Do Small Farmers Borrow Less when the Lending rate Increases? The Case of Rice Farming in the Philippines

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The new generation of credit programs directed at small borrowers emphasizes financial sustainability. Based on anecdotal information (especially from microfinance experiences), proponents of cost recovery claim that raising formal lending rates would have a minimal impact on borrowing. Rigorous evidence for this conjecture is however sparse. This study conducts an econometric test of this conjecture using data from a survey of small rice farmers from the Philippines. Alternative regression techniques tend to reject the conjecture; in particular, a regression that controls for selection effects shows a unitary elastic response of formal borrowing to the lending rate.

Key words: credit demand, interest elasticity, rural credit, credit policy, Philippines, Asia

1.Introduction

In many developing countries, rural credit programs are on a transition from subsidized to market-oriented schemes. An important manifestation of this is the growth of microfinance. Microfinance advocates favor raising lending rates to market levels to improve cost recovery. One of the 'key principles of microfinance' states: 'Microfinance can pay for itself, and must do so if it is to reach very large numbers of poor people' (Consultative Group to Assist the Poor, 2004).

The ability to simultaneously increase outreach and interest rates assumes that the poor would not significantly reduce their borrowing when the lending

rate is increased. Proponents of this conjecture argue that the problem faced by the poor is not the *cost*, but rather *access* to credit. Hence for example, informal moneylenders who do provide access to the poor are able to charge exorbitant interest rates.

Such assessments of credit demand response are typically based on anecdotal evidence. Rigorous empirical tests of this conjecture are sparse. To remedy this gap, this study conducts such a test using data from a survey of rice farmers in the Philippines. The major finding is that increasing the effective lending rate has a negative and statistically significant effect on the demand for credit, contrary to the conjecture. Demand response must therefore be an important consideration in designing the interest rate policy of financial institutions serving small borrowers.

The rest of this paper is organized as follows: Section 2 provides additional background and related studies. Section 3 develops the theoretical framework and econometric model. Section 4 presents the survey frame and data analysis. Section 5 concludes.

2. Background and related studies

2.1. Rural credit markets and policies

In rural credit markets, informal lending rates are typically much higher than formal lending rates. On the other hand, formal loans are associated with more stringent requirements and other transaction costs that deter poor borrowers (Zeller and Sharma, 2001). The traditional policy response was to impose interest rate ceilings on and provide subsidies to formal credit. This regime of 'financial repression' however proved to be ineffective and costly. Financial repression was largely dismantled in the wave of structural adjustment and stabilization

programs in the 1980s. Subsidized credit programs were downsized, state financial institutions were restructured, and restrictions in financial markets were lifted (Conning and Udry, 2005).

Within this period, several microfinance institutions became prominent for extending loans to the poor, without generous external support, while maintaining a sound financial standing. This was accomplished by lending to small borrowers at interest rates closer to market levels, while achieving high repayment rates. The features and accomplishments of such microfinance schemes contrasted sharply with the earlier state-run schemes of subsidized credit (Morduch, 1999).

The microfinance experience supports the notion that demand response would be minimal if formal lending rates are raised to market levels. Proponents of this claim argue that main obstacle confronting credit for the poor is not the interest rate, but rather lack of access. Unavailability of credit for the poor is mainly attributed to the collateral requirement imposed by formal lenders (Littlefield and Rosenberg, 2004). Traditional patronage of the poor for very expensive but accessible loans from informal lenders is seen as evidence of affordability of market rates for formal loans. However Morduch (1999, p. 1594) asseses the empirical status of the conjecture as follows: “Anecdotal evidence for this claim, however, tends to rely on either partial analytics (e.g., application of the principle of declining marginal returns to capital when all else is not held constant) or incomplete views of demand conditions (e.g., seeing demand at high interest rates but overlooking the pool of potential borrowers that are discouraged by high costs).”

Only a few empirical studies test this hypothesis; those that do tend to find an interest elasticity of credit demand to be substantially greater (in absolute terms) than zero. For example, a study of small and medium enterprises in Ghana obtains an interest rate elasticity of around -1.1 (Amonoo et al 2003). One major problem confronting empirical analysis is the segmentation of the credit market (Banerjee, 2003). Interest rates could be adjusted by the lender depending on borrower characteristics correlated with risk, trustworthiness, and ability to repay. The same borrower characteristics are typically included in regression models to control for other factors affecting credit demand. Hence, the correlation introduces endogeneity (a type of omitted variable problem).

Two very recent studies use randomized experiments to correct for this source of bias. Karlan and Zinman (2005) find complex patterns of interest rate response of consumption credit, though none are close to zero. For microfinance, Dehejia et al (2005) examine a Dhaka-based program and find a demand elasticity of about unity. Despite these findings, the unresponsive-demand conjecture remains popular among rural credit proponents.

