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CREDIT UNION POLICIES AND PERFORMANCE IN LATIN AMERICA

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Abstract

This paper explores empirical linkages between credit unions' (CUs') policies and their financial perfomance, as measured by loan delinquency and profitability, using a unique micro dataset of credit unions in three Latin American countries. The estimated translog profit function is generalized using a slack variable concept that parameterizes any systematic deviation from profit-maximizing behavior exhibited within the sample. In general, we find that performance depends in important ways on two types of CU policy variables, some associated with the incentives of borrowers to repay and others that affect the CU's ability to screen loans.

JEL codes: O54, G21

CREDIT UNION POLICIES AND PERFORMANCE IN LATIN AMERICA

This paper presents evidence of several hitherto unexplored linkages between the policies adopted by credit unions (CUs) and their performance, as measured by delinquency and profitability, for a unique dataset of CUs in Latin America. In general, we find that performance depends in important ways on two types of CU policy variables, some associated with the incentives of borrowers to repay and others that affect the CU's ability to screen loans. These findings have significant policy implications for economic development in Latin America.

1. Background

In most countries of Latin America, commercial banks have shown a great reluctance to serve the lower end of the economic spectrum—micro- and small enterprises and poor and working class households, which are the staple of the CU movement in the region.[1] Providing these historically underserved groups with better financial services offers the possibility of substantial efficiency and growth gains as well as positive equity effects.

Table 1 shows that micro- and small enterprises play a very substantial role in economic production in Latin America. This fact, together with a growing body of evidence that increased usage of banking services is associated with greater economic efficiency and growth, implies that better serving only the micro- and small enterprise part of the CU target population could yield

[1] Based on existing survey and other evidence, IDB (1995) estimates that less than 5% of Latin American microentrepreneurs have access to credit from the formal financial system. Magill (1991) and Richardson and Lennon (1994) discuss and present empirical evidence on the income level of households and the size of firms served by CUs in Latin America.

growth rate gains that are significant in macroeconomic terms.[2] Figure 1 additionally indicates that microenterprises alone involve about half of the labor force of the typical Latin American country, suggesting that macroeconomically significant employment gains may also be derived from easing constraints on microenterpise access to credit and other financial services.

In serving this clientele, CUs have an advantage over financial non-governmental organizations (NGOs) because, unlike the latter, CUs are full-service institutions, taking deposits as well as making loans. Financial NGOs, the other type of intermediary that has been widely promoted as a vehicle for providing financial services to poorer households and smaller business, generally are not permitted to take deposits and thus depend on limited external donor funds. Further, CUs may be superior to banks in loan screening and collection because neighbors may have better information about borrowers than bank credit officers and may also be better able to impose sanctions—including social sanctions—on delinquent borrowers (see Banerjee, Besley, and Guinnane, 1994).

Most CUs in Latin America were established between 1950 and 1980 with an explicit social welfare focus (Poyo, 1987). Many were organized by Catholic priests and Peace Corps volunteers. They generally lacked professional management, were weak at loan recovery and at earning and retaining profits for future expansion, and set loan rates low to benefit borrowing members. Low lending rates mandated low deposit rates; nevertheless, many CUs grew rapidly in this period, relying on substantial grants and soft loans available from external donors. With the elimination of

[2] For example, King and Levine (1993) find that a 10 percentage point rise in the ratio of private banking system credit to GDP is associated with an increase in the annual GDP growth rate of about 1/3 of a percentage point. Ghani (1992) finds an even larger growth effect, approximately ½ of a percentage point. Westley (1994) discusses several channels through which increased intermediation may result in productivity and growth rate gains. Jayaratne and Strahan (1996) find evidence of a positive linkage between financial intermediation and economic growth.

most of these donor funds in the 1980s and 1990s, the CU movements in many of these countries foundered, leading to the situation depicted in Figure 2. In those few Latin American countries where the CU movements have regained vigor, the key to their success has generally been an aggressive campaign to mobilize savings, combined with much stricter attention to delinquency control and a policy of earning and capitalizing profits. While successful deposit mobilization is largely a question of appropriate pricing, delinquency and profitability are more complex matters that—despite their importance—have been largely overlooked in previous studies of Latin American CUs.

2. Conceptual and Empirical Framework

For CUs, as for other firms, profits are important to help build a capital base, both for future expansion and to buffer negative shocks and thereby foster long-run survivability. Delinquency, in turn, has been a leading cause of CU losses and insolvency.[3]

CUs that suffer delinquency rates above 5-10 percent see an immediate impact on their incomes as loans go uncollected. Their administrative costs may also rise sharply, since the collection of bad loans is generally the most expensive component of the lending cycle. Equally debilitating in the long run are the adversarial client relationships that can develop, undermining a base of customer loyalty. In addition, at high delinquency rates, a contagion effect may develop. If some borrowers become aware that many others are not repaying, they may consider defaulting as well, reasoning that the CU is not in a position to punish delinquency very strongly. Liquidity crises may also erupt as delinquency worsens, forcing the CU to borrow expensive short-term

[3] Huppi and Feder (1990, p. 196) note that for CUs in the developing world in general, "high delinquency rates have been the primary reason for failure."

money—damaging profits— and/or causing restrictions in lending. Such restrictions may further increase delinquency, especially for borrowers in need of a rollover. A vicious circle can result, with increased delinquency exacerbating the liquidity crisis, and vice-versa. Finally, weak loan recovery undermines a CU's growth by reducing available funds with which to extend new loans.

Turning to profitability, credit unions are cooperatives that may attempt to maximize profits only in a conditional sense or perhaps not at all. Smith, Cargill, and Meyer (1981) and Smith (1984) propose a framework that depicts how CUs might set their loan and deposit rates. A *borrower-dominated* CU—run to maximize benefits to its borrowers—might minimize its loan rate subject to the sustainability constraint of nonnegative profits. Such a CU can best achieve this goal by operating efficiently in all ways so as to maximize profits and then use the full amount of those profits to subsidize loan rates. While the CU would earn zero profits, this would be the maximum possible profit level conditional on the price vector chosen. Similarly, a *saver-dominated* CU may act to maximize profits and then use any positive profits to subsidize the rate paid on deposits. CUs that are balanced somewhere between the interests of savers and borrowers may also find it in their interests to be efficient given whatever combination of supra-market deposit rate and sub-market loan rate emerges from the quasi-bargaining problem between the two groups.

Even these descriptions of CU behavior may be too idealized if, for example, CUs fail to control costs or push outputs to optimal levels. This may occur because CUs often do not suffer capital outflows in response to suboptimal profit levels, as many members—especially those lacking other sources of financial services—will stay and even contribute additional share capital if they receive sufficient benefits. In addition, directors and managers often lack management skills and

financial sophistication, as do the members who elect the governing board.[4] A common result is a reactive management style that may overlook one or more of the long-run fundamentals of financial management, cost controls (including limits on managerial perk taking), and member services. In addition, CUs that are borrower dominated may choose to keep loan rates high but be lax on loan collection as an alternative way to benefit the borrowers, and one that yields less than maximum profits at the given vector of prices. We test whether the CUs are conditional profit maximizers using the generalized profit functions described below.

Delinquency Equation

A number of previous studies report attempts to estimate delinquency (or "scoring") equations for selected components of commercial bank lending.[5] There appear to be no published studies estimating delinquency equations for CUs, in either the developed or developing country literature. Our delinquency equations differ from the bank scoring literature in our emphasis on financial institution policy variables and the incentives these policies create for borrowers to repay. The high delinquency rates in our sample (averaging nearly 20 percent) despite generally favorable macroeconomic conditions suggests that repayment may depend more on borrowers' *willingness* to pay than on *ability* to repay. Willingness to repay, in turn, should respond to incentives created by the CUs' choice of policies, as discussed below. By contrast, the bank scoring literature focuses

[4] It is because the board of directors and management frequently lack skills and knowledge, yet often possess a great desire to serve their members, that CU strengthening programs such as those alluded to below in Section 3 can be so valuable.

[5] For the U.S. literature, see for example Avery *et al.* (1996), Asch (1995), and Boyes, Hoffman, and Low (1989), and references contained therein. For developing country scoring functions, see for example Viganò (1993) and the references contained there.

largely on borrower characteristics such as financial ratios that measure ability to repay.

The dependent variable in the delinquency regressions is the share of the loan portfolio with any payments one day or more overdue, as of the end of the year.[6] Table 2 defines the regressors. All explanatory variables measure average conditions during the preceding 12 months, which shape both borrower decisions to default and the more recent loan selection decisions (the average loan term being about 20 months).[7] Hypotheses on the determinants of CU delinquency rates are as follows, where the anticipated sign of each coefficient is denoted in square brackets.

a) Real deposit rate (RSDTD)[-]. Higher real deposit rates motivate loan repayment in two ways. First, to the extent that borrowers maintain or may eventually desire to maintain deposits, higher real deposit rates increase borrower incentives not to lose access to the CU's savings services by defaulting, since these services have greater value at higher real rates. Second, by improving deposit mobilization, higher real deposit rates reduce the often severe problem of loan rationing, thus increasing a non-defaulting borrower's probability of obtaining future loans when (s)he would like one. Reducing loan rationing may also discourage a culture of insider lending, favoritism, and even corruption—a culture that can result in poor loan selection, weak collection efforts, and high delinquency rates.

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[6] This is the definition used in reported figures for Guatemala in 1993-94 and for Bolivia. Honduras used a 60-day cutoff in all years and Guatemala a 30-day cutoff in 1992. To adjust for these various cutoffs, we added 6 percentage points to Honduras' reported delinquency rates and 3 percentage points to Guatemala's 1992 rates prior to the regression analysis (these adjustments being based on data from a sample of credit unions in which delinquency rates were calculated with multiple cutoffs). We also ran regressions with adjustment factors of 4 percent and 2 percent, respectively, and with no adjustment at all, the last on the hypothesis that behavior adjusts to whatever the delinquency definition is, so that Bolivian CUs press their members just as hard on the first day of delinquency as the Honduran CUs do on the 61st day. These changes in the dependent variable had little effect on the regression results.

[7] The sign and significance of our results are robust to using two-year averages for independent variables instead of one-year measures.

b) CU effective loan rate minus commercial bank loan rate (ILDIFE) [±].[8] Lower CU loan rates may discourage repayment by creating a condition of excess credit demand, thus increasing the likelihood of future loan rationing and the culture of insider lending referred to above. On the other hand, the direct savings are lower when a borrower defaults on a low interest rate loan. Also, following Stiglitz and Weiss (1981), lower lending rates may avoid an adverse selection of borrowers and thus contribute to lower delinquency rates.[9]

c) Ratio of the CU's average wage rate to the average wage rate prevailing in the country's financial sector (RELWAGE) [-]. Underlying this variable is an efficiency wage hypothesis. A chronic problem in CUs in Latin America is that wage levels are often held down by a membership that compares their own income levels with those of the CU officials. Low CU wage levels relative to those paid elsewhere in the financial sector may result in low effort and morale, high turnover, and a general inability to recruit and retain high quality staff.[10] Poorer loan selection and weaker recovery efforts may result, implying higher delinquency rates.

d) The CU's return on assets, lagged one year (ROA1) [-]. ROA is a measure of the CU's financial health. Incentives to repay loans diminish if borrowers believe the CU may not survive to offer credit and savings services in the future, or may only survive with greatly diminished capacity

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[8] The effective loan rate refers to the fact that most CUs in our sample require that the borrower deposit a certain fraction of the loan amount in a share deposit account. The effective loan rate is calculated as the ratio of the amount of net interest paid to the net loan proceeds.

[9] In the regression analysis, we consistently find that the first set of arguments prevails, with CU loan rates always negatively associated with CU delinquency rates. A significantly negative coefficient is also consistently obtained when the effective CU loan rate appears in the regression in real terms instead of in the ILDIFE difference form.

[10] Arbuckle (1994, p. 34) notes that in the case of Honduras, "The biggest obstacle to rational personnel policies is the fear of board members that General Assemblies may protest that high performing managers and staff are too highly paid."

to offer loans, for example. While ROA is not a policy variable, it reflects a variety of policy variables such as those discussed here and formally tested in the next section.[11]

e) Severity of default sanctions. Two variables reflect this factor. Loans collateralized with real or movable property (MORTMOVE) should have lower default rates than signature loans because of the additional threat to the borrower's assets. The length of grace period (GRACE) before late loan charges (penalty rates) are applied should be positively related to the delinquency rate, both because of the direct monetary incentive to borrowers contemplating temporary or potentially temporary default and as an indicator of how seriously a CU treats delinquency overall.

f) Lags in financial reporting [+]. This factor was measured in two ways: the number of months between financial reports (FINPERIOD) and the number of days after the close of the month or other accounting period before financial reports are ready (FINLAG). A large value for either variable is an indicator of lax management in general and may indicate the lack of a serious repayment culture. While most CUs prepare financial reports every month, some have intervals of two, six, or even 12 months between reports. And while the average CU has its financial reports ready about 12 days after the close of the previous accounting period, in some CUs the delay is as long as 40 days.

g) Percentage of loans more than one year overdue that are charged off (CHARGE-OFF) [-]. This variable may provide an additional measure of whether a CU deals with delinquency in a serious manner. While loans more than one year overdue should generally be charged off, many CUs

[11] While there are many measures of financial health, profits are followed with special interest by CU members, who normally hold an annual assembly around March to set dividend distributions from the preceding year's profits. Intra-year profit reports are prepared in some of the better CUs but are not normally available to the membership, who we also assume are not financially sophisticated enough to gauge ROA in the current year by any better measure than last year's value. When current year ROA is used in the regression (using 2SLS because of the endogeneity of ROA), it is less significant than ROA1. When ROA1 is used, OLS is used since lagging eliminates the simultaneity problem.

keep them on the books much longer.[12]

h) The ratio of loans to employees (LOANS$/EMP) [+]. The stock of loans in December, 1993 dollars per CU employee is an inverse measure of the human resources available to do loan screening, administration, and collection. We expect more resources to reduce delinquency.

i) Natural log of the population of the town in which the credit union is located (LNPOPM) [+].[13] We expect delinquency rates to be higher in cities than in small towns, reflecting the greater social controls that operate in the latter and the fact that rural credit unions in our sample of countries suffered huge losses in donor-sponsored, small agricultural lending programs, which ended shortly before our sample period. The memories of these losses were still vivid, and so credit unions were likely to have been exercising special caution in their lending to agriculture and agriculture-related activities. In addition, the 1994 coffee price boom and the generally solid growth of real agricultural value-added during the sample period years should further strengthen loan repayments in rural CUs.

Profit Equation

Following Hancock (1991), we estimate a short-run translog profit function as shown in equation (1), together with all but one of the five share equations (2), subject to the usual homogeneity and symmetry constraints in (3) and (4).[14] Our profit function is based on the

[12] The fact that credit unions with higher values of CHARGE-OFF purge their loan portfolios more thoroughly of very overdue loans may contribute in a purely mechanical way to reducing measured delinquency rates (reducing the numerator and denominator of the delinquency ratio by equal amounts). This may be an alternative or an additional explanation to the one offered in the text.

[13] Or the log of the weighted average of the town populations if the credit union has branches; see Table 2.

[14] For other studies estimating bank profit functions see Berger, Hancock, and Humphrey (1993) and the references contained therein. The only study we know of that estimates a profit function for CUs is Beshouri and Glennon (1996), which uses a sample of U.S. CUs and a loglinear profit equation. Our profit function is short-run because the quantity of fixed capital, x_F, is used rather than its price.

intermediation model of Klein (1971) and Sealey and Lindley (1977), extended to include several policy and other variables as intercept shifters (the S_q terms in equation (1)). It is also generalized to include slack variables c_i reflecting possible deviations of CUs from optimizing behavior, as discussed above. Estimates are presented with and without these slack terms, which parameterize the discrepancy between the actual and profit-maximizing quantities of netputs in a manner analogous to Mester's (1989) separable-expense-preference cost function.[15] Table 2 defines the variables, which include the real prices p_i of two outputs (loans and investments) and three inputs (deposits plus borrowing, wages, and materials).

$$\ln\pi = A + \sum_{q=1}^{\cdot} d_q S_q + \sum_{i=1}^{\cdot} a_i \ln p_i + a_F \ln x_F + 1/2 \sum_{i=1}^{\cdot} \sum_{j=1}^{\cdot} b_{ij} \ln p_i \ln p_j + \sum_{j=1}^{\cdot} b_{jF} \ln p_j \ln x_F + 1/2\, b_{FF} (\ln x_F)^2 + \ln[1 + \sum_{i=1}^{5} c_i (a_i + \sum_{j=1}^{5} b_{ij} \ln p_j + b_{iF} \ln x_F)] + v \qquad (1)$$

$$\frac{p_i x_i}{\pi} = (a_i + \sum_{j=1}^{5} b_{ij} \ln p_j + b_{iF} \ln x_F)(1 + c_i)/(1 + \sum_{k=1}^{5} c_k [a_k + \sum_{j=1}^{5} b_{kj} \ln p_j + b_{kF} \ln x_F]) + v_i \quad \text{for } i=1,...,5 \qquad (2)$$

$$\sum_{j=1}^{5} b_{ij} = 0 \quad \text{for } i=1,...,5 \; ; \quad \sum_{j=1}^{5} b_{jF} = 0 \; ; \quad \sum_{i=1}^{5} a_i = 1 \qquad (3)$$

[15] The derivation, employing Hotelling's lemma, is available from the authors upon request. Following Hancock (1991), we define quantities of inputs as negative numbers, so input shares in equation (2) are negative as required by Hotelling's lemma.

$$b_{ij} = b_{ji} \qquad \text{for } i=1,...,5 \text{ and } j=1,...,5 \qquad (4)$$

A fixed constant was added to all real prices except wages (100) and to profits (10^6) before taking logs, to ensure positive argument values; this procedure is standard and does not bias the results (see for example Berger, 1993 and Gropper, 1991). To facilitate interpretation of the results, the five price variables and the fixed capital variable were centered around their sample means after taking logs.

Equation (1) is the ordinary translog profit function supplemented by the ln[1 + ...] term at the end, containing five c_i parameters. The c_i are markup factors: if a (conditional) profit-maximizing CU would have used/produced x_i^* of the ith netput, a slack (non-maximizing) CU would use/produce $(1 + c_i)x_i^*$ instead, where c_i is constant across CUs but may take different values for each netput. Given the log form of the profit function, the bracketed [1 + ...] term in equation (1) is the factor by which profits are reduced in the slack CU as compared to the profit-maximizing one, to reflect the fact that the former might, for example, use more inputs or produce less outputs than the latter. If the slack coefficients are all zero, the interpretation would be that, although CUs may not maximize profits unconditionally, they are efficient in the sense that they maximize profits conditional on the vector of prices they select, and thus their profit-price vector is located on the profit frontier. Such a finding would be consistent with the Smith, Cargill, and Meyer (1981) model, discussed above.

3. Sample and Estimates

The model was fitted to a new and unique dataset that enables the preceding issues to be empirically addressed for the first time. Two to four years of annual data at the CU level were collected on 58 CUs distributed across three Latin American countries: Bolivia, Guatemala, and Honduras.[16] The International Monetary Fund's International Financial Statistics provided most of the macroeconomic series, occasionally supplemented by data from national sources. The technical assistance team of the World Council of Credit Unions (WOCCU) in each of the three countries provided balance sheets, income statements, delinquency data, locality population data (based for each country on a recent population census), and a classification of each CU as either borrower dominated, saver dominated, or neutral.[17] Other data were collected by survey, as described below. The existence of accurate financial information was directly attributable to the CU strengthening programs carried out by WOCCU since 1987 in Guatemala and Honduras and since mid-1993 in Bolivia.[18]

A 17-page written survey questionnaire, filled out by the manager of each participating CU (or occasionally his/her delegate), provided information on that CU's delinquency control measures;

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[16] The countries, CUs, and years selected were those for which reasonably accurate and consistent balance sheet, income statement, and delinquency rate data were available.

[17] This categorization was subjective but based on intimate knowledge of the politics of each CU. The subjective classification was corroborated by loan and deposit rate data. Neutral CUs are those roughly balanced between the interests of savers and borrowers.

[18] The great diversity both within and across countries in the success of these programs in strengthening financial discipline and management imparted a huge range of variation to many variables in our dataset. For example, delinquency rates varied from a low of 1.3 percent for a CU in Guatemala to a high of 49 percent for one in Bolivia. In general, the delinquency and profitability performance of the Bolivian CUs was the weakest (reflecting the recency of the strengthening program there), while that of Guatemalan CUs was the strongest, particularly with regard to delinquency.

the breakdown of its loan portfolio by sector, type of guarantee, and branch; loan and deposit rates; wages and employment; and data on membership and the number of banks and other financial institutions in the same locality. Of the 69 CUs surveyed, 58 responded in usable form. This high 84 percent response rate is attributable in part to the efforts of the WOCCU technical assistance teams, which distributed and collected the surveys, and exhorted CUs to fill them out thoroughly and accurately despite the four to six hours it normally took to do so. A telephone follow-up was made with every participating CU by one of the authors to fill in and verify any missing or suspicious-looking information. Given that a few isolated problems were later discovered with some of the balance sheet and income statement information, data for 55 CUs were ultimately used in this study: 18 in Bolivia, 15 in Guatemala, and 22 in Honduras. With certain averaged and lagged variables consuming the first observation for each country, our regressions are based on data for 1994 in Bolivia and for 1992-94 in Guatemala and Honduras, with a total of 126 observations. Table 3 reports summary statistics for the data.

Empirical Results: Delinquency

Table 4 indicates that each regressor had the anticipated sign in the delinquency equation, consistent with the hypotheses delineated above. The fit was reasonable, with an R^2 exceeding 0.56 in each of the three regressions. The results were found to be robust with respect to alternative specifications. For example, alternative measures of CU health, such as the growth of the number of members, real assets, or real voluntary (savings plus time) deposits, all had the same sign as ROA1 but were less significant. Similar results were obtained when loan and deposit rates were used in real terms (deflating by the December-to-December increase in the local consumer price index)

or as the difference between nominal CU and commercial bank rates. Similarly, deposit rates could be based on voluntary (savings plus time) deposits only or could also include share accounts.[19] Including country or (country x year) dummies made little change to the other regression coefficients, and these dummy variables were insignificant both individually and as a group. Dropping all observations for Bolivia (on grounds that the data were less reliable there) did not change any of our conclusions, and a Chow test indicated that the regressions were the same with and without these data points.

Overall, the results indicate that delinquency is significantly related to two types of CU policy variables, reflecting the incentives of borrowers to repay and the CU's ability to screen loans. Of these, the first group of variables is particularly numerous and important, implying that CUs have substantial scope to motivate borrowers to choose to repay. This finding is consistent with a conceptual framework in which borrowers choose between timely repayment and default on the basis of expected lifetime utility, trading off the value of not repaying principal and interest on the current loan against the value and probability of obtaining future loans, of using other potentially valuable credit union services such as savings facilities, and of avoiding sanctions.

From the descriptive statistics given in Table 3 and the regression coefficients in Table 4, it is easy to see that reasonable size changes in the explanatory variables are associated with numerically important changes in the delinquency rate. For example, 10 percentage point increases in CU deposit and loan rates reduce delinquency rates by 3 and 4 percentage points, respectively. Increasing ROA1 by 0.10 (a reasonable increment since this variable ranges from -0.30 to 0.11)

[19] In share accounts, the funds are not available to members until they leave the CU. None of the CUs were permitted to offer demand deposits.

reduces delinquency by 3 percentage points. A 20 percentage point increase in the share of the loan portfolio collateralized by real or movable property is associated with a fall in the delinquency rate of 1.5-2 percentage points. Increasing relative CU wages (a variable ranging from 0.27 to 1.68) by 0.5 reduces delinquency by 3 to 5 percentage points.

Empirical Results: Profits

The estimated profit equations are shown in Table 5 both with and without the slack terms c_i. Instead of denoting the netput prices as $p_1,...,p_5$, they are, for ease of identification, denoted as p_h, p_l, p_d, p_w, and p_m, which are the prices pertaining to investments, loans, deposits plus borrowing, wages, and materials, respectively. Intercept shifters, defined in Table 2, are denoted in uppercase.

Many of the variables that were significant in the Table 4 delinquency regressions are also significant in the profit regressions, including deposit, loan, and wage rates; FINPERIOD; and LNPOPM. The variable MORTGAGE in Table 5 is a variant of MORTMOVE from Table 4 (the latter including loans collateralized by movable as well as real property). Still, several variables that were significant in the delinquency regressions are not significant in the profit regressions. This likely reflects multicollinearity in the translog profit regressions, which have some 40 parameters, including quadratic and cross-product terms.

We find that higher values of FINPERIOD and LNPOPM reduce profits, as expected, since they are also associated with higher delinquency rates (Table 4). Longer periods between financial statements (i.e., higher values of FINPERIOD) may also diminish the CU's ability to control costs and thus further contribute to reducing profits.

Increasing the share of the loan portfolio backed by real property guarantees is found to

reduce the delinquency rate, but has a nonmonotonic (inverted "U" shaped) effect on profits as shown by the coefficients of MORTGAGE and $(MORTGAGE)^2$. Profits are estimated to be an increasing function of mortgage guarantees up to 39 percent of the total portfolio, which is essentially the sample mean. One implication of this result, which is quantitatively robust across alternative specifications, is that many CUs secure more loans with a mortgage than is profit maximizing. One possible explanation is that the additional administrative costs of processing such credits outweigh the benefits of enhanced loan recovery (via either higher repayment rates or collateral forfeiture).

SAVER and NEUTRAL are dummy variables that equal unity when the CU is saver-dominated or neutral, respectively, and zero otherwise. While SAVER is usually significant in the profit regressions, NEUTRAL is much less often so. We might expect these variables to affect profits positively through the delinquency channel, since borrower-dominated CUs would likely not only subsidize loan rates but also be less strict about loan collection. Point estimates of coefficients for SAVER and NEUTRAL are consistently negative but not significant in the delinquency regressions. The significance of SAVER in the profit regressions but not in the delinquency regressions is somewhat puzzling and may be due to the fact that only 11 percent of the CUs are classified as saver dominated, making it difficult to clearly identify the impact of this variable in either regression. Our fieldