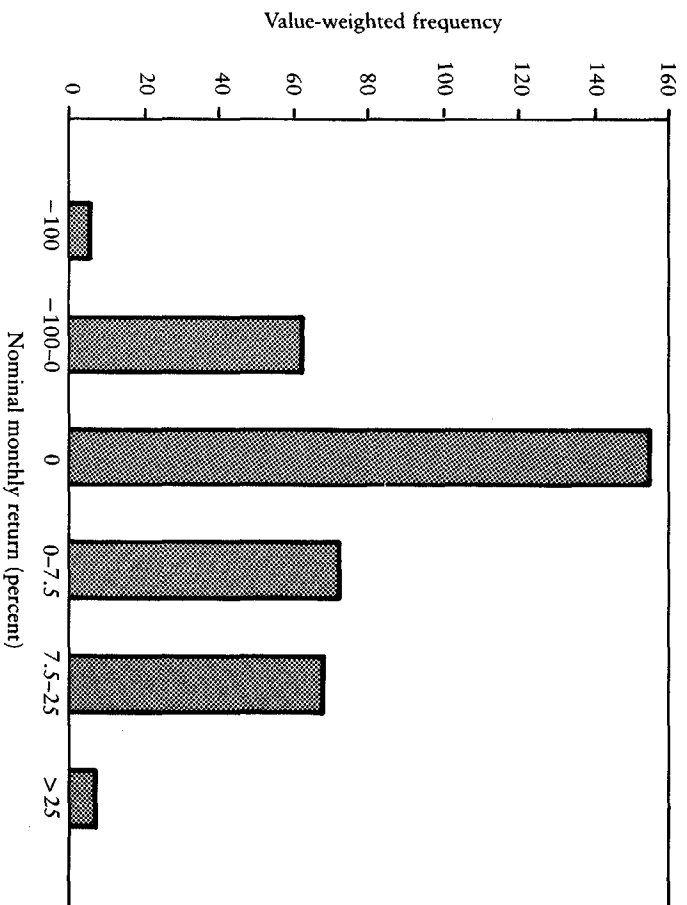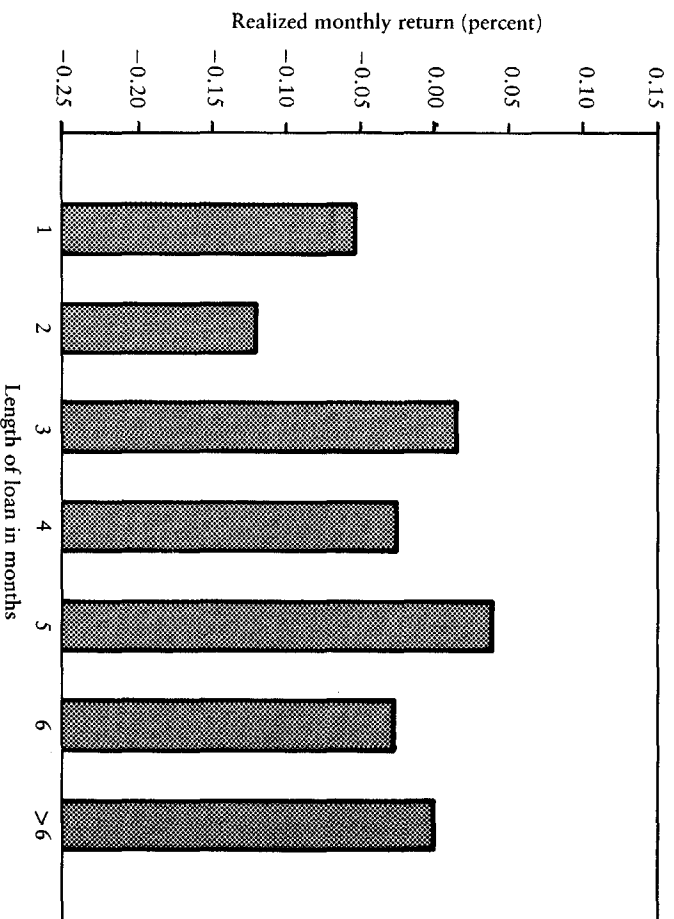
Figure 3. *Distribution of Returns*

Value-weighted frequency

Nominal monthly return (percent)

Figure 4. *Term Structure of Returns*

Realized monthly return (percent)

Length of loan in months

implicit, so the response to a default must consist of at least two stages: first, the lender must convince the authority that the borrower has not met his obligations; and second, the authority must impose a penalty. Both steps depend heavily on the fact that for the vast majority of these loans, borrower and lender are members of the same small community. The authority's decision as to whether a breach of an implicit contract has occurred must rest on the statements of the two parties involved. He must take into account the possibility of deliberate deception as well as of misunderstandings over the terms of the contract.[11] As a member of the same community, the authority is able to consider the reputations of both parties for honesty in previous activities in all markets and, more generally, in all types of social activity.