2.2. The Philippine case

The Philippines went through the phases of financial repression and structural adjustment over the last three decades. Interest rate ceilings, state-supplied credit (especially for rice and corn farming), credit subsidies, and mandatory lending to agriculture were imposed in the 1970s, but were mostly discontinued in the late 1980s (Floro and Yotopoulos, 1991). Nevertheless government-owned financial institutions maintain a significant presence in the countryside. The Land Bank of the Philippines (LBP) serves as the main credit arm for reaching the small farmer.

Small farmer credit is usually channeled through farmer cooperatives and and rural banks. A large proportion of the loans is taken up by the rice sector. Effectively cooperatives serve as conduits of LBP funds to individual members, who assume joint liability. Loans to farmer cooperatives require collateral, though crop insurance may be applied as a collateral substitute. In practice the vast majority of farmers are unable or unwilling to put up collateral for loans, hence LBP loans carry mandatory crop insurance.

The sole provider of crop insurance is the state-owned Philippine Crop Insurance Corporation (PCIC). Up to 1990, for rice, the farmer's premium was fixed at 2.0% of the crop loan; that of the LBP was 1.55%, and the government subsidy was 4.5%. These rates applied uniformly in all areas. From 1991, premiums began to increase, and rates were allowed to diverge across the various regions. While the LBP premium share was fixed at 2.0%, the amount of government subsidy began to vary over time, implying an erratic policy of cost recovery from borrowers.

Data on formal and informal lending rates facing agrarian reform beneficiaries is reported in Bravo and Pantoja (1998). For 1996-1997, the formal lending rate (average of cooperatives and rural banks) was 28.2% per annum, which is much lower than the reported lending rate of informal credit (obtained from traders, moneylenders, and input dealers). However the majority of small farmers are in fact not enrolled in these schemes. Based on a survey by the Agricultural Credit Policy Council (ACPC), among farmers who borrow, 68% obtain informal loans, with the largest source being professional moneylenders (40%). This is followed by relatives or friends, employers, traders, retailers, and suppliers. Farmers describe informal loans as more convenient, due to quick loan

release and the absence of documentation requirements (Cañeda and Badiola, 1999). This suggests that informal borrowing is more common than formal borrowing, despite its higher interest cost, as transaction costs are higher for the latter. The same survey shows that over half of sample farmers (53%) do not borrow at all; such farmers self-finance their crop production.

Due to financial difficulties faced by the PCIC in late 1990s onwards, the issue of raising premium rates aroused contentious debate. Some reasoned – in parallel with microfinance-inspired arguments cited earlier – that farmers would be willing to pay higher effective lending rates for LBP loans, as these would still remain far cheaper than interest rates charged by informal lenders (Montemayor, 1999). On the other hand, opponents claimed that such an adjustment would discourage borrowing and undermine state policy to promote small farmers' welfare. Clearly systematic empirical analysis would be very useful to provide a sound basis for policy.

3. Modeling farm credit demand

3.1. Credit demand

Consider a farmer selecting the amount to borrow to finance working capital requirements of crop production, with the loan falling due at the end of the cropping season. Under constant returns in production, crop loans can be expressed per unit area. Production is risky, providing a rationale for crop insurance. Two possible sources of loans are the bank and the informal lender; the commodity characteristics of a loan from either source are similar, except that bank borrowing carries a mandatory insurance cover. Furthermore a bank loan is subject to fixed transaction cost; the transaction cost for informal borrowing is normalized at zero. The effective interest rate of the bank loan,

denoted *R*, is the sum of the interest rate charge and the insurance premium. The effective bank rate is lower than informal lending rate, denoted *Q*. Production and borrowing choices are determined by expected utility maximization subject to asset endowment, technology, and market prices.

Formalization of the foregoing set-up leads to a derivation of a credit demand curve (Figure 1), where total borrowing is represented by the horizontal axis. (Details of the derivation are available upon request.) The intuition behind the curve is quite transparent: farmers would borrow from only one source for a given season; the relevant lending rate (represented by the vertical axis) would depend on the loan source. At a sufficiently low *R*, borrowing is entirely formal, i.e. there is no informal borrowing for bank interest rates within the range $[0, R_c]$. As *R* increases within this range, bank borrowing declines; at the top of this range, the farmer switches to informal borrowing. Above R_c, the relevant interest rate is *Q*; likewise as *Q* increases, informal borrowing declines; at the vertical intercept Q_c, the farmer switches entirely to self-finance.

[FIGURE 1 ABOUT HERE]

At the switch from a formal to an informal loan, it is possible that the farmer may reduce borrowing by a discrete amount; that is, there may be a jump discontinuity along the credit demand curve. The reason is that bank borrowing provides an insurance cover, which disappears completely when the farmer switches to informal borrowing.

