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Screening And Loan Determination By Trader-Lenders In The Rural LDC

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E. F. Esguerra and R. V. Fabella

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*E. F. Esguerra and R. V. Fabella**
University of the Philippines
Diliman, Quezon City
Philippines

Abstract

We model the lending behavior of rural traders in a linked credit-output transaction. The likelihood of credit involvement with a trader rises with farm area, with the combination of enforceability of repayment and demand elasticity and with the likelihood of procurement of marketable surplus by the trader. Loans granted to farmers rise with farm area and the presence of output tying. Data from the Philippines support these claims.

Introduction

The linked contract literature has focused largely on the complex relationship between landlord and tenant encompassing the credit, factor, consumption goods and output markets (e.g., Bardhan, 1980; Braverman and Stiglitz, 1982; Kotwal, 1985; Binswanger and Rosenzweig, 1981; and Otsuka and Hayami, 1988, for an excellent survey) to the relative neglect of other rural players. Bell (1988) has argued for the need to enquire into the relationship between farmers and their other credit sources, most notably, traders which he considers "probably more prevalent and important in practice." Even more interesting, Bell observes, is this relationship's tendency to grow with commercialization while others fade away. The importance of trader-lender credit as a rural economy becomes more commercialized has been documented in several researches [See for example TBAC (1981), Floro (1987) and Geron (1989)]. More recently Esguerra and Meyer (1989), focusing on informal credit arrangements in a rice-growing province in Central Luzon, Philippines, traced the widespread use of product-credit interlinkages to the adoption of the high-yielding rice technology in rice-growing areas. Fabella (1989) has shown, among others, that the loan repayment in-kind arrangement between traders and farmers is Pareto superior to straight cash-for-cash arrangement when output price is uncertain and farmers are risk-averse.

This paper models the trader's lending behavior in a linked contract framework and presents evidence on the role of marketable surplus, repayment enforceability and the linked nature of the contract. This may then help explain why the trader's role expands in the process of commercialization.

In II, we present the model and derive the hypotheses and in III we test these and other related hypotheses.

2. *The Model*

We start with rural traders who also serve as sources of rural credit. While the credit extended insures that a marketable surplus is produced, it also gives the trader a first crack at turning this surplus into trading profit. Following Fabella (op.cit.), at planting time, the farmer procures credit B (in cash or kind) from a trader-lender payable in units of produce at harvest time, the number of units, q, being agreed upon at the time the loan was secured. Let $q = [(1+r')/P']B$ where r' is the interest rate charged on B and P' is the purchase price per unit of produce. After repayment, the farmer is left with $(F-q)$, where F is the farmer's total output, which he sells at prevailing post-harvest farmgate price to the same trader as part of the contract. The total output is $F(B;A)$ where A is the land area cultivated by the farmer assumed fixed. Clearly, $[(1+r')/P'] = R$ is the effective price of the credit. Assuming $F(B;A)$ to be nondecreasing concave in B, the risk-neutral farmer maximizes expected profit $\bar{\pi}_f$ defined as

$$\bar{\pi}_f = P\{F(B;A) - RB\} \qquad (1)$$

where P is the expected post-harvest farmgate price. Maximizing (1) with respect to B gives the loan demand function $B^*(R)$. The case of the risk-averse farmer only strengthens the likelihood of this linkage (Fabella, op.cit.). The payment-in-kind acts as price insurance for the farmer and the linkage acts like a futures market arrangement.

At harvest time, the trader-lender has access to two types of the same produce: q, the repayment in units of produce and [F(B*; A) - q], the residual output which the trader-lender by contract purchases at current farmgate price. Let β be the probability that the farmer fulfills his end of the bargain. This is never a certainty despite a screening process later discussed. Nonpayment is always a possibility and, for the trader-lender, this is a crucial consideration. Let Q be the expected market price at harvest time and c be the per unit distribution cost. For providing the farmer B*, the trader now has to pay his financier (which could be himself) B*(1+r) where r is the rural market interest rate on loans to which traders have access.

The expected profit of the risk-neutral trader-lender is then

$$\bar{\pi} = (Q-c)\beta q - B^*(1+r) + (Q-P-c)\beta(F(B^*,A) - q) \qquad (2)$$

which simplifies into

$$\bar{\pi} = \beta[mF + PRB^*] - B^*(1+r) \qquad (3)$$

where m = (Q-P-c) which is assumed nonnegative. Note that B* is the farmer loan demand function and is a decreasing function of R. In this model, r' and P' are perfect substitutes as instruments of profit maximization (Fabella, op. cit.) and we only focus on r' given P'. The 1° condition for expected profit maximum is

$$\{\beta[mF' + PR] - (1+r)\}\, B^{*\prime}/P' + \beta PB^*/P' = 0 \qquad (4)$$

where $F' = \partial F(B^*;A)/\partial B^*$ and $B^{*\prime} = \partial B^*/\partial R$.

A. Loan Levels Phase

From (4), we can solve for (dr'/dA) and (dr'/dβ). Totally differentiating (4) gives :

$$Mdr' = NdA + Od\beta \tag{5}$$

where

$$M = [HB^{*''}/(P')^2] + [\beta mF'' B^{*'} + 2\beta P] [B^{*'}/(P')^2],$$

$$N = (-B^{*'}/P')\beta m(dF'/dA),$$

$$O = -\{\epsilon_{B*R} [mF' + PR] + PR\}B^{*}/P'R$$

where $\epsilon_{BR} = B^{*'}R/B^{*}$ and

$$H = \{\beta[mF' + PR] - (1+r)\} > 0 \text{ from (4).}$$

If $F'' < 0$, then $B^{*''} < 0$ and $M < 0$. If the marginal product of borrowed funds rises with farm area $[(dF'/dA) > 0]$, then $N > 0$. If $|\epsilon_{BR}| > 1$, then $O > 0$. Thus, from (5), ceteris paribus,

$$(dr'/dA) = (N/M) < 0, \tag{6}$$

or that the larger is the farm area, the lower the interest charged by the trader-lender. This may come because large farmers may have more credit sources. The larger farm area also allows larger marketable surplus given $(dF'/dA) > 0$, which is the trader's source of profit. Since $B^{*'} < 0$, it is obvious from (5) that $dB^{*}/dA > 0$. The loan level B^{*} is the focus of our empirical work rather than r'. Likewise, ceteris paribus,

$$(dr'/d\beta) = (O/M) < 0. \tag{7}$$

The larger the likelihood that the borrower will abide by the terms of the contract the smaller is the interest rate charged. Thus, the borrower who agrees to a linked contract signals a greater willingness to comply and should get an interest discount. On the other hand, considerations that weaken the enforcement hand of the trader-lender will raise the interest rate. This, for example, should be the case if a relative is involved as borrower. The fact that the borrower is a farmer as opposed to a landless wage worker should earn him better treatment. From (7), it follows that $(dB^*/d\beta) > 0$ or that loan levels rise with a rise in β. The idea here is that the trader-lender is an increasingly more commercialized agent than farmer-lenders and considers consanguinity an obstacle to straight business relationship.

B. Screening Phase

The trader confronts a set of borrowers not all of whom may be bright prospects. In this model, the trader himself but not the borrowers has access to a fairly elastic credit market at interest rate r so that he/she faces no budget constraint with respect to potential clients. Let $\bar{\pi}^*(i)$ be the maximum of (3) for borrower $i = 1, 2, \ldots, k$. To realize $\bar{\pi}^*(i)$, the lender provides $B^*(i)$ which, if he just deposits in the banks, generates $B^*(i)r$. The trader will then finance borrower i as long as $\bar{\pi}^*(i) \geq B^*(i)r$ or if

$$S = \bar{\pi}^*(i)/B^*(i) \geq r \qquad (8)$$

This inequality generates the probability that borrower i will be financed. Anything that raises S, such as the postharvest price Q, will raise the probability of the trader financing borrower i. We are not concerned presently with considerations that affect every farmer in the vicinity but with

features that can vary across farmers. These considerations are associated either with the farmer's capacity to produce a marketable surplus or the farmer's inclination to honor commitments in conjunction with the lender's own capacity to enforce those commitments.