The penalties invoked by the authority also depend on his position as a respected figure in the community. In many cases, the possibility that he might disapprove of one's activities is sufficient to prompt a potential defaulter to meet his obligations. The possibility that he might make his finding public, either to other authority figures or to the community at large (through gossip), is a stronger incentive to meet obligations. Both of these penalties apparently impose a cost on the defaulting party. If his honesty is impugned, the defaulter may be excluded from future credit transactions, and his ability to transact in other markets may be damaged as well. Private negotiation with (and admonishment from) an authority figure was the only penalty imposed on any of the sample households during the survey period; no dispute over loan repayments was made public.

III. The Information Environment

Since formal sector lenders are almost completely absent from the study area, the information flows of concern are between individuals who lend to each other. These parties are, with very few exceptions, well known to each other: 97 percent of informal sector loans by value are between residents of the same village or between relatives (see table 3).[12] A total of 65 percent of the remaining informal sector loans occur between individuals who share a long history of exchanging gifts or a long history of previous credit transactions.[13] The respondents claimed that they knew their transaction partners well. Respondents were asked to give an account of unexpected occurrences on their transaction partners' farms and of nonregular expenditures (such as ceremonies or medical expenses) by their partners. For 82 percent of the 808 private loan transactions, the respondents were able to provide such an accounting.

11. Male pronouns are appropriate in this context because most borrowers and lenders and virtually all authorities to whom disputes are referred are men.

12. Only loans across households are counted as transactions; loans between members of the same household are excluded from the data.

13. A history of previous gift exchanges or credit transactions was defined as "long" when respondents reported more than three transactions extending over more than three years.

Table 3. *Relationship between Borrowers and Lenders*
(percent)

Residency	Related by kinship	Not related by kinship
Residents of the same village	37	55
Residents of different villages	5	3

Note: Proportion of loans, by value, in each cell; n = 808. Loans from banks and companies are excluded.

Source: Survey data, available at a nominal reproduction charge upon written request to the author.

This direct evidence that information flows freely between borrowers and lenders is complemented by the lack of indirect evidence of information asymmetries. The special contractual forms that are used in other situations to ameliorate the problems of moral hazard and adverse selection are not common in northern Nigeria.

The first question I investigated was the possibility that collateral was used to secure these loans.[14] Almost all households own some land, and although land sales are prohibited by statutory law, each of the sample villages has active land sales markets. A total of 34 percent of all land owned by sample households was acquired through market transactions. These transactions are not limited to within the village; one-fifth of the land purchased by sample households was acquired from individuals who were neither residents of the same village nor relatives. Land, therefore, is available to serve as a collateral asset.[15] However, collateral (usually land) is used in only 3 percent of the loans observed. The distinguishing feature of the few loans for which collateral is used is their size; the average size of a loan involving collateral is N634, as opposed to an average size of N276 for unsecured loans. Loans involving collateral are just as likely to be between members of the same family as are other loans, and respondents are even more likely to be able to provide an accounting of events on their transaction partners' farms when the loans involve collateral (96 percent of the cases) than when they are unsecured.

Contractual interlinkages, discussed above, have also been hypothesized to be common adaptations to the moral hazard implicit in many loan transactions, and empirical studies by Siamwalla and others and Bell in this issue document their high incidence in Asia.[16] In these data, however, there is no evidence of interlinkage of the credit market with the land, labor, or product markets. A necessary condition for the presence of interlinkages between the credit market

---

14. Hill (1982) documents some use of collateral in other parts of northern Nigeria.

15. See Feder and Feeny (forthcoming) for a discussion of the suitability of land as collateral. See Hill (1982) and Shenton (1985) for details on the history and legal basis of land sales in northern Nigeria.