Lending rates are not the only factors affecting credit demand. The following will alter the the position of the demand curve: the variability of yield and aversion to risk; the cost structure of farming; and the cost structure of self-

finance, that is, indicators of consumption and consumption smoothing requirements of the farm household.

3.2. Econometric model

Suppose the functional relationships between borrowing and interest rates are preserved under a natural logarithmic transformation. Let *i* index the individual farmer, B_i the credit demanded (in natural logs), R_i and Q_i respectively the bank and informal lending rates facing the farmer (in natural logs), R_{ci} the critical bank lending rate, and $\mathbf{Z_i}$ the farmer-specific vector of variables that also determine credit demand. Given deterministic variables and in general form, the demand function is described as follows:

$$B_i = \begin{cases} F(R_i, \mathbf{Z_i}) \text{ for } R_i \leq R_{ci} \\ G(Q_i, \mathbf{Z_i}) \text{ otherwise} \end{cases} \quad (1)$$

Estimation of (1) may be limited only to *F*, that is, the portion of the curve for formal borrowing; however if the sample contains both formal and informal borrowers, this limitation would discard some of the sample information. On the other hand, estimation of (1) can encompass both formal and informal borrowing within a single demand curve. The stochastic version of the model incorporates an error term ε_i with the usual properties. Suppose further that from the outset that farmers are exogenously sorted into bank borrowers and informal borrowers, and the possible discontinuity at the critical interest rate affects only the slope of the demand function with respect to the interest rate. Let BNK_i be a dummy variable which takes on a value of 1 for bank borrowers and zero otherwise. Then (incorporating the parameter terms) the credit demand function (in linear form) can be compactly stated as follows:

$$B_i = \beta_0 + \beta_1 R_i BNK_i + \beta_2 Q_i (1 - BNK_i) + \boldsymbol{\beta}'\mathbf{Z}_i + \varepsilon_i \quad (2)$$

The coefficients β_1 and β_2 are the interest rate elasticities. The dummy interaction creates a distinction in the slope of the demand curve for formal loans compared to informal loans. Based on statistical inference we can test whether or not β_1, the elasticity of demand for formal loans, differs from zero.

Under classical assumptions, model fitting can be done by ordinary least squares. There are however good reasons to suspect departure from classical assumptions. One is that some farmers may opt to fully self-finance working capital; the case of zero borrowings implies truncation at zero, which can be corrected by Tobit regression. The second departure takes the form of endogeneity problems. One source, as mentioned earlier, is the potential endogeneity of interest rates. Rural credit markets in the Philippines are segmented (Floro and Yotopoulos, 1991). Several methods are available for correcting this once the endogeneity problem is confirmed. The second source is endogeneity in the bank borrower dummy used in (2); that is, farmers may be endogenously sorted between those who are bank borrowers and those who are not. It is therefore a variation of the sample selection problem, which may also need to be corrected in the regression.

4. Implementation

4.1. Survey frame

A survey of rice farmers covering LBP ("bank") borrowers and non-bank-borrowing farmers was conducted for crop year 2000-2001. Interviews were conducted using a structured survey questionnaire, which covers demographic and household information, farm characteristics, and various data

for crop year 2000-2001, namely: cost and returns, borrowing, lending rate, insurance premium, insurance cover, and insurance claims. Data is computed as the average over two cropping seasons within the crop year. The survey also collected information on farm assets, nonfarm assets, as well as the history of borrowing and insurance of the previous five years.

During the survey period, the country was divided into 79 provinces, grouped into 17 administrative regions. Respondents are drawn from the top six regions in terms of number of bank borrowers, namely: Cagayan Valley, Central Luzon, Nueva Ecija, Western Visayas, Western Mindanao, and Southern Mindanao. The first three belong to the Luzon (the country's northern island group), the fourth to Visayas (the central island group), and the last two to Mindanao (the southern island group).

From each region a representative cooperative is found with the assistance of the regional office of the PCIC. To identify this cooperative, an "average province" within the region is selected, based on the number of bank borrowers, total farm area of bank borrowers, total amount of loan, and total insurance indemnities. Within this province, the cooperative whose membership size, amount of cover, premium paid, and indemnities received are closest to the provincial average is identified as the representative cooperative. The cooperative and its host village comprise one survey site per region. (For Cagayan Valley though, two provinces appeared to be representative, hence a sample was drawn from both, with bank and non-bank borrowers evenly split between them.)

Within the village, eight cooperative members who are bank borrowers in 2000-2001 are randomly chosen using the cooperative's membership list. In the

same site, eight farmers are randomly selected as a control group using the master list of village residents (excluding the *current* bank borrowers). Hence, the plan was each that of the six project sites contributes sixteen respondents, for a total sample size of 96, evenly divided between bank borrowers and non-bank borrowers.

4.2. Data

Upon completion of the survey, one observation from the control group was discarded. The conduct of the survey needed to adjust to inaccuracies in the cooperative records; hence the sample was drawn from 7 provinces. (For 5 of these, the borrowers were equally split between the bank borrowers and the control group. For the two provinces the split was 5:3 and 2:6). The data contains the following variables:

BOR	per ha crop loans, in pesos, survey year
AGE	Age of household head
SCHOOL	Years of schooling of household head
HHSIZE	Number of household members
IRRIGATE	Proportion of land under national or communal irrigation
TENANT	Proportion of land held as share tenant
FMAST	Current value of farm equipment stock
NFMAST	Current value of nonfarm fixed assets
LANDV	Current value of landholding
YRDEBT	Years of experience in borrowing from cooperative
CLAIMS	Frequency of indemnity claims over the past five years

The explanatory variables proxy for differential access to technology, different degrees of risk and risk aversion, and differences in asset endowment, which determine the cost of self-finance. *AGE* and *SCHOOL* are measures of assets in the form of human capital; *FMAST*, *NFMAST*, and *LANDV* measure ownership of fixed assets. *FMAST* and *SCHOOL* may also measure differences in access to technology, while *LANDV* may indicate favorable locations and land quality. *IRRIGATE* could be a proxy for productivity as well as output risk. Meanwhile, *TENANT* could be capturing the degree of risk aversion of the farmer as well as differences in asset ownership. A larger *HHSIZE* implies greater cost of self-finance, due to larger consumption requirements and greater vulnerability to consumption shocks. *CLAIMS* is another indicator of yield risk. Higher YRDEBT proxies for lower transaction cost in dealing with a formal lender.

Descriptive statistics of the key variables are shown in Table 1. Among borrowers, loan size averages about 8,200 pesos/ha. No bank borrower received a loan in excess of 16,000 pesos/ha, which is the ceiling on insurance cover and approximately the maximum loan limit imposed by LBP. Bank loans are larger than informal loans, but charge a lower effective lending rate. Among the control group there were 30 farmers who did not avail of crop loans within the survey period. Consistent with our theoretical framework, with one exception, farmers do not mix production credit from bank and informal sources at any time within a crop year. (In the exceptional case, the farmer borrowed only a small amount informally from a trader. In the data set this farmer is treated as a formal borrower only.)

Moreover the respondents described crop loans in a fairly stereotypical manner – provided at the beginning of the cropping season, to be used to puchase production inputs, and repaid at the end of the cropping season (which lasts about four months). Hence it is reasonable to regard bank and informal loans as homogenous product forms.

[TABLE 1 ABOUT HERE]

As for farmer characteristics: the respondents are typically middle-aged, and have had secondary schooling. Most of the respondents reported small farm sizes (a little over 2 ha. on average). Farm areas are mainly planted to rice. Land irrigated by national or communal facilities accounts for over half of rice lands on average. Due to the agrarian reform program, sharecropping is now a minor tenancy arrangement.

4.3. Econometric analysis

We seek to estimate a model corresponding to equation (2). We include dummy variables for major island groups (Nueva Ecija province omitted) to control for geographical variations. Regression is implemented with STATA. In the following the significance level is set at 5%. The variables *BOR*, *AGE*, *SCHOOL*, *HHSIZE*, *FMAST*, *NFMAST*, *LANDV*, and *YRDEBT* are all transformed into their natural logarithms (to simplify notation we retain the same variable labels).

Table 2 presents the results of least squares regression on bank borrowers only. The interest rate elasticity is statistically significant, of the expected sign, and is above unity. The only other significant variables are *AGE*, *HHSIZE*, *NFMAST*, *CLAIMS*, *LUZ*, and VI. The model as a whole is significant, with an adjusted-R^2 of 0.56. The Cook-Weisberg test fails to spot heteroscedasticity

($\Pr(\chi^2 > \chi_c) = 0.19$), while the Ramsey reset test does not detect an omitted variable ($\Pr(F > F_c) = 0.26$).

[TABLE 2 ABOUT HERE]

Consider a regression for the full sample (Table 3). The least squares estimates now have both interest rate terms, whose coefficients are of the right sign. The elasticities are (in absolute terms) much greater than those computed from the limited sample. A Wald test rejects identity of the coefficients ($\Pr(F > F_c) = 0.019$). However only the the informal lending rate term is significant at the 5% level. The variables with significant coefficients are also much different. The model as a whole remains significant; adjusted-R^2 is higher at 0.63. However the Cook-Weisberg test detects heteroscedasticity ($\Pr(\chi^2 > \chi_c) = 0.007$), and Ramsey reset detects an omitted variable problem ($\Pr(F > F_c) = 0.000$). Results from a robust regression correcting for heteroscedasticity are also presented in Table 3. Standard errors increase, and the insensitivity of borrowing to the bank lending rate cannot be rejected.

[TABLE 3 ABOUT HERE]

The least squares estimates for the full-sample are problematic due to the large number of zero observations for the dependent variable. Correcting this through Tobit regression (Table 4) dramatically increases the interest rate elasticities, as well as shrinking the standard errors (with both interest rate terms becoming significant).

[TABLE 4 ABOUT HERE]

However robust truncated regression (also in Table 4) again fails to confirm the statistical significance of the formal lending rate term. Nor does the

Wald test reject equality between the coefficients of the two interest rate terms ($\Pr(\chi^2 > \chi_c) = 0.09$. Moreover the endogeneity problem remains uncorrected, as the residual plot from the robust Tobit regression shows a clear downward sloping pattern (Figure 2).

[FIGURE 2 ABOUT HERE]

One possible source of endogeneity is that of the interest rate, owing to market segmentation. Individual-level sorting of clients, under product homogeneity, would violate the law of one price. To confirm this we take a direct approach of inspecting the data for violations. The data set reveals that annual lending rates take only several discrete values. Table 5 presents the frequency count for each of these values. For bank loans, lending rates take on only one value for each province. That is, a cooperative sets only one lending rate for all members. Somewhat surprising is that within each survey site, informal borrowers usually face the same interest rate as well.[1] The law-of-one price also holds for the informal sector.

[TABLE 5 ABOUT HERE]

This finding does not actually conflict with the literature which finds market segmentation across the broad spectrum of informal loan types and over various types of rural households. The data is restricted to crop loans for small rice farmers. Product characteristics are therefore highly standardized, even within the informal sector.

[1] Three respondents mentioned obtaining informal loans from relatives at low rates. However loan sizes were small; further questioning indicated that these loans were mostly for consumption. One exception remains, in which just two farmers in the same location obtain different informal lending rates.

We now turn to the other source of endogeneity, namely the type of loan. Unfortunately simple inspection of the data set cannot rule out this type of endogeneity. We therefore turn to Heckman regression, which is a more general technique for dealing with selection bias. The Heckman regression is conducted in two stages. The dependent variable in the latent variable regression is restricted only to bank loans; the explanatory factors are the bank lending rate and the **Z**-variables. The informal lending rate is not included. The selection equation contains all the second stage variables along with the informal lending rate, in their original (untransformed) values.

The regression is implemented with a two step estimator (Table 6) and with maximum likelihood estimator (Table 7). In both cases the bank lending rate coefficient is negative, and highly significant. Credit demand response is close to unit elastic; note that this is lower than the result obtained from the sub-sample, least squares regression in Table 1. Many of the other control variables are statistically significant, namely age (negative effect), household size (positive effect), farm assets (positive effect), nonfarm assets (negative effect), claims history (positive effect), and the geographic dummies except Mindanao. The residual plot shows a much more even scatter, obviating the slope pattern found from the earlier Tobit regression. Results from the maximum likelihood estimator are nearly identical to those of the two-step regression.

[TABLES 6 AND 7 ABOUT HERE]

[FIGURE 3 ABOUT HERE]

In summary, the regression results point consistently toward nonzero elasticity of credit demand response to the bank lending rate. In the last pair of

regressions which control for the selection problem, the bank lending rate elasticity is significant and close to unity.

5. Conclusion

Cost recovery policies in rural credit programs are controversial. A popular conjecture in the literature and related discussions is the insensitivity of credit demand to increases in the lending rate. The debate is however informed by little more than casual empirics. For example, informal credit, which is seen as the alternative to formal credit, charges much higher interest rates, but continues to be patronized. Another common argument is that the 'enterprising poor' borrow little, not because of high credit cost, but because of inability to obtain access to credit due to collateral requirements.

This study informs the discussion by producing quantitative evidence regarding this conjecture. Data was obtained from a survey of small rice farmers, covering bank borrowers, informal borrowers, and non-borrowers. Regression analysis points to a negative and significant effect of the effective lending rate on the demand for credit. Upon correcting for selection effects, the interest rate elasticity is found to be close to unity.

Demand response alone is insufficient to derive any recommendations on interest rate and insurance premium policies. The supply side of formal lending should also be examined, in terms of cost, sustainability, and the welfare loss from subsidizing production loans. Nevertheless the study indicates that borrowing response should be a serious concern in designing cost recovery policies for rural finance.

