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INTEREST RATE POLICIES AND BORROWING COSTS IN RURAL FINANCIAL MARKETS

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Abstract

Hidden costs are an important feature of credit transactions in rural financial markets of lesser developed countries. There is frequently a trade-off between explicit interest charges and implicit borrowing costs such that smaller borrowers experience relatively greater borrowing costs than larger borrowers in a low, subsidized interest rate setting. Implicit interest and explicit interest are found to be perfect substitutes, and lending institutions exercise loan rate differentiation through implicit charges to borrowers. Changes in the explicit interest rate have a differential impact by loan size.

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1. Introduction

The purpose of this paper is to investigate the nature and magnitude of borrowing costs imposed by lenders on agricultural borrowers in an environment of controlled and fragmented interest rates for loans, targeting or end-use requirements imposed by governmental authorities or international donors, and specialized lending institutions dealing with agricultural credit. In this environment lending institutions exercise price-setting or loan rate differentiation through the non-interest component of the price vector associated with loan operations. In so doing they consider the range of pre-determined explicit interest rates they can charge, over which they have a limited discretionary power, and the relevant features of the loan operation that can play the role of proxies for risk.

Using data from a farm level survey of clients of selected lenders in Honduras, it is found that non-interest borrowing transaction costs add approximately 3 percentage points to the average explicit interest rate. Transaction costs per loan are an increasing function of loan size, but with an elasticity of response below unity, thereby making transaction costs per currency unit (lempira) a decreasing function of loan size. Implicit interest (transaction costs) and explicit interest are found to be perfect substitutes. A one percent increase in the explicit interest rate leads to a one percent decrease in transaction costs per lempira and vice versa. This unit elasticity between implicit and explicit interest has a differential impact by loan size. A given change in the explicit interest rate creates a larger absolute change in the opposite direction in average transaction costs per lempira for smaller loans than for larger loans. Therefore the impact of a rise in the explicit interest rate will be relatively greater in increasing total borrowing costs for larger sized loans than for smaller sized loans.

Section 2 of the paper addresses the relevant theoretical issues involved in the analysis of implicit-pricing of loan funds and the implications for empirical work. A general formulation of a model is set forth and discussed in Section 3, along with some preliminary insights into the empirical results. In Section 4 a specific version of that model is presented and the main results of its estimation using multiple regression techniques are then discussed. Some concluding remarks and policy implications are outlined in the final section.

2. Loan Rate Differentiation and Implicit Pricing

Borrowers are seen by lenders as essentially non-homogenous. Each borrower has a different demand function for loanable funds and, more importantly, different borrowers have different risk characteristics and therefore different probabilities of repaying their loans. Since lenders are concerned with the expected return on loans which is a decreasing function of risk, they will be interested in using various "screening devices" with their borrowers [7], of which the interest rate would be the most important.

Thus loan rate differentiation is a necessary element of lenders' behavior if they are to maximize profits. Some literature on credit rationing has approached this issue by considering lenders as price-setting entities that optimize along the borrower's demand function [3], even though this price-discriminating behavior is not necessarily determined only by different demand elasticities. Different risk characteristics of customers, and, in this sense, different costs associated with the loan operation also play a role [2]. The price setting analytical model set forth below closely follows those presented by Jaffee and Modigliani [3] and Jaffee and Russell [4], with some additional extensions relevant for the purposes of this paper.

It is assumed that lenders maximize the expected value of their profits, π, which in a loan operation are given by:

$$\pi = LR[P] - LC \qquad (1)$$

where,

LR is the size of the loan contract given by:

R, the interest rate factor $R = 1 + r$, and

$L = L(R,\overline{W})$, the borrower's loan demand function faced by the lender. This function derives from a multi-period optimization in which the borrower behaves as price-taker, and where $\overline{W}$ represents the individual's resource endowment that influences the potential size of his/her investment projects. It is assumed that $L' = \delta L/\delta R < 0$

$P = P(L,R)$ is the likelihood of repayment (the λ function in Jaffee and Russell, [4]) which is conditional on the value of a minimum cost of default Z that determines the range of contract sizes over which default is observed.

$P(L,R) = 1$ if $LR \leq Z$

$P(L,R) < 1$, $P_L' < 0$, $P_R' < 0$, for $LR > Z$ 1/

where the prime denotes the partial derivative with respect to the variable that appears as a subscript. C is the cost of funds for the lender which is assumed constant (i.e. the marginal cost is equal to average cost).

Maximization of (1) with respect to the loan rate factor R gives the first order condition:

$$PL + PRL' + LRP_R' - CL' = 0 \tag{2}$$

which can be rearranged as

$$RP \left(L' + \frac{L}{R} + L \frac{P'R}{P}\right) = CL'$$

and then stated in terms of the elasticities of the loan demand function (η) and of the likelihood function (ε) with respect to the loan rate factor:[2/]

$$RP \left[1 + \frac{1}{\eta} (1 + \varepsilon)\right] = C \tag{3}$$

In other words, the expected marginal revenue is set equal to the marginal cost, therefore the optimal loan rate is determined by:

$$R^* = C/P\left[1 + \frac{1}{\eta} (1 + \varepsilon)\right] \tag{4}$$

That is, the loan rate would be optimally set considering the probability of repayment (P), the borrower's demand elasticity (η) and the response of P to changes in R (ε). In general form, R (and thus r) will be a function of loan demand and the probability of repayment, together with the perceived response of those functions to variations in R.

Note that under certainty of payment ($P=1$, $\varepsilon=0$) condition (3) reduces to the familiar result in monopolistic equilibrium:

$$R \left(1 + \frac{1}{\eta}\right) = C \tag{5}$$

The two basic reasons for loan rate differentiation are summarized in equation (4): first, as the likelihood of repayment, P, diminishes, i.e. <u>ceteris paribus</u> the loan becomes riskier, the interest rate factor R (and therefore r) will go up. Second, customers with different demand elasticities will be charged (everthing else constant) different rates. An additional element in (4) is the response of the probability of repayment to changes in R. However, its behavior will not be discussed here, considering the simplifying assumptions made with respect to the P function.[3/]

It is important to point out that pure monopoly price setting is not a necessary condition for this loan rate differentiation process. As asserted in Stiglitz and Weiss [7], many banks can compete by means of their choice of a price (interest rate) that maximizes their profits. However, the typical environment in which lenders perform their activities in lesser developed countries (LDCs) is characterized by institutional arrangements that constrain price-setting or loan rate differentiation. These restrictions are particularly strong in rural financial markets in LDCs where the targeting of credit flows to specified groups or end-use requirements for loan funds at concessionary (and controlled) interest rates prevail [1].

In this setting lenders, facing constraints on loan rate differentiation, will engage in "regulatory avoidance" or implicit-price setting [5]. This involves establishing different procedures for credit allocation, monitoring and supervision that create both lender and borrower transactions costs (see [1,6]). This amounts to exercising price-setting through the non-interest component of the price vector. Lenders are substituting the discriminatory application of loan procedures among borrowers for explicit loan rate differentiation. Also, to the extent that different sources of funds (international donors, government, etc.) allow lenders to charge slightly different loan rates, lenders will use their limited discretionary power on those rates to set their prices. This price setting procedure places borrowers into different "tracks", where the number and height of the obstacles to negotiate loans in each track (i.e. transaction costs) are controlled by the lending institutions, enabling them to ration out unwanted (risky) clients and ration in desired clients.

Furthermore, the lender can transfer the burden of transaction costs from himself to the borrower in the form of administrative charges, fees, documentation requirements and charges, compensatory balances, etc. Borrowers will experience a rise in their total borrowing costs equivalent to the implicit charges passed on by the lender. There is however, as Kane [5] points out, some degree of waste embodied in implicit pricing since this effort diverts economic resources from other uses. In the present context, this consideration implies that total borrower's costs will eventually differ from the actual revenue or total price perceived by the lender by the amount of that "waste". This wedge is neglected in the following analysis assuming that the behavior of borrower's costs indeed is reflecting accurately the differential loan rates (inclusive of implicit charges) that lenders impose.