First, with respect to the capacity to deliver a surplus associated with farm area A, we find dS/dA which, after rearranging, is

$$\frac{1}{B^{*2}} \{[\beta m B^{*F} r'/(1+r')A]\{[(1+r')\epsilon_{FA}/r'] - \epsilon_{B^*R}\epsilon_{r'\cdot A}\} + B^*[(1+r) - \beta PR]\, B^{*'}(dr'/dA)/P'\}$$

where $\epsilon_{r'\cdot A} = (dr'/dA)(B/r')$, the elasticity of r' with respect to A and $\epsilon_{FA} = (dF/dA)(A/F)$ is the elasticity of output with respect to area A. Now $(dr'/dA) < 0$ and $B^{*'} < 0$ so the second line in (9) is positive if (a) $(1+r) > \beta PR$. The first line in (9) is positive if (b) $((1+r')/r')\epsilon_{FA} > \epsilon_{B^*R}\ \epsilon_{r'\cdot A}$. We do not really have any prior knowledge of the magnitudes of these elasticities. It may, however, be observed that the rate of interest r' does not change much across the range of farm areas in our data. With $\epsilon_{r'\cdot A}$ being very small, we would have $dS/dA > 0$, or that the larger the farm area, the more likely will the farmer obtain a loan from the trader. Thus, farm area is a screening variable. With respect to the inclination to deliver, we find dS/dβ which is

$$\frac{1}{B^{*2}} \{[(mF + PRB^*)(r'/(1+r'))B^*]\{[(1+r')/r'] - \epsilon_{B^*R}\epsilon_{r'\cdot\beta}) + B^*(1+r)(B^{*'}/P')(dr'/d\beta)\} \qquad (10)$$

where $\epsilon_{r'\cdot\beta} = (dr'/d\beta)(\beta/r')$. Again the second expression in (10) is positive with $B^{*'}$ and $(dr'/d\beta)$ both negative. The first expression is positive if $[(1+r')/r'] > [\epsilon_{B^*R}\ \epsilon_{r'\cdot\beta}]$. Again if the nominal rate doesn't change very much

across farmers, we would have $dS/d\beta > 0$. The farmer who agrees to a linked arrangement is a better prospect while a borrower who happens to be a relative may be a poor prospect.

In the case of the trader-lender, the enforcement instrument is a collateral substitute in the form of access to future credit. This collateral substitute fails to bind under certain circumstances: (a) when the farmer is a relative in which case considerations other than business may murky the waters and (b) when the farmer operates a large farm in which case the farmer's loan demand tends to be price elastic.

In the next section, we test the roles of farm area and other kindred variables and variables related to an improved likelihood of contract compliance in (a) the screening process and (b) the loan level determination.

3. *Empirical Evidence*

In this section we provide econometric estimates of the influence of borrower characteristics on the trader-lender's decision to lend as well as the loan size granted. We use government survey data[1] from four villages in the rice-growing province of Nueva Ecija in Central Luzon, Philippines. These data were collected in 1988 and cover the credit transactions of 171 farm and landless (both agricultural and non-agricultural) households for the main and second cropping seasons of 1987-88.

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[1] The Agricultural Credit Policy Council (ACPC), an agency of the Philippines' Department of Agriculture undertook the survey in connection with its Rural Informal Credit Markets (RICM) Research Project. The ACPC is the policymaking body for agricultural finance.

3.1 Data Description

The rural financial market in the four Central Luzon villages is described in more detail in Esguerra and Meyer (op cit). Of the total volume of loans reported by households during two cropping seasons in 1987-88, institutional sources made up of banks and multipurpose cooperatives contributed only 9 percent, while informal sources accounted for the remaining 91 percent (Table 1). The relative importance of traders as lenders is also shown in Table 1. Trader-lenders are mainly operators of paddy-buying stations situated in the town center who buy paddy from farmers at harvest time for sale to big rice millers. As a single informal lender category in the rural financial market of the four rice-producing villages, traders granted the largest share of total reported loans (29 percent). Their leading role as suppliers of farm finance is even more obvious in the second column of figures in Table 1; 31 percent of total reported loans by farm households was sourced from traders.