16. See Clough (1981, 1986) for evidence that market interlinkages are used for credit in some markets of northern Nigeria.

and other markets is the coincidence of transaction partners across pairs of markets.[17] Product market transactions generally occur in markets in nearby, larger villages. Out of 1,150 product market transactions recorded, 96 percent were made with traders in the market with whom the household member had no other connection. Only 0.5 percent of the product market transactions occurred between parties who had engaged in a credit transaction previously.

Land and labor transactions occur mainly within the village, so some overlap with credit transactions is to be expected. The overlap that I found is no more than what would be expected given random assignments of transaction partners within the village. Each household had, on average, 3.65 credit transactions within the village during the sample year, whereas the average size of the four villages is 366 households. Clearly, the proportion of the village with which an average household has ever engaged in a credit transaction is higher than 1 percent; unfortunately, no data are available concerning past loans that had been repaid before the start of the survey. Of 1,920 recorded labor transactions, only 1 percent occurred between individuals who had ever lent to or borrowed from each other. Of 323 land rentals, only 3 percent previously had shared a credit transaction.

The information asymmetries that may drive market interlinkage and collateral use in other contexts do not seem to be present in this set of loans. This does not imply that the pattern of information availability is unimportant for the structure of the credit market. Information flows freely between borrowers and lenders within an extremely small geographic or social space. The fact that almost no loans are observed to cross the boundaries of this space is an indication of the advantages held by family members and village co-residents in the availability of either information or enforcement mechanisms.

IV. Risk Pooling

Wherever insurance markets are incomplete, credit markets are known to play an important role by allowing risks to be pooled over time; households borrow more when they suffer an adverse shock, and they lend more when favored with a positive shock. The free flow of information within the village and among relatives may permit credit contracts to play a more direct role in insuring against risk. A striking finding is that repayments *owed* on a loan appear to depend upon the random production and consumption shocks received by both the borrower and the lender.[18] Such state-contingent contracting would allow households to pool risk more efficiently and would permit credit

17. An anonymous referee points out that the coincidence of transactions is not sufficient to establish the existence of interlinkages because transactions costs might make simultaneous contracting in more than one market optimal, even if the terms of the different contracts are set independently.

18. Actual repayments of loans will generally depend on the random shocks received by the borrower, as long as defaults are possible. Here, *owed* repayments are at issue.

transactions to conform to the Islamic prohibition of fixed interest charges. The easy availability of information implies that a lender need not engage in statistical inference in order to detect a default on a state-contingent contract, because the degree of compliance with the contract is known to both parties.

I hypothesize that these credit contracts are contingent upon random production and consumption shocks that are observable to the borrower, the lender, and to the community authorities who will enforce the obligations of both contracting parties. Examples of such events are flooding, wind damage to crops, or insect infestations on the production side, and medical problems on the consumption side. If these events are common knowledge to the community, then the enforcement of contracts which are contingent upon their realization poses no special difficulty. If the occurrence of these events is exogenous to the agents' actions, or if the actions which affect their probability of occurrence are observable, then no moral hazard issue arises.

The institutional framework within which these contracts are made and enforced is well suited to state-contingent contracting. As noted in section II, contractual terms are set implicitly and are enforced by community leaders. At least two distinct types of state-contingent contracting could be supported in this environment. The first would permit renegotiation of loans after the realization of any random shocks. With rational agents this is equivalent to explicit ex ante state-contingent contracting, and can be enforced provided that the realization of the shocks is common knowledge. Second, there may be implicit but commonly known community standards which require adjustments to loan repayments depending upon the realization of the random shocks. This type of contract would limit the flexibility of the borrower and lender in making the loan contract, but would economize on transaction costs and integrate well with the community-based enforcement mechanisms. In this section I will focus on establishing a case for the presence of state-contingent contracting; I will not attempt to distinguish between these alternative mechanisms through which it may be achieved.

Striking preliminary evidence in support of the hypothesis of state-contingent terms is revealed by data on the willingness of the lender to enter into another credit contract with the borrower. If the enforcement mechanism for these contracts includes the exclusion of defaulters from future borrowing, then data on the future availability of loans should provide information on the incidence of default. If contracts are *not* state-contingent, then a judgment that a borrower has defaulted depends upon the realized interest rate (and, of course, on the unobserved promised terms), but *not* on the state of nature conditioned on the realized interest rate. However, as shown in table 4, for a given realized interest rate, a borrower is less likely to be considered in default if he was subject to an adverse production or consumption shock.

The simplest form of this loan contract, in which repayments depend upon the outcome of a particular project, is analogous to sharecropping in the land market. More generally, both parties may understand that if the debtor house-

Table 4. *Defaults by and Shocks to Borrowers*

Loan	Realized monthly nominal return, r			
	$r<0$	$r=0$	$0<r<0.05$	$r>0.05$
Total loans (number)[a]	108	194	147	140
Of this total, those in default (number)	16	20	6	2
(percent)	(15)	(11)	(4)	(1)
Loans (number) for which borrower subject to an adverse shock[b]	38	118	19	41
Of this total, those in default (number)	1	2	0	0
(percent)	(2)	(2)	(0)	(0)
Loans (number) for which borrower not subject to an adverse shock	70	76	127	99
Of this total, those in default (number)	15	18	6	2
(percent)	(22)	(24)	(5)	(2)

Note: The difference between the within-interval proportions is significant at the 0.01 level, using the following test: Let p_{ins}, $i = 1, \ldots , 4$ be the proportion of borrowers who received no shock who are judged to be in default as indicated by the statement that no further loans will be available. Let p_{is} be the similarly defined proportion of borrowers who received a shock who are judged to be in default. A chi-square test of the hypothesis that $p_{ins} = p_{is}$, for $i = 1, \ldots , 4$ against the open alternative yields a test statistic of 30.57. The hypothesis is rejected at the 0.01 level.

a. All loans are weighted by value.

b. A borrower is judged to have received an adverse shock if he reported an unexpected adverse event on any of the fields he farms during the term of the loan. Common events were flooding, wind damage, or infestation by insects. A borrower who is *not* a respondent (that is, the respondent was the lender) is judged to have received an adverse shock if the respondent reported that an unexpected, serious event occurred in the borrower household during the term of the loan. Common events include those just mentioned, as well as medical problems, rain damage to houses, and other "household emergencies."

Source: Survey data, available at a nominal reproduction charge upon written request to the author.

hold's economic fortunes are good, the loan will be repaid with a relatively high interest rate; but if the household suffers an unexpected negative shock, the interest rate will be lower. The survey data show that realized interest rates are lower and repayment periods are longer for debtor households who have experienced adverse shocks (table 5). This observation is consistent with conventional credit contracts because those who experience adverse shocks are more likely to default. The evidence that repayments respond not only to the entire circumstances of the debtor household, but also to those of the creditor household (table 5), however, is not consistent with conventional models. These transactions, therefore, are not analogous to equity investments by the lender in the borrower's activities. They are true risk pooling arrangements between the two households.

It is interesting to note that tables 4 and 5 can be replicated for loans between relatives (see tables 6 and 7). The statistical significance of the results declines as a result of the reduction in sample size, but the pattern remains the same. Loans involving relatives, overall, are just as likely to be considered in default as are other loans, and the terms of loans between relatives seem to be just as responsive to realizations of random shocks.

Table 5. *Realized Terms versus Borrower and Lender Shocks Received*

	Sample means		
Adverse shock to:[a]	*Monthly interest rate (percent)*	*Simple interest rate (percent)*	*Repayment period (days)*
Borrower			
No shock	0.5	20.4	67
Shock	−4.0	−0.6	72
Impact of shock on mean	Lower	Lower	Longer
t-statistic[b]	(1.58)	(2.20)	(1.03)
Lender			
No shock	−7.5	−5.0	89
Shock	2.6	11.8	80
Impact of shock on mean	Higher	Higher	Shorter
t-statistic[b]	(4.56)	(3.06)	(1.89)

a. The definition of adverse shock is that of table 4, broadened to include lenders.

b. The impact of the shocks is judged by a two-sided *t*-test of equal means $(\mu_{noshock} - \mu_{shock})$. The absolute value of the *t*-statistic is in parentheses.

Source: Survey data, available at a nominal reproduction charge upon written request to the author.