In terms of the simple model developed above, the interest rate factor R should now be interpreted in the broad sense of including explicit and implicit interest, i.e. the rate r would consist of an explicit rate (i) and an implicit element (τ) which result from expressing borrowing transaction costs per loan on a percent basis. It is precisely this component of the total price that will be affected by the variables involved in equation (4), i.e. borrower's riskiness and demand conditions, since the explicit rate is bounded by the existing regulations.

A result of the foregoing discussion is that the loan demand curve and the average borrowing cost schedule are essentially the same locus in the (L,R) space, except for expectational errors due to imperfect information. Models that consider loan demand and average borrowing costs as essentially different schedules (e.g. Ladman, [6]) are unsolvable.

In summary, it is argued here that lenders in rural financial markets in LDCs are price-setters (of explicit and implicit interest charges) that take as given the profile of loan demand such as farm size, loan amount, enterprise type, and other characteristics of the borrower. Lenders then set explicit interest charges and, more importantly, establish differential administrative procedures that are in effect transformed into implicit charges (i.e. transaction costs for the borrower) according to these loan demand characteristics.

In what follows field survey results are investigated that show how agricultural lenders in Honduras have in practice adjusted their credit procedures to allocate credit in the context of various end-use requirements and a limited range of explicit interest rates within which they were able to operate. We will discover to what extent they in fact transferred transaction costs to borrowers according to selected features of the loan operation as proxies for risk.

3. A General Model and Some Empirical Results

A general formulation of the model used to test the relationships hypothesized in the preceding section is as follows:

$$T = T\ (B, i) \qquad (6)$$

where:

T is the borrowing (non-interest) transaction costs per loan

B is a vector of risk-related characteristics of the loan operation (loan size, farm size, end-use, etc.)

i is the explicit interest rate that can be charged on loans.

Transaction costs are defined here as all those non-interest explicit and implicit expenses incurred by the borrower in the process of obtaining a loan. These costs occur at different stages of the sequence of procedures established by the lending institution, in general: application and documentation, approval, and disbursement. Explicit expenses refer basically to the following:

(a) Cost of transportation, lodging and meals when travelling to the office of the institution granting the loan, or to other places with the purpose of obtaining related documents.

(b) Fees, taxes or other charges associated with the issuing of documents, registration of guarantees or collateral, contracts and the like.

(c) Other explicit charges imposed by the lending institutions in the process of handling the application.

The implicit transaction costs directly related to borrowing correspond to the value of the time foregone by farmers attributable to negotiating and securing their loan.

Components of B in the model refer to those proxies associated with risk. The key elements here from the point of view of the lender are farm size (associated with farm wealth and the capacity for loan recovery); the loan amount (the larger the amount the greater the risk); and loan use (enterprise type characteristics associated with different levels of farming risks, marketing risks, built-in collateral, etc.)

Data utilized in the field study came from a random sample of farm level clients of selected lenders in Honduras. The survey was undertaken in August 1981 and consisted of a total of 198 farmer-clients of which 104 had loans from the National Agricultural Development Bank (BANADESA), 52 from private commercial banks and 42 from small rural credit unions. Approximately one-half of the total sample of farm borrowers had loans less than 5,000 lempiras (i.e. $2,500 at the current exchange rate of two lempiras equal to one dollar). The average loan size however was close to 23,000 lempiras indicating a clear asymmetry or skewness in the overall distribution of loans.

Although the distribution of the clientele for each loan source overlaps to some extent, each can be clearly identified with respect to the predominant scope of their operations in terms of loan and farm size. Rural credit unions in Honduras are the classic small farmer loan source with most loans below 2,000 lempiras on farms typically less than 20 hectares. At the other extreme are the farmer-clients of the private commercial banks with the larger proportion of their loans over 25,000 lempiras on farms generally above 100 hectares. The national agricultural development bank (BANADESA) activity falls in between with a majority of its loan operations between 1,000 and 10,000 lempiras on farms largely between 10 and 100 hectares.

The aggregate results for the sample as a whole indicate that the various elements of borrower transactions costs added roughly three percentage points to the average explicit interest rate of 13 percent. This represents almost one quarter of the interest rate. More importantly however is the incidence of these borrowing costs by loan and farm size in the sample. Table 1, panels A and B, highlight the results of transactions or borrowing costs per loan and per lempira.