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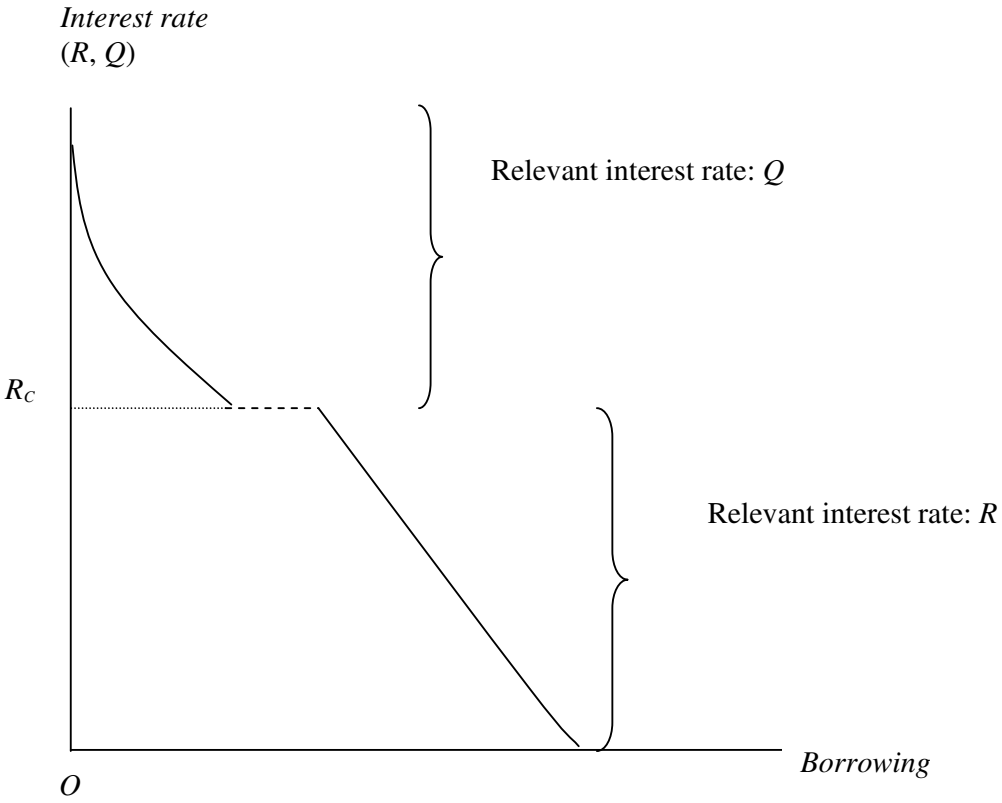