The flexibility of these contractual forms allows for more efficient risk sharing between the debtor and the creditor than is possible with conventional fixed-interest contracts. Access to conventional loans permits a household to consume its permanent income; the consumption effects of an unexpected shock to income (and therefore to wealth) can be spread over a period of time. In contrast, state-contingent contracting offers a mechanism through which

Table 6. *Defaults by and Shocks to Borrowers, for Loans between Relatives Only*

	Realized monthly nominal return			
Loan	*r<0*	*r=0*	*0<r<0.05*	*r>0.05*
Total loans (number)[a]	19	85	66	34
Of this total, those in default (number)	2	8	0	0
(percent)	(12)	(9)	(0)	(1)
Loans (number) for which borrower subject to an adverse shock	6	42	7	23
Of this total, those in default (number)	0	0	0	0
(percent)	(2)	(1)	(0)	(0)
Loans (number) for which borrower not subject to an adverse shock	14	43	59	12
Of this total, those in default (number)	2	8	0	0
(percent)	(16)	(18)	(0)	(1)

Note: The difference between the within-interval proportions is significant at the 0.01 level, using the following test: Let p_{ins}, $i = 1, \ldots, 4$ be the proportion of borrowers who received no shock who are judged to be in default as indicated by the statement that no further loans will be available. Let p_{is} be the similarly defined proportion of borrowers who received a shock who are judged to be in default. A chi-square test of the hypothesis that $p_{ins} = p_{is}$, for $i = 1, \ldots, 4$ against the open alternative yields a test statistic of 7.39. The hypothesis can not be rejected at the 0.10 level.

a. All loans are weighted by value.

Source: Survey data, available at a nominal reproduction charge upon written request to the author.

Table 7. *Realized Terms versus Borrower and Lender Shocks Received, for Loans between Relatives Only*

Adverse shock to:[a]	Sample means		
	Monthly interest rate (percent)	Simple interest rate (percent)	Repayment period (days)
Borrower			
No shock	−0.7	8.4	69
Shock	−5.6	−1.7	72
Impact of shock on mean	Lower	Lower	Longer
t-statistic[b]	(0.89)	(0.69)	(0.32)
Lender			
No shock	−0.7	4.4	84
Shock	0.1	1.6	80
Impact of shock on mean	Higher	Lower	Shorter
t-statistic[b]	(0.37)	(0.54)	(0.46)

a. The impact of the shocks is judged by a two-sided *t*-test of equal means $(\mu_{noshock} - \mu_{shock})$. The absolute value of the *t*-statistic is in parentheses.

Source: Survey data, available at a nominal reproduction charge upon written request to the author.

both borrowers and lenders can neutralize the unexpected shock itself so that it has no effect on wealth. Only certain shocks, however, can be insured against through this market. In general, the loans described in this article are concentrated within single villages, and thus can serve to pool only the idiosyncratic shocks faced by households within the village. To the extent that these loan transactions do not cross village borders, they can contribute almost nothing to a household's efforts to respond to a shock that affects the village as a whole.[19]

To what extent do the shocks affecting these households originate in idiosyncratic as opposed to villagewide events? An analysis of the variation in farm yields across sample households indicates that of that proportion that can be explained by some combination of random shocks and village-level effects, 42 percent result from idiosyncratic shocks, and 58 percent result from a combination of shocks that affects the entire village and other village-level effects.[20] In principle, therefore, a significant component of the total risk faced by these households can be insured against through state-contingent loan contracting with other households within the same village. Furthermore, this contractual form provides a mechanism for circumventing legal restrictions on credit transactions.[21] The existence of these contracts in an information environment in which they are feasible is, therefore, not surprising.

19. Some evidence is presented below that in one of the four sample villages a significant amount of credit is transacted with individuals not resident in the village.

20. The results are derived from a cross-section regression of yields on village dummy variables and the self-reported shock variables used in tables 4 and 5.

21. Shari'a law, strictly interpreted, requires that risk be shared in proportion to the capital contributed to an enterprise (see Schacht 1936). Thus not any state-contingent contract is legal. This amounts to a prohibition on the payment of risk premia (which are implicit in any conventional credit contract, and in many forms of state-contingent contracting).

More puzzling is the almost complete absence of credit transactions which cross community boundaries. This is an environment characterized by seasonal demands for finance that are highly positively correlated over small areas, and the analysis above indicates that there is a large component of yield risk that cannot be insured against within the village. It would seem that there could be high returns available to financial intermediaries able to move finance over wide areas.[22] The absence of direct lending from outside the community can be explained by the high information costs of such transactions and by the existence of village-based traders who provide financial intermediation.

The strict information requirements of state-contingent contracts place the outside lender at a severe disadvantage. Because he cannot observe the production shocks, the outside lender is faced with a classic monitoring problem, and the borrower has an incentive to claim a more adverse shock than he actually received. Leaving aside the monitoring problem, unless an outside lender can exclude a borrower from future access to other lenders, he cannot impose a strong penalty on a borrower whom he considers to be in default. These informational disadvantages raise the cost of credit provided by outside lenders.