In terms of direction of lending, all lenders allocated more than 50 percent of their loans to farm households. Banks, of course, and, to a large extent, cooperatives lent mainly to farmers. Traders granted 78 percent of their total loans to farmers, exceeded only by the category 'others' with 80 percent. However, given the smaller share of this latter category as well as professional moneylenders in loan volume, the more relevant comparison is that between trader- and farmer-lenders. Here the data clearly reveal the trader's bias for farmer borrowers, a bias that may be explained by the trader's interest in his borrowers' marketable surplus. Interest in the borrower's output as a principal motivation for lending is moreover borne out by the share

Table 1

THE IMPORTANCE OF TRADERS AS A CREDIT SOURCE
IN FOUR RICE-PRODUCING VILLAGES
CENTRAL LUZON, PHILIPPINES, 1987-88
(All Figures in Percent)

	Total Loans	Total Farm Loans	Share of Farm Loans	Share of Output-linked Loans[a]	Share of Labor-linked Loans[a]
Formal Lenders					
Banks	5.0	6.9	100.0	-	-
Cooperatives	4.0	5.4	97.9	-	-
Informal Lenders					
Farmers	27.8	21.1	54.9	2.2	24.8
Traders	29.1	31.5	78.5	61.0	16.6
Professional Moneylenders	13.0	11.9	66.7	51.0	0
Others[b]	21.1	23.2	79.8	9.8	4.1

[a] Ratio based on number of loan transactions.

[b] Includes rice millers, input dealers, retail storeowners and fixed-salaried individuals, notably public school teachers and government employees.

of loans linked to the sale of output. Sixty-one (61) percent of trader loans required the borrower to sell his paddy to the trader upon harvest. On the other hand, farmer-lenders appeared to cater more (than traders) to landless rural wage workers as suggested by the share (25 percent) of their loans linked to the provision of labor services.

3.2 Econometric Estimation and Results

To test the hypotheses generated by the theoretical model in Section 2 above, we estimate behavioral equations. The nature of the data set does not allow us to specify a trader-lender's supply function and a borrower's loan demand function estimable by the usual methods. Identifying the supply equation is not possible since individual information on trader-lenders' characteristics and costs is not available. What is observable from the data are levels of borrowings of particular households and the corresponding loan source(s). We are in effect looking at effective lending (or borrowing); its determinants constitute the focus of our empirical tests.

We thus proceed in two steps. First, following the propositions derived from our discussion of the screening phase (section 2.b), we examine the probability that a particular household obtained a loan from a trader-lender. Note that this is the same thing as the probability of a trader-lender granting a loan to a borrower with given characteristics. This may be estimated as a conditional logit or probit model with a dichotomous dependent variable, i.e.

$$\text{Prob}\ [y_i = j] = F_{ij}(X, \beta)$$

where j=1 if the i^{th} borrower is observed to have a loan from a trader, and 0 otherwise. X and β are vectors of borrower characteristics and unknown parameters, respectively. Since we do not have any prior information about the distribution of the error term, we report both logit and probit estimates.

Second, we account for the level of loans granted by trader-lenders. A censored regression or tobit model is specified where the dependent variable, loan size or level of borrowing, is a positive and continuous variable if the household's creditor is a trader-lender, and 0 otherwise. The same explanatory variables as in the logit and probit specifications are hypothesized to affect loan levels.

Table 2 reports the maximum likelihood estimation results of logit, probit and tobit procedures. To avoid problems of endogeneity, we have included only exogenous variables on the right-hand side. These variables, which are essentially borrower characteristics observable to lenders, convey information regarding the relative riskiness of loan applicants. These characteristics may be categorized broadly as (a) those that describe the household, and (b) those that describe a borrower's relation to his lender, if such exists, outside of the credit market. A third group of variables may be added, namely, those that describe the production or physical environment of the credit market. Our interest in market interlinkage makes the second class of borrower characteristics important in the specification of our empirical model.

3.2.1 Household Characteristics. The importance of farm size as a determinant of the probability of dealing with a trader-lender is basically supported by our empirical results. The variable AREA which proxies for potentially available marketable surplus indicates the importance of farm

Table 2

Single-Equation Estimates of Loan Probability (columns 1 and 2) And Loan Size (column 3) From Trader-Lenders