Figure 1: The credit demand curve

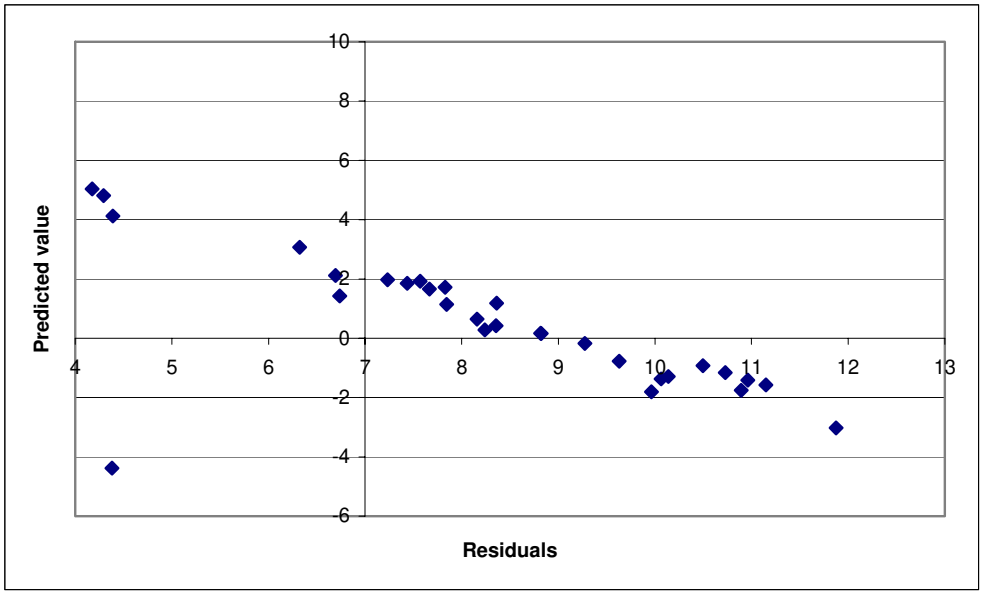

Figure 2: Residual plot for the robust Tobit regression

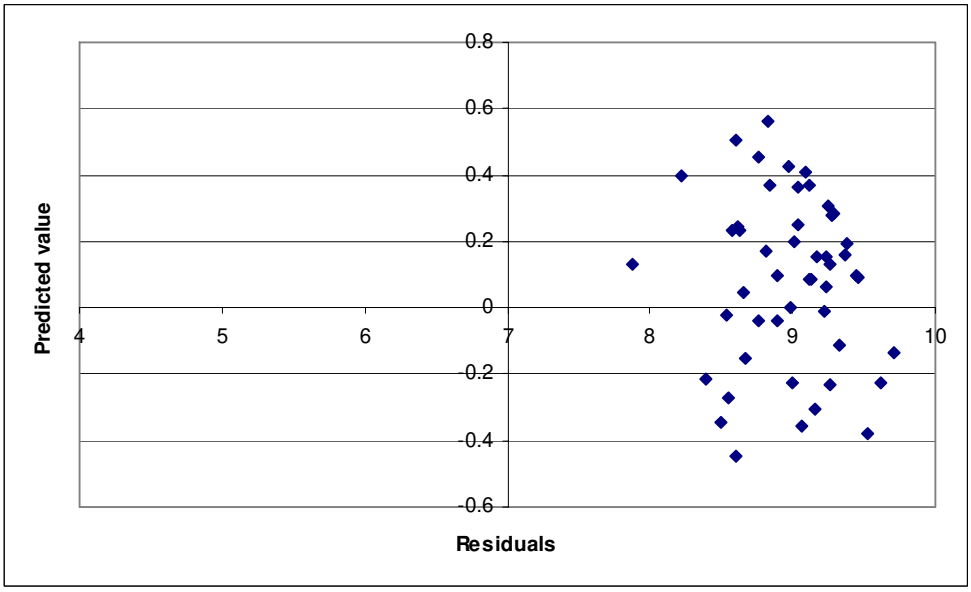

Figure 3: Residual plot for the Heckman latent variable regression

Table 1: Descriptive statistics of key variables

	Mean	Standard deviation	Min	Max
Loan/ha (borrowers)	8,184.2	3,858.9	1,500	14,399
Bank loan/ha (borrowers)	9,334.1	3,435.8	2,985.1	14,399
Informal loan/ha (borrowers)	4,662.8	2,866.0	1,500.0	10,000
Effective bank lending rate	35.5	4.67	29.3	43.8
Informal lending rate	90.0	30.0	60.0	120
Age, in years	50.1	13.3	27.0	79
Schooling, in years	8.5	3.5	0.0	17
Household size	5.1	2.6	1.0	12
Farm size, ha	2.3	1.7	0.2	8
Owned land value, '000 pesos	435,434.2	657,396.5	0.0	3,500,000
Farm asset value, pesos	60,614.7	120,903.9	0.0	978,998.8
Nonfarm asset value, 'pesos	331,634.2	543,147.6	1,500	3,873,000
Area irrigated (%)	60.1	46.6	0.0	100
Area under sharecrop (%)	11.8	29.3	0.0	100
Years LBP borrower	1.2	1.6	0	4

Note: The average exchange rate in 2000 was 44.4 pesos per US$.

Table 2: Least squares regression of credit demand, formal borrowers only

Variable	Coefficient	$Pr(t > t_c)$
R	-1.221**	0.01
AGE	-0.589**	0.01
SCHOOL	-0.218	0.11
HHSIZE*	0.296	0.03
IRRIG	0.010	0.94
LANDV	-0.002	0.83
TENANT	0.166	0.42
FMAST	0.030	0.12
NFMAST	-0.083*	0.03
CLAIMS	0.077*	0.05
YRDEBT	0.089	0.51
LUZ*	-0.772	0.00
VI*	-0.999	0.00
MINDA	-0.350	0.07
Constant	16.711**	0.00

[a]Pr(F>F-critical) = 0.00.

*Significant at 5% level.

**Significant at 1% level.

Table 3: Least squares and robust regression of credit demand

	Least squares[a]		Robust regression[b]	
Variable	**Coefficient**	***Pr*($t > t_c$)**	**Coefficient**	***Pr*($t > t_c$)**
R*(BNKB)	-2.645	0.07	-2.645	0.16
Q*(1-BNKB)	-3.470**	0.00	-3.470*	0.02
AGE	-0.758	0.55	-0.758	0.54
SCHOOL	-0.083	0.91	-0.083	0.91
HHSIZE	-0.145	0.83	-0.145	0.84
IRRIG	-0.009	0.99	-0.009	0.99
LANDV	0.128*	0.02	0.128*	0.02
TENANT**	4.115**	0.00	4.115**	0.01
FMAST	0.007	0.95	0.007	0.95
NFMAST	-0.150	0.52	-0.150	0.53
CLAIMS	0.209	0.46	0.209	0.34
YRDEBT	-0.432	0.52	-0.432	0.44
LUZ	1.191	0.22	1.191	0.15
VI	-0.500	0.65	-0.500	0.55
MINDA	0.664	0.51	0.664	0.44
Constant	15.777*	0.05	15.777	0.12

[a]Pr(F>F-critical) = 0.00.

[b]Pr($Chi^2 > Chi^2$-critical) = 0.00.

*Significant at 5% level.

**Significant at 1% level.

Table 4: Tobit regression of credit demand

	Tobit regression[a]		Tobit robust regression[b]	
Variable	**Coefficient**	***Pr*($t > t_c$)**	**Coefficient**	***Pr*($t > t_c$)**
R*(BNKB)	-4.187*	0.03	-4.187	0.08
Q*(1-BNKB)	-5.110**	0.00	-5.110**	0.01
AGE	0.936	0.58	0.936	0.57
SCHOOL	-0.204	0.83	-0.204	0.84
HHSIZE	-0.381	0.68	-0.381	0.69
IRRIG	-0.116	0.90	-0.116	0.91
LANDV	0.199**	0.01	0.199**	0.01
TENANT**	5.687**	0.00	5.687**	0.00
FMAST	0.010	0.95	0.010	0.95
NFMAST	-0.206	0.49	-0.206	0.50
CLAIMS	0.292	0.42	0.292	0.28
YRDEBT	-1.017	0.28	-1.017	0.23
LUZ	2.004	0.16	2.004	0.10
VI	-0.113	0.94	-0.113	0.92
MINDA	1.438	0.32	1.438	0.23
Constant	21.104*	0.05	21.104	0.11

[a]Pr(F>F-critical) = 0.00.

[b]Pr($Chi^2 > Chi^2$-critical) = 0.00.

*Significant at 5% level.

**Significant at 1% level

Table 5: Frequency count of lending rates

	Formal borrowers				Informal borrowers			
	24	30	36	Total	60	90	120	Total
1	5	0	0	5	0	0	0	0
2	0	0	2	2	0	0	1	1
3	0	8	0	8	0	0	0	0
4	10	0	0	10	5	0	0	5
5	8	0	0	8	1	1	0	2
6	0	0	8	8	3	0	0	3
7	0	0	8	8	0	0	5	5
Total	23	8	18	49	9	1	6	16

Table 6: Heckman regression, two-step estimator[a]

Variable	Latent variable equation		Selection equation	
	Coefficient	**P($t > t_c$)**	**Coefficient**	**P($t > t_c$)**
R*(BNKB)	-1.067**	0.01	-0.069	0.16
Q*(1-BNKB)			-0.019	0.07
AGE	-0.643**	0.00	-0.030	0.10
SCHOOL	-0.181	0.13	0.116	0.11
HHSIZE	0.311**	0.01	-0.023	0.79
IRRIG	0.034	0.75	0.236	0.66
LANDV	-0.002	0.78	0.000	0.27
TENANT	0.170	0.31	0.167	0.80
FMAST	0.035*	0.03	0.000	0.62
NFMAST	-0.061*	0.04	0.000	0.64
CLAIMS	0.130**	0.00	1.153	0.00
YRDEBT	0.117	0.30	0.190	0.14
LUZ	-0.754**	0.00	-1.928	0.01
VI	-1.021**	0.00	-1.758	0.06
MINDA	-0.280	0.08	-0.986	0.13
Constant	15.713**	0.00	4.526	0.14

[a] $Pr(Chi^2 > Chi^2\text{-critical}) = 0.00$.

*Significant at 5% level.

**Significant at 1% level.

Table 7: Heckman regression, maximum likelihood estimator [a]

Variable	Latent variable equation		Selection equation	
	Coefficient	**P($t > t_c$)**	**Coefficient**	**P($t > t_c$)**
R*(BNKB)	-1.065**	0.00	-0.069	0.17
Q*(1-BNKB)	-	-	-0.018	0.09
AGE	-0.645**	0.00	-0.032	0.08
SCHOOL	-0.181	0.12	0.111	0.12
HHSIZE	0.309**	0.01	-0.027	0.75
IRRIG	0.038	0.71	0.259	0.63
LANDV	-0.002	0.78	0.000	0.27
TENANT	0.171	0.31	0.000	0.82
FMAST	0.035*	0.03	0.000	0.59
NFMAST	-0.060*	0.04	0.000	0.69
CLAIMS	0.130**	0.00	1.154	0.00
YRDEBT	0.119	0.29	0.185	0.15
LUZ	-0.754**	0.00	-1.888	0.01
VI	-1.025**	0.00	-1.754	0.06
MINDA	-0.280	0.08	-0.945	0.15
Constant	15.707*	0.00	4.528	0.14

[a] Note: $Pr(Chi^2 > Chi^2\text{-critical}) = 0.00$.

*Significant at 5% level.

**Significant at 1% level.