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CREDIT RATIONING IN SMALL SCALE ENTERPRISES: SPECIAL MICROENTERPRISE PROGRAMS IN ECUADOR

by

Mayada M. Baydas

Richard L. Meyer

and

Nelson Aguilera-Alfred

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Agricultural Finance Program
Department of Agricultural Economics
and
Rural Sociology
The Ohio State University
2120 Fyffe Road
Columbus, Ohio 43210-1099

Abstract

Small scale enterprises receive several forms of aid, but many are denied access to formal loans. A demand and supply model is estimated to analyze the factors lenders use to ration credit in special microenterprise programs. The results reveal that suppliers do not discriminate against less profitable enterprises and entrepreneurs who have not completed their high school education; however, these entrepreneurs have a smaller demand for external finance from the microenterprise programs than more profitable enterprises and entrepreneurs who have graduated from high school.

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1. INTRODUCTION

Small scale rural and urban enterprises have been the concern of many policymakers attempting to accelerate the development process in low income countries. These enterprises often receive several types of aid in the form of targeted credit programs, training and technical assistance (Levitsky). Many entrepreneurs continue to face difficulties, however, in expanding their operations because of a reported lack of funds (Meyer, 1989). Many special microenterprise programs have been created for those entrepreneurs who have difficulty in getting access to regular commercial loans. External finance is obtained by some entrepreneurs through these special microenterprise programs, but some entrepreneurs also experience credit rationing in these programs.

Lenders make their loan decisions within regulatory constraints, such as interest rate ceilings, and based upon some observed characteristics of borrowers and their businesses. Lenders typically face problems of asymmetric information when trying to identify the riskiness of lending to subsets of borrowers. Financial contracts involve default risk because of adverse selection and moral hazard problems associated with the borrower's indeterminate type and unpredictable action (Stiglitz and Weiss). Imperfect information generates an equilibrium in credit markets where interest rates are inadequate to clear the market demand for loans (Bester; Jaffee and Russell). To resolve asymmetric information

problems and to identify creditworthy borrowers, lenders utilize non-price rationing mechanisms based upon the characteristics of enterprises and entrepreneurs (Aguilera and Graham; Lapar and Graham). Credit rationing occurs when lenders grant the loans demanded by applicants who are identified as creditworthy borrowers while granting loans smaller than demanded to some applicants and completely rejecting other applicants willing to pay the interest rate demanded.

This paper describes a model used to investigate credit rationing by lenders in special microenterprise programs in Ecuador. The objective was to evaluate the important factors used in credit rationing which result in some loan applicants being rejected and others receiving amounts smaller than demanded in these targeted programs. The next section introduces the theoretical model used for evaluating the credit rationing process. The third section describes the data used, and the results and implications are discussed in section 4. The last section presents the conclusions of the study.

2. THE CREDIT RATIONING MODEL

The framework needed for analyzing credit rationing requires consideration of the demand for and supply of loans. Aguilera and Graham, and Maddala and Trost, among others, argue that it is necessary to utilize a model including both demand and supply equations to determine conclusively whether credit allocation patterns represent supply side external rationing or internal self-selection by some types of borrowers. A simultaneous equations system should be estimated utilizing information about all applicants, both borrowers and non-borrowers, in order to avoid biased results. A single equation supply

model could result in the misleading interpretation that lenders discriminate against a particular type of borrower, while the simultaneous estimation of a demand equation could reveal that some classes of entrepreneurs demand less external finance. Thus, the model used in this paper involves a demand and supply simultaneous equations system which tests for the criteria used by lenders in the rationing process.

It is assumed that special microenterprise programs provide entrepreneurs with loans at some exogenously established interest rate for each loan type. Intervention programs are often designed to target particular classes or types of borrowers who presumably have limited access to other sources of formal finance; thus, interest rates are usually predetermined by borrower and loan type. Due to asymmetric information, lenders employ non-price rationing mechanisms to determine the maximum loan amount they will grant each applicant, and reject some applications from entrepreneurs who seem to be too risky. The demand and supply equations can be presented as follows:

$$LD = \beta_1 X_1 + \alpha_1 r + u_1 \tag{1}$$

$$LS = \beta_2 X_2 + \alpha_2 r + u_2 \tag{2}$$

where LD is loan demand; LS is the maximum amount that the lender is willing to lend given the state of knowledge about the applicant; r is the fixed interest rate charged for a particular loan type; X is a vector of independent explanatory variables; and u_1 and u_2 are random disturbances assumed to be independent of X.

Lenders select borrowers according to the following decision rule:

$$LR = \begin{cases} LS & If\ LS \geq LD \\ 0 & If\ LS < LD \end{cases} \tag{3}$$

where LR is the observed loan granted. Decision rule (3) presents a censored dependent variable where applicants under the condition LS ≥ LD fall in the creditworthy borrower subgroup, while applicants where LS < LD fall in the rejected applicant subgroup. A similar general model was advanced by Nelson, where different cases are discussed depending on the available information about the latent endogenous variables. It is assumed that the random disturbances follow a bivariate normal distribution with a zero mean vector and unknown variances and covariance, $(\sigma_1^2, \sigma_2^2, \sigma_{12})$, and that both disturbances are independent across observations and of X. The formulation of the likelihood function requires the derivation of the distribution of LR from the joint distribution of u_1 and u_2.

Assuming u_1 and u_2 to be independent, the likelihood function (L) to be maximized as advanced by Nelson is:

$$L = \prod^{n_0} \int_{-\infty}^{LD} f(LS-\beta'_2 X_2)dLS \cdot \prod^{n_1} f(LR-\beta'_2 X_2) \cdot \prod^{n_0+n_1} f(LD-\beta'_1 X_1) \tag{4}$$

where n_0 is the subset of rejected applicants and n_1 is the subset that is granted loans. The data typically available is for LD and LR, i.e. LS is observed only when LS ≥ LD. Nelson suggests that this case allows the separate estimation of equation (1) by OLS and equation (2) by Tobit analysis with no identification problems. For this study, however, we believe

that maximum likelihood will yield more efficient results for the simultaneous equations system, so this estimation technique is used given the information available (Maddala).

The estimated loan demand equation is:

$$LD = a_0 + a_1IR + a_2IL + a_3AST + a_4PRFT + a_5STRT + a_6OW + a_7NAGR + a_8LOC + a_9EDUC + a_{10}SEX + a_{11}AGE$$

with the variables identified in Table 1. The loan supply equation is specified as:

$$LS = b_0 + b_1IR + b_2MAT + b_3AST + b_4PRFT + b_5STRT + b_6OW + b_7NAGR + b_8LOC + b_9EDUC + b_{10}SEX + b_{11}AGE$$

The demand and supply equations include interest rates (IR) to measure price elasticities, and several proxies to describe the characteristics of enterprises and entrepreneurs believed to be used by lenders to ration credit (Aguilera and Graham; Lapar and Graham; Liedholm and Mead). The demand equation includes informal loans (IL) to measure the degree of complementarity or substitutability between formal and informal sources of loans; size of business, measured by value of total assets (AST), to measure the need for liquidity; profits (PRFT) reported for 1989 to indicate ability for self-finance; agricultural vs. non-agricultural enterprises (NAGR) in the production, commerce, and service sectors to reflect the demand for loans in different sectors; years of experience of the entrepreneur (STRT) to reflect management capabilities; and ownership (OW) versus non-ownership and other personal characteristics to represent type of applicant. The supply equation includes maturity of loans (MAT) in months to test the preference of lenders for maturity periods; amount of assets in the business (AST) to reflect the entrepreneur's ability to provide loan collateral or to liquidate in order to meet loan payments; amount of profits (PRFT)

representing potential income for loan repayment; agricultural or non-agricultural (NAGR) enterprises as a possible reflection of risk; past experience of the entrepreneur as reflected in the years of operating the business (STRT); ownership (OW) versus non-ownership of businesses and personal characteristics of the entrepreneur including education (EDUC), sex (SEX) and age (AGE) as additional possible indicators of entrepreneurial success and creditworthiness. Geographic location (LOC) is included to determine if demand and supply conditions differ in the dynamic coastal region versus other regions of the country.

3. THE MICROENTERPRISE SURVEY

The data used in this study were obtained from a survey of small scale enterprises conducted in Ecuador in 1990. It involved in-depth interviews with 625 entrepreneurs randomly selected from non-participants and participants in special microenterprise programs, that either directly grant loans or assist borrowers to get commercial loans. A total of 248 entrepreneurs applied for loans from the special microenterprise programs during the year, of which 172 received loans, while the rest did not get access to any loan amounts and were completely rejected. Loans were extended in amounts ranging from 60,000 to 8,500,000 sucres[1], with nominal interest rates ranging between 36% and 56% for loans given for periods of 1 to 2 years. Loan demands were reported from a minimum of 100,000 to a maximum of 15,000,000 sucres. The informal loans received varied between 10,000 and 2,000,000 sucres. The borrowers were approximately equally distributed between the coastal and other regions, with 80% owning their enterprises and about 40% representing female

[1] Approximately 900 sucres = 1$.

entrepreneurs. The majority of the entrepreneurs (40%) were concentrated in production activities, 25% in commerce, 24% in services, and only 2.5% in agriculture.

4. RESULTS AND IMPLICATIONS

The results presented in Table 2 were generated from the maximum likelihood estimation of the demand and supply simultaneous equations system. The results show acceptable R-squares for both equations considering models using cross-sectional data, and the F-values were significant. The demand equation produced an unexpected positive but insignificant interest rate (IR) coefficient. Interest rates have been negative in real terms in the past few years and at best bear a zero real rate at present. Under these circumstances, nominal interest rates may not effectively ration demand.

The results show that borrowers with larger amounts of informal loans (IL) demanded larger loans from microenterprise credit programs. Although this relationship is not significant, it may suggest that borrowers with large loan demand for microenterprise programs borrow from both formal and informal lenders. This result is analogous to the analysis provided by Meyer et al. (1990) which suggests that informal loans for some borrowers are inferior to formal ones indicating substitution, while a number of entrepreneurs satisfy the terms and conditions for both sources and thus borrow simultaneously from both.

The coefficients for both assets (AST) and profits (PRFT) are positively and significantly related to loan demand. Assets as a proxy for size of business imply a higher loan demand among larger enterprises. Profits may be a proxy for business success and repayment capacity so that profitable businesses encourage entrepreneurs to incur greater

financial risk through increased borrowing. This explanation seems to overwhelm the alternative explanation that profits are a proxy for capacity to self-finance.

Several variables may influence the risk perception of the entrepreneur and loan demand. These include the number of years the entrepreneur has been running the business (STRT) reflecting the entrepreneur's experience, the type of ownership of the business (OW), and the sector (NAGR) which separates agricultural from non-agricultural enterprises. There is no statistical significance between loan demand and age of business. Owners of businesses demand significantly larger loans than non-owners, and entrepreneurs operating non-agricultural businesses also demand significantly larger loans than those in agriculture. Entrepreneurs in the coastal region (LOC), including Guayaquil, demand significantly smaller loan amounts than those in other regions including the capital of Quito. Highly educated entrepreneurs who hold high school diplomas and above seem to demand larger loans, and male entrepreneurs demand larger loans than female entrepreneurs. The negative but insignificant coefficient for age suggests that loan demand may decline for older entrepreneurs.

As expected for the supply equation, the interest rate variable (IR) is positive and significant indicating that lenders are willing to supply larger loans at higher interest rates, perhaps because of the large transaction costs associated with small loans. Surprisingly, lenders are also more inclined to favor the disbursement of longer maturity loans; this may also reflect an attempt to lower transaction costs. Another surprise was that assets are not a significant variable. This may be due to the fact that many microenterprise loans are made with cosigner guarantees rather than taking physical assets as collateral. Profits,

however, are a significant variable, implying that lenders tend to make loan decisions based more on profits than on assets. This interesting result is what microenterprise advocates hope will occur in intervention projects such as special microenterprise programs.

Almost all of the other variables included in the model to reflect the lender's perception of creditworthiness are not significant, except for education. This may be due to the fact that special microenterprise programs are developed precisely to channel funds to entrepreneurs who are excluded from regular commercial lending. Lenders evaluate the entrepreneur's education as a positive factor in determining loan size and this gives holders of high school degrees and above greater access to credit from these special programs. An important contrast stands out in Table 2, between the demand and supply effects of ownership, sector, location, and sex. The results suggest that owners, non-agricultural entrepreneurs, and male entrepreneurs are more likely to get loans not because they are favored by lenders, but rather because they tend to demand larger loans. The smaller amount of loans reported by older entrepreneurs and those in the coastal region is not due to greater rationing, but rather because they demand less than young entrepreneurs and those from other regions. Finally, although it is believed that lenders often discriminate against female entrepreneurs, the variable for gender, (SEX), in the supply equation is positive but insignificant implying that neither gender has an advantage in receiving loans.

5. CONCLUSIONS

The credit rationing model specified in this paper highlights the importance of separating loan demand from loan supply effects when evaluating the criteria used by lenders in

rationing credit. The results show that if we would have considered a single supply equation model we could have misinterpreted the effects of profitability and education to imply that lenders discriminate against less profitable enterprises and entrepreneurs who have not completed their high school education. However, considering the demand effects, it is clear that entrepreneurs with less profitable enterprises and less education have a smaller demand for external finance from microenterprise programs than those with more profitable enterprises and who have graduated from high school. Likewise, enterprises in the agricultural sector, located in the coastal region, operated by non-owners, and managed by less experienced entrepreneurs also receive smaller loans because they demand less, not because they have been more discriminated against than other entrepreneurs or enterprises. Finally, because the gender variable in the supply equation is not significant, it seems that discrimination against female entrepreneurs does not exist in the supply of loans, contrary to popular beliefs. However, the positive sign of the gender variable in the demand equation implies that male borrowers demand larger loans than female ones.

To sum up our conclusions, the demand function suggests that larger assets and profits, and higher levels of education are associated with larger loan demand. Male entrepreneurs, owners of enterprises and entrepreneurs in non-agricultural sectors also demand larger loans. As expected, the supply function implies that lenders grant larger loans at higher interest rates. Surprisingly, they grant larger loans for longer terms. Larger loan supplies are also associated with more profitable enterprises and entrepreneurs with higher education.

These results are important because they show that if small scale enterprises are profitable and are operated by educated entrepreneurs who demand external finance, and if these entrepreneurs are willing to pay higher interest rates, their chances of getting loans may improve because of special microenterprise programs. On the other hand, like commercial lenders these programs also face information problems which lead them to ration borrowers by characteristics of entrepreneurs and enterprises. If entrepreneurs hope to be successful in borrowing, they need to participate actively in financial markets and generate information that lenders find useful in making loan decisions. This is likely to be most difficult for those small, first-time borrowers who also have the most difficulty in getting commercial loans. Special programs, therefore, may ease the credit constraints for some borrowers but they do not resolve the rationing problem inherent in credit markets.

TABLE 1
DEFINITION OF VARIABLES

VARIABLE	DESCRIPTION
LD	Amount of Credit Demanded [a]
LS	Amount of Loan Granted [a]
IR	Nominal Interest Rate in Percent
MAT	Loan Period in Months
IL	Informal Loan Amount Received [a]
AST	Value of Assets Reported.[a]
PRFT	Amount of Profits for 1989 [a]
STRT	Number of Years in Business
OW	Ownership Dummy Variable; 1=Owner
NAGR	Sector Dummy Variable; 1=Non-Agriculture
LOC	Location Dummy Variable; 1=Coastal Region
EDUC	Education Dummy Variable; 1=High School Level or Above
SEX	Gender Dummy Variable; 1=Male
AGE	Number of Years of Entrepreneur's Age

a All values are in sucres.

TABLE 2
RESULTS OF THE LOAN-QUANTITY RATIONING MODEL

Maximum Likelihood Estimation Coefficients

	Demand		Supply	
Variable	Coefficient	T-Ratio	Coefficient	T-Ratio
IR	6,080.69	0.93	8,009.50	3.18***
MAT	-	-	11,435.38	2.43**
IL	0.01	0.07	-	-
AST	0.14	4.25***	0.01	-0.34
PRFT	2.23	2.04**	0.75	2.19**
STRT	-25,353.38	-0.73	9,051.96	0.82
OW	509,177.95	1.56*	28,746.95	0.28
NAGR	984,044.50	2.13**	33,367.17	0.23
LOC	-782,009.75	-2.99**	-41,751.62	-0.50
EDUC	415,348.57	1.51*	168,641.96	1.96**
SEX	502,843.08	1.86*	45,161.66	0.53
AGE	-11,061.86	-0.86	-3,083.99	-0.72
CONST	295,201.56	0.41	-77,892.88	-0.34
R^2	0.22		0.19	
F-Value	6.03***		5.28***	

N = 248 Observations
*** Significant at 1 percent level
** Significant at 5 percent level
* Significant at 10 percent level

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