These costs could be reduced by a contravention of the requirements imposed by Islam or by the development of alternative institutions (such as interlinkages with other markets) within which fixed interest charges can be hidden. A fixed-term contract would reduce the monitoring difficulties faced by outside lenders, and the availability of assets that could serve as collateral could alleviate the problem of contract enforcement. Land is available to serve as collateral for borrowing from outside lenders because, as noted in section IV, both the rental and sales markets in land are active.

An important element in the explanation for the puzzling absence of outside lenders might be found in the role that village merchants play in channeling outside credit to the village. In northern Nigeria, the Hausa tradition of long-distance trading has led to a class of merchants, dispersed through many villages, who have long-term relations with other merchants throughout Nigeria and beyond. These merchants provide market intelligence, advance short-term trading credit, and act as agents for each other. This intensive contact enables them to enter into information-intensive state-contingent credit contracts of the sort described above. Therefore, these village-based traders with wide connections can act as pipelines for outside credit to enter the village, increasing the volume of locally available credit and keeping the cost of credit below the threshold which would induce the entrance of outside lenders.

The fact that village-based traders do at times use their access to credit from other traders to lend to local borrowers is fairly certain. It was confirmed to me in interviews with six such traders in three of the four sample villages, and it corresponds to Clough's (1981, 1986) description of merchant activities in

---

22. See Binswanger and McIntire (1987, pp. 78–79, 88–89) for a theoretical account of the development of a geographically widespread credit market in such circumstances.

Kaduna State. There is also some indication of its importance in the sample data. Of the 198 household heads in the sample, three are traders who have active relationships with traders in other locations.[23] Each of the three made far more loans than average, accounting for 37, 25, and 17 percent of the total value of loans made by the fifty sample households in their villages.[24] One of the three also had large loans from outside traders, accounting for 11 percent of all of the borrowing by sample households in that village. Although too much should not be made of the behavior of one individual, it seems that at least in one village a significant amount of credit flows through this trader across village boundaries.

The degree to which this phenomenon is responsible for the absence of outside lenders in the local credit market is less obvious, because there are other potential explanations. It is possible that contravention or circumvention of the Shari'a prohibition of fixed interest rates is impossible. This would make the information barrier faced by outside lenders almost insurmountable. It is also possible that even peak demand for credit is small enough, relative to local supply, that "pipeline" credit from local traders is not needed to keep rents below the critical value that would induce outside lenders to enter the market. An investigation over several years would be needed to make a definitive statement regarding the importance of local traders' access to external capital as a mechanism for excluding direct lending by external agents. The critical test would be to observe credit transactions during a crisis year in order to see how borrowing by locally resident traders from outside traders and local lending by resident traders respond to peak levels of local demand for credit. No such test is possible with these data; the study year was characterized by generally better than average yields (rainfall was just over the long-run average, and well-distributed).

V. SUMMARY AND IMPLICATIONS

The rural credit market in northern Nigeria appears to be significantly different from its counterparts in other areas of the world and from the idealized markets that appear in theoretical work on the subject. There is only minimal use of collateral and no evidence of contractual interlinkage with other markets. Contractual mechanisms to alleviate the difficulties posed by information asymmetries are not necessary because credit flows through paths that take advantage of the extremely free flow of information within a rural community.

23. These traders do little buying or selling within their own villages. They purchase and sell wholesale lots of grain at larger markets, and they have business ties with traders as far away as Sokoto (400 kilometers to the northwest) and Lagos (more than 750 kilometers away).

24. Credit transactions involving these households were no more likely to overlap with transactions in other markets than were those of other sample households. Traders are not sources of interlinked credit.

In this information environment, credit transactions can be viewed as state-contingent contracts that allow direct risk pooling between creditor and debtor and that conform to the prohibition on fixed interest charges by Shari'a law. There is some evidence in one village that these information-intensive contracts are spread over a wide geographical area by a network of village-based long-distance traders.

The flexibility of the state-contingent credit contracts presents an exceptional challenge to potential formal sector lenders. They have neither the access to information nor (generally speaking) the administrative flexibility necessary to make state-contingent loans. Therefore, they cannot compete directly with lenders from within the community. The existence of assets that could serve as collateral for fixed-interest loans may provide an opportunity for institutional change that could be exploited by formal sector lenders. In addition, the conditions which permit state-contingent loan contracting within rural communities, namely the free flow of information within the village and the availability of mechanisms to enforce agreements between village residents, may also allow the design of peer monitoring systems to support lending by formal sector institutions to groups of rural households.

REFERENCES

Balcet, Jean-Claude, and Wilfred Candler. 1982. "Farm Technology Adoption in Northern Nigeria." World Bank Western Africa Projects Department. Washington, D.C. Processed.

Bardhan, P., ed. 1989. *The Economic Theory of Agrarian Institutions*. Oxford, England: Clarendon Press.

Bell, Clive. 1988. "Credit Markets, Contracts, and Interlinked Transactions." In Hollis Chenery and T. N. Srinivasan, eds., *Handbook of Development Economics*. New York: North-Holland.

Bell, Clive, and T. N. Srinivasan. 1989. "Interlinked Transactions in Rural Markets: An Empirical Study of Andhra Pradesh, Bihar, and Punjab." *Oxford Bulletin of Economics and Statistics* 51: 73–83.

Binswanger, Hans, and J. McIntire. 1987. "Behavioral and Material Determinants of Production Relations in Land-Abundant Tropical Agriculture." *Economic Development and Cultural Change* 36: 73–99.

Buntjer, B. 1969. "The Changing Structure of Gandu." Ahmadu Bello University. Zaria, Nigeria. Processed.

Chan, Y. S., and A. Thakor. 1987. "Collateral and Competitive Equilibria with Moral Hazard and Private Information." *Journal of Finance* 62: 345–63.

Clough, Paul. 1981. "Farmers and Traders in Hausaland." *Development and Change* 12: 273–92.

———. 1986. "The Social Relations of Grain Marketing in Northern Nigeria." *Review of African Political Economy* 34: 16–34.

Eswaran, M., and A. Kotwal. 1989. "Credit as Insurance in Agrarian Economies." *Journal of Development Economics* 31: 37–53.

Feder, G., and D. Feeny. Forthcoming. "Theory of Land Tenure and Property Rights." *World Bank Economic Review*.

Gangopadhyay, S., and K. Sengupta. 1987. "Usury and Collateral Pricing: Towards an Alternative Explanation." *Cambridge Journal of Economics* 11: 47–54.

Goddard, A. 1973. "Changing Family Structures among the Hausa." *Africa* 43: 207–18.

Guyer, J. 1982. "Household and Community in African Studies." *African Studies Review* 24: 87–137.

Hart, G. 1986. "Interlocking Transactions: Obstacles, Precursors, or Instruments of Agrarian Capitalism?" *Journal of Development Economics* 23: 177–203.

Hill, P. 1982. *Dry Grain Farming Families*. Cambridge, England: Cambridge University Press.

IMF (International Monetary Fund). 1989. *International Financial Statistics*. Washington, D.C.

Kreps, D. 1990. *A Course in Microeconomic Theory*. Princeton, N.J.: Princeton University Press.

Longhurst, R. 1985. "Farm Level Decision Making in a Northern Nigerian Village." Ahmadu Bello University, Samaru Miscellaneous Paper 106. Zaria, Nigeria. Processed.

Nicolas, G. 1974. "La Pratique traditionnelle du crédit au sein d'une societé subsaharienne (vallée de Maradi, Niger)." *Cultures et Développement* 6, no. 4.

Norman, D. 1972. "An Economic Survey of Three Villages in Zaria Province: 2. Input-Output Study, Vols. i. text and ii. Basic Data and Survey Forms." Ahmadu Bello University, Samaru Miscellaneous Paper 37. Zaria, Nigeria. Processed.

Norman, D., J. Fine, A. Goddard, W. Kroeker, and D. Pryor. 1976. "A Socio-Economic Survey of Three Villages in the Sokoto Close-Settled Zone." Ahmadu Bello University, Samaru Miscellaneous Paper 64. Zaria, Nigeria. Processed.

Raynaut, C. 1977. "Aspects Socio-économiques de la préparation et de la Circulation de la Nourriture dans un Village Hausa (Niger)." *Cahiers d'Etudes Africaines* 68: 569–97.

Schacht, Joseph. 1936. "Riba." *Encyclopedia of Islam*. London: Luzac and Lo.

Shenton, R. 1985. *The Development of Capitalism in Northern Nigeria*. Toronto: University of Toronto Press.

Watts, M. 1983. *Silent Violence: Food, Famine and Peasantry in Northern Nigeria*. Berkeley: University of California Press.