	(1) Logit	(2) Probit	(3) Tobit
Intercept	-2.646	-1.575	-41388.9
	(-3.176)**	(-3.326)**	(-4.002)**
Household Characteristics			
Age	.0001	.0001	142.88
	(.009)	(.009)	(.855)
Education	.0406	.0262	1153.14
	(.857)	(.957)	(2.194)*
Dependents	-.1168	-.0689	-1359.99
	(-1.738)	(-1.783)	(-1.434)
Residence Years	-.0022	-.0010	-154.64
	(-.217)	(-.176)	(-1.090)
Area	.8218	.4662	11780.4
	(2.867)**	(2.911)**	(3.790)**
Area-Squared	-.2012	-.1148	-2551.17
	(-2.798)**	(-2.896)**	(-3.346)**
Relation to Lender			
Relative or friend[a]	.2623	.1501	4738.85
	(.953)	(.969)	(1.497)
Paddy Source[a]	1.912	1.157	22029.8
	(3.711)**	(3.816)**	(3.713)**
Hired Labor[a]	.5643	.3291	6366.12
	(1.038)	(1.075)	(.827)
Production Environment			
Season[b]	.2470	.1454	1520.33
	(.990)	(1.027)	(.547)
Irrigation[b]	.8469	.4849	10682.0
	(2.005)*	(2.088)*	(1.879)
Log-Likelihood	-209.65	-209.28	-1157.3
Chi-Squared	39.28	40.01	
N	456	456	456

t-values in parentheses.

[a] Dummy variables. Respectively, equal to 1 if borrower is a relative/friend of the trader-lender, a regular source of paddy for the trader or a hired laborer, 0 otherwise.

[b] Dummy variables. Season is equal to 1 if credit transaction was in the wet cropping season, 0 otherwise. Irrigation equals 1 if village is irrigated, 0 otherwise.

** - significant at 1% level
* - significant at 5% level

output in the trader's lending decision. We expect this consideration to be reflected in the trader's preference for borrowers who operate farms. Therefore a greater propensity among traders to deal with these households than with landless workers may also be hypothesized. However, a dummy variable for household type (1 if farm household, 0 otherwise) in the model (not reported), while yielding the expected sign, is not significant. Its inclusion reduces the reliability of the AREA coefficient because of the systematic relation between farm size (which equals zero for landless households) and household type. The trader-lender's preference for farmer borrowers is suggested, however, by the negative and statistically significant value of the intercept, which indicates that, trader-lenders generally do not grant loans to landless households.

The negative and significant estimate for AREA-squared provides indication of a threshold farm size, above which the probability of dealing with a trader decreases. From the model, this threshold was computed as being close to 2.0 hectares. To the extent that bigger farm sizes are associated with higher incomes, this effect may be explained by the possibility of self-finance for households with bigger farm sizes. Too, households with bigger farms typically have access to other credit sources, e.g. banks or cooperatives. In addition, if bigger farms have facilities for storing and transporting output, the advantages derived from dealing with the trader-lender, who usually supplies these services, are reduced.

None of the other variables that describe household characteristics came out significant in the logit or probit regressions. The negative influence of DEPENDENTS on the likelihood of obtaining trader loans is consistent with the orientation of trader credit, which is basically production. Years of RESIDENCE in the village, AGE, and EDUCATION do not seem to be crucial determinants of the likelihood of getting a trader-lender loan.

The tobit estimates of the effect of the same household characteristics on the size of loan obtained from trader-lenders reflect a similar pattern. Trader loan size is positively affected by borrower's farm size (AREA) up to a maximum, and EDUCATION. The latter variable may be picking up wealth effects which make it possible for the borrower to bargain for a higher loan amount if the lender has decided that he is worth lending money to.

The effect of the production environment on the credit market is proxied by two variables, namely SEASON and IRRIGATION. The inclusion of SEASON is intended to capture the seasonal variations in rural credit supply and demand which basically respond to expected output. Output is normally expected to be higher during the wet or main season than during the dry or second season. All results show, however, that SEASON, which is represented by a dummy variable (1 if main crop, 0 otherwise), affects neither the probability of receiving a trader loan nor the size of the loan.

The IRRIGATION variable - specified as a dummy variable equal to 1 if the village is irrigated, 0 otherwise - positively affects the probability of dealing with a trader-lender, as well as the loan size. If traders are mainly interested in the farmer's marketable surplus as we have been arguing all along, then their presence is more likely to be felt in the irrigated villages. This explains the higher probability of loans with traders in irrigated areas. Irrigation seems to be of less importance as a direct determinant of loan size as evidenced by its lower t-value in the tobit regression (6 percent significance level). However, its exclusion from the model (not reported) renders the effect of AREA on loan amount insignificant. This result may be understood in terms of the productivity enhancing effect of IRRIGATION on land. Amount borrowed or lent responds positively to farm size if land quality has

been properly accounted for. The IRRIGATION dummy therefore acts as a proxy for land quality in the tobit model (see Bhalla and Roy, 1988, for an excellent discussion of the crucial importance of land quality).

3.2.2 Borrower's Relation to Lender. The borrower's relation to his creditor is an important source of information about the borrower's risk quality. The existence of such relations could also provide the lender with an instrument for enforcing repayment. These relations have been specified as dummy variables, where the absence of such relations is the base case.

Both the loan probability and loan size estimates are consistent with our intuition regarding the role of interlinkage in the trader-lender's loan offer. Our empirical results show that if a farmer regularly sells his paddy output to a particular trader (PADDY SOURCE), that same trader is highly likely to be the farmer's credit source. Moreover, given the regularity of transactions in the output market, the lender has a better sense of the borrower's repayment capacity. Thus a bigger loan size may be granted. This particular variable was statistically significant in practically all alternative specifications.

That borrowers and lenders transact in the output market as well does not mean that the loan granted by the trader is necessarily a linked loan. Interlinkage implies that the terms of credit and related contracts are determined jointly [Bell (1988)]. The variable PADDY SOURCE does not contain this information. It merely describes a relation other than debtor-creditor between the same two parties. As such, it includes, though is not limited to, trader loans that are linked in the sense defined by the interlinked markets literature. That it is an important predictor of loan probability and size as far as trader lenders are concerned reinforces the thesis that traders lend mainly to secure the farmer's marketable surplus. However, to the extent that

the potential for credit-output linkage exists in the relation PADDY SOURCE, the variable also indicates that such form of interlinkage is likely to be crucial in dealings with trader-creditors. On this point our intuition finds support in the evidence presented in Table 1.

The dummy variable HIRED LABOR shows up as insignificant because trader-lenders are rarely employers of their borrowers. This implies that an employer-worker relationship is not likely to be a source of borrower information for the trader, and therefore a key determinant of neither the probability of a trader loan nor its size. This also suggests that the commitment of labor services by borrowers is unlikely to be a dominant feature of trader loans. This result is consistent with the observed preference of traders for farmer borrowers (as against landless workers) and corroborates our results regarding the importance of variables associated with being a cultivator.

The commercial nature of trader loans is underscored by the weak and insignificant influence of personal relations - represented by the dummy variable RELATIVES OR FRIENDS - on the probability of obtaining trader loans as well as on the amount actually borrowed. This result was expected. Trader-creditors may be expected to have a lower preference for dealing with persons with whom they have close personal relations. While these relations are important information-producing mechanisms for lenders, their open-endedness often blurs the distinction between a debt that requires prompt repayment and a personal favor that may be reciprocated at any time. This weakens repayment incentives. The nature of his buy-sell business requires that the trader be sufficiently liquid. Thus, he can ill-afford to tie up his working capital in outstanding loans. Enforceability of the credit contract requires that the trader choose those borrowers with characteristics that facilitate contract enforcement. Impersonal, businesslike dealings are therefore preferred over open-ended transactions with relatives and friends.

As commercialization spreads in an economy, kinship and other personal ties tend to loosen, becoming less important in economic transactions [Ben-Porath (1980)]. The growth of markets entails the expansion of economic exchanges beyond the circle of family and friends. The full significance of these explanations is more obvious, however, in the contrasting behavior of trader-lenders and farmer-lenders, which is beyond the scope of this paper.

Conclusion

The tendency of the output-credit linkage between trader and farmer to expand with growing commercialization motivates interest in the behavior of traders in rural LDCs. The model, constructed in the linked contract framework, points to the importance of marketable surplus (proxied by farm area), enforceability of repayment and the extension of the linked contract to include residual output purchase as important determinants of the availability and level of financing by the trader-lender. The econometric evidence seems to confirm these hypotheses. Moreover, influences considered important in the behavior of other rural lenders (say, farmer-lenders) such as borrower information (proxied by duration of stay) and labor linkage prove insignificant. A study that further contrasts the behavior of trader-lenders and farmer-lenders would greatly complement the rural credit picture presented in this paper.

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