Transactions costs per loan are positively related to both loan and farm size, however, when one takes into account the size of the loan it can be seen that transactions costs per lempira are negatively related to both loan and farm size. In short the smaller the farm and the smaller the loan, the greater the relative importance of transactions costs per lempira.

4. Multiple Regression Model and Results

A more formal estimation of the determinants of total transaction costs was undertaken using a power function specification for the variables in question. The form of this specification is as follows:

$$T = \alpha A^{\beta} L^{\gamma} (i)^{\delta} e^{H} \quad (7)$$

and $$\tau = \alpha A^{\beta} L^{(\gamma-1)} (i)^{\delta} e^{H} \quad (8)$$

where $\tau = T/L$ (i.e. transactions cost per lempira).

and T = transactions cost per loan in lempiras.

A = farm size in hectares

L = approved loan amount in lempiras

i = the explicit interest rate

e = the base of the natural logarithms

$H = a_1 D_1 + a_2 D_2 + b_1 U_1 + b_2 U_2 + b_3 U_3$

with D_1 and D_2 dummy variables representing the deviation of T in private banks and credit unions with respect to BANADESA, the base or level of reference; and U_1, U_2 and U_3 being dummy variables defined to handle the deviations due to enterprise type or end-use of the loan in basic grains U_1, export crops U_2, and livestock U_3, with respect to the miscellaneous end-use category of all other end-uses in agriculture (land purchases, trade, vegetable crops, etc.). This specification was chosen in order to directly estimate the elasticities of transactions costs with respect to the proxies for loan risk and the explicit interest rate. At the same time the per lempira specification allows us to correct for any potential problem of heteroskedasticity.[4/]

The results of the ordinary least squares estimation for the log linear transformation of equation (7) are presented in columns 1, 2 and 3 in Table 2. Those corresponding to equation (8) are presented in columns 4, 5, and 6 of the same table. The two sets of estimated equations are consistent with each other, i.e. the exponents of loan amounts for equations 4, 5 and 6 are the same as for equations 1, 2 and 3, minus one. The signs, the magnitude and significance level of all the other coefficients are consistent with the previous discussion.

Among the more relevant findings is the fact that farm size is not significant. Dropping this variable from the equation does not change the overall significance and, in the end, simplifies the specification. This may be reflecting the fact that farm size does not constitute a good proxy for farmer's wealth in the Honduran setting, given the heterogeneity of land between and within different areas of the country. Another interesting finding is that transaction costs per loan are an increasing function of loan size. This can be seen in Figure 1 where this result is portrayed for reference. This finding contradicts the assumption made in some studies (e.g. Ladman, [6]) that transaction costs are independent of loan size. The behavior of these costs with respect to loan size highlights the cost economies evident in making larger sized loans. The elasticity of transaction or borrowing costs with respect to loan size is less than one (it ranges from 0.26 to 0.37 in Table 2) while the level of the explicit interest rate is a shift parameter in this relationship as can be seen in Figure 1.

As a consequence of the foregoing relationship, transaction costs per lempira is a monotonically decreasing function of loan size with the explicit interest rate as a shift parameter, as seen in Figure 2. In other words, for a given loan size, an increase in the interest rate that lenders charge would lead to a reduction of transactions costs per lempira.

The most interesting finding emerging from these data is that the elasticity of τ, transaction costs per lempira, with respect to the explicit nominal interest rate is not statistically different from minus one; the range of values obtained is -0.8662 through -1.0761 and the t-tests performed on these estimates indicate we cannot reject the hypothesis that the elasticity is minus one. This means that τ and i are perfect substitutes for each other, in the sense that a one percent increase in the explicit interest rate leads to a one percent decline in transaction costs per lempira.

An additional finding here is that this elasticity of τ to changes in i has a differential impact on the borrowing costs of different loan sizes. Figure 3 illustrates this point where loan size is the shift parameter in this diagram. The curve shifts downward (towards the origin) when loan size increases and upward (away from the origin) when the loan size decreases. At a given explicit interest rate i_o, a change in i will create a larger absolute change in the opposite direction in average transaction costs per lempira for smaller loans than for larger loans (see Figure 3).

This result implies that a rise in the explicit interest rate will create a relatively more progressive or equitable result in that this increase will reduce the absolute borrowing or transaction costs per lempira for smaller sized loans relatively more than for larger sized loans.

An evaluation of the change in total borrowing costs ($i + \tau$) brought about by a change in the explicit interest rate (i) that considers this offsetting effect on transaction costs (τ) can be seen below, for different loan sizes:

Loan Size (in lempiras)	$d(\tau+i)/di$
1,000	0.80
5,300 (median value in the sample)	.93
100,000	.99

Thus a one point increase in the interest rate will only create 0.8 of a point increase in total borrowing costs for a loan size of 1,000 lempiras and 0.99 of a point increase for 100,000 lempiras. The offsetting decline in non-interest borrowing or transactions costs is stronger for smaller sized loans.

With respect to differences between institutions, the results suggest that, *ceteris paribus*, it is more expensive for borrowers to deal with private banks and less expensive with rural credit unions than it is to borrow from BANADESA. In other words, the estimated functions shift upwards in the case of private banks and shift downwards when lenders are rural credit unions. The non-significance of the estimated coefficients for the dummy variables representing different end-use of loans suggest that lending institutions (probably well aware of the credit diversion phenomenon) do not consider this feature when setting up their different procedures.

5. Concluding Remarks

The issue of non-interest borrowing costs is an important feature of rural financial markets. This study illustrates how these non-interest borrowing costs in Honduras are significantly associated with loan size and represent (on a per lempira basis) a substitute for interest charges. It was found there was a differential incidence of borrowing costs by loan size such that a rise in the interest rate would have a greater relative effect in increasing total borrowing costs for larger than smaller loans and, conversely, a decline in interest rates would lower total borrowing costs relatively more for larger than smaller loan sizes. Subsidized credit programs therefore may have an inequitable effect on borrowers by loan size.

The price-setting framework utilized in this paper seems appropriate for the analysis of lender-borrower relationships in the LDC context. Further developments should emphasize the consideration of collateral requirements in the model and the improvement of linkages between the analytical model and its empirical counterpart.

FOOTNOTES

1/ Note that $P'_R = \delta P/\delta R < 0$ does not ensure $dP/dR < 0$ since the latter is given by $dP/dR = P'_L L' + P'_R$ where the first term to the right of the equal sign is positive (since $L' < 0$) thus making the sign of dP/dR indetermined.

2/ See the Appendix for the derivation of this expression.

3/ In particular the role of collateral, not considered here, may be important in determining the behavior of the likelihood of repayment and expected revenue.

4/ It was observed in fact, that, the variance of T increased for partitions of the sample of increasing loan sizes.

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APPENDIX

Equilibrium Condition for Expected-Profit Maximization

$$\pi = LR[P] - LC \tag{1a}$$

where $L = L(R,\overline{W})$

$$P = P(L,R)$$

maximizing with respect to R

$$\frac{\delta\pi}{\delta R} = PL + PRL' + LRP'_R - CL' = 0 \tag{2a}$$

where $L' = \frac{\delta L}{\delta R}$, $P'_R = \frac{\delta P}{\delta R}$

rearranging and factoring out RP

$$RP(L' + \frac{L}{R} + L\frac{P'_R}{P}) = CL' \tag{3a}$$

dividing through by L'

$$RP(1 + \frac{1}{L'}\frac{L}{R} + \frac{L}{L'}\frac{P'_R}{P}) = C \tag{4a}$$

then defining

$\eta = \frac{\delta L}{\delta R}\frac{R}{L} = L'\frac{R}{L}$, elasticity of demand for loan funds

$\varepsilon = \frac{\delta P}{\delta R}\frac{R}{P} = P'_R\frac{R}{P}$, elasticity of the probability of repayment with respect to R

The second element in parenthesis in (4a) can be recognized as $\frac{1}{\eta}$, and the third term in that parenthesis can be transformed into $\frac{\varepsilon}{\eta}$ by multiplying and dividing by (R). Then (4a) becomes

$$RP(1 + \frac{1}{\eta} + \frac{\varepsilon}{\eta}) = C \tag{5a}$$

which gives equation (3) in the text once $\frac{1}{\eta}$ is factored out within the parenthesis.

$$RP[1 + \frac{1}{\eta}(1 + \varepsilon)] = C \tag{6a}$$

Table 1. Borrowing Costs per Loan and per Lempira by Farm Size and Loan Size.

Panel A. Borrowing Costs, by Farm Size*

Farm Size Category (Has.)	Transaction Costs Per Loan (Lps.)	Interest Rate (%)	Total Borrowing Costs Per Lempira (%)	
			Approved	Disbursed
Less than 5	31.75	13	16.0	17.33
5.1 - 10	40.0	13	15.07	17.14
10.1 - 20	53.5	13	16.20	17.67
20.1 - 50	56.25	13	14.64	15.52
50.1 - 100	75.0	13	14.84	15.64
100.1 - 200	133.75	13.5	16.52	17.52
More than 200	149.25	13	13.82	14.02

Panel B. Borrowing Costs, by Loan Size*

Loan Size Category (Lps.)	Transaction Costs Per Loan (Lps.)	Interest Rate (%)	Total Borrowing Costs Per Lempira (%)	
			Approved	Disbursed
Less than 1,000	30.75	13	18.92	19.23
1,001 - 2,000	42.0	13	16.07	17.73
2,001 - 5,000	44.88	13	14.88	15.77
5,001 - 10,000	53.0	13	14.03	14.94
10,001 - 15,000	86.75	13	14.56	14.87
15,001 - 25,000	42.75	13.5	13.89	14.35
25,001 - 50,000	131.50	14	14.40	15.71
50,001 - 100,000	322.50	13	13.17	13.63
More than 100,000	1,414.50	11	12.09	12.36

Table 1 (continued)

*All values are median values. Therefore, the median values of total borrowing costs are not necessarily the sum of the median values of the separate transaction costs per lempira plus the median value of the interest rate, as they would be if mean values had been used.

Source: Survey results.

Table 2. Regression Analysis of Transaction Costs Per Loan and Transaction Costs Per Lempira. Estimated Coefficients in Different Regressions*

Explanatory Variables	Transaction Costs Per Loan Equations			Transaction Costs Per Lempira Equations		
	1	2	3	4	5	6
Area of the Farm	0.0758 (1.01)	0.0001 (0.0)		0.0758 (1.01)	0.0001 (0.0)	
Loan Amount	0.2621 (3.14)[a]	0.3387 (3.84)[a]	0.3658 (5.30)[a]	-0.7378 (-8.84)[a]	-0.6612 (-7.50)[a]	-0.6342 (-9.19)[a]
Interest Rate[+]	-1.0781 (-4.47)[a]	-0.9237 (-3.78)[a]	-0.8662 (-3.63)[a]	-1.0781 (-4.47)[a]	-0.9237 (-3.78)[a]	-0.8662 (-3.63)[a]
Loan Source:						
Private Banks	0.54 (2.20)[b]	0.59 (2.20)[b]	0.50 (1.93)[b]	0.54 (2.20)[b]	0.59 (2.20)[b]	0.50 (1.93)[b]
Credit Unions	-1.02 (-4.47)[a]	-0.83 (-3.11)[a]	-0.83 (-3.23)[a]	-1.02 (-4.47)[a]	-0.83 (-3.11)[a]	-0.83 (-3.23)[a]
Loan Use:						
Basic Grains		0.36 (1.36)	0.34 (1.36)		0.36 (1.36)	0.34 (1.36)
Export Crops		-0.34 (-1.09)	-0.38 (-1.28)		-0.34 (-1.09)	-0.38 (-1.28)
Livestock		0.49 (1.50)	0.45 (1.48)		0.49 (1.50)	0.45 (1.48)
Intercept	4.47 (5.01)[a]	3.42 (3.40)[a]	3.09 (3.32)[a]	9.07 (10.17)[a]	8.03 (7.97)[a]	7.69 (8.27)[a]
R-Square	0.43	0.47	0.46	0.46	0.49	0.48
F Value	26.66[a]	18.81[a]	22.20[a]	29.69[a]	20.80[a]	23.46[a]

Table 2 (continued)

*t-statistics in parentheses. Significance levels: a, 0.01; b, 0.05.

+t-statistics for the hypothesis $\delta=-1$ were computed with the following results: eq. 4: -0.3237; eq. 5: 0.3124; eq. 6: 0.5609. Therefore the hypothesis is not rejected in any of these cases.

List of Illustrations

Figure 1. Transaction Costs per Loan (T) and Loan Size (L), for Different Levels of Interest Rate (i).

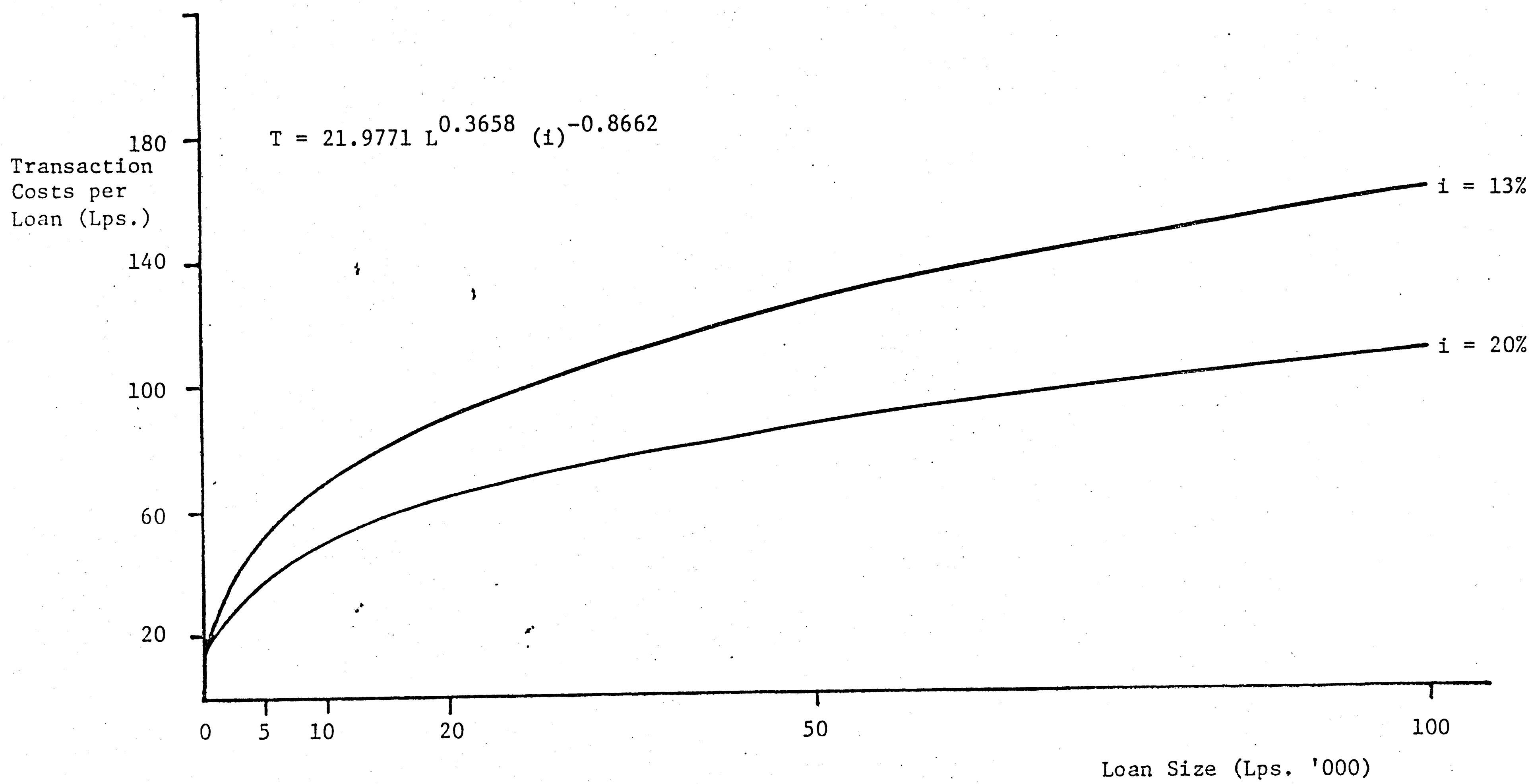

Figure 2. Transaction Costs per Lempira (τ) and Loan Size (L), for Different Levels of Interest Rate (i)

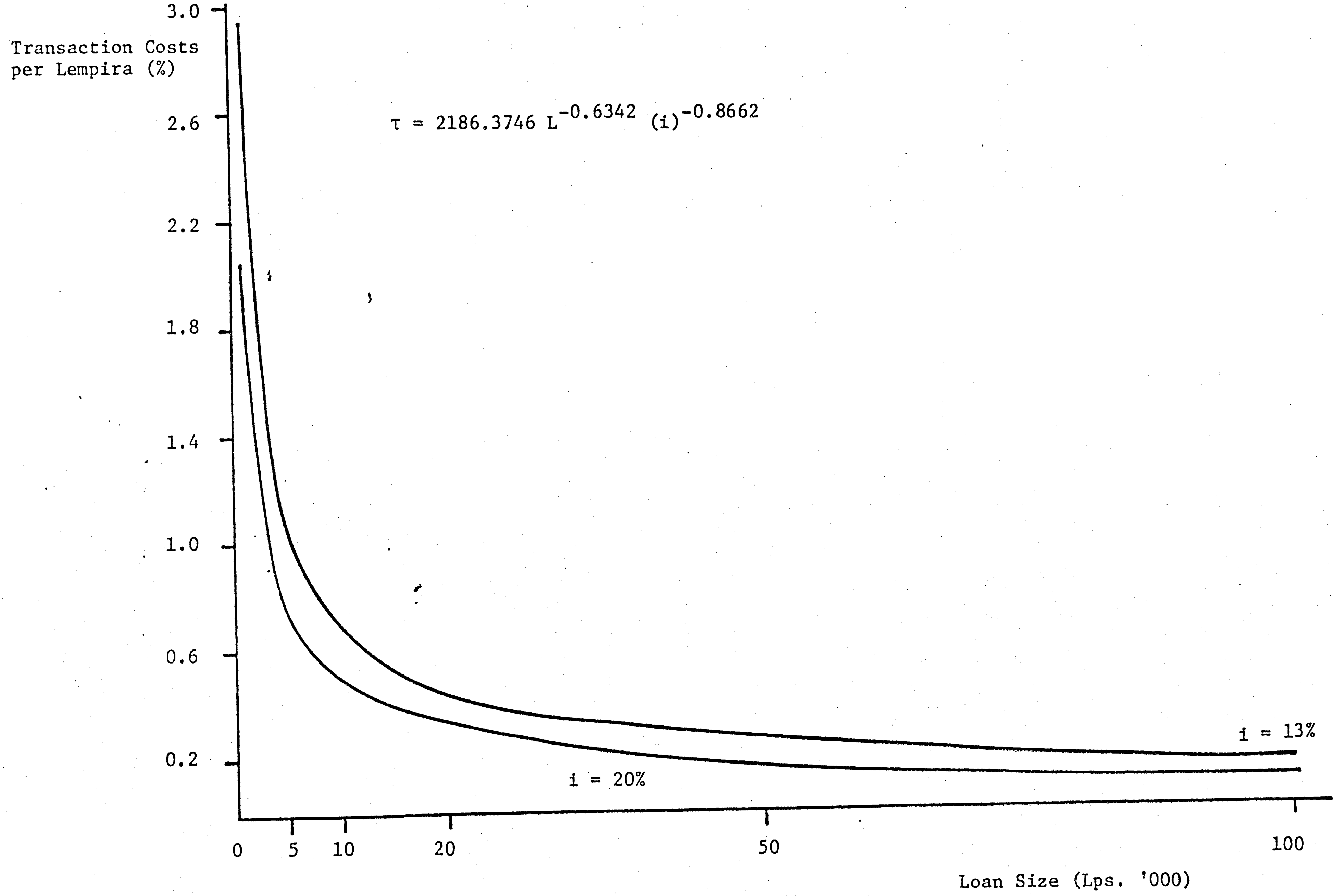

Figure 3. Transaction Costs per Lempira (τ) and Interest Rate (i), for Different Loan Sizes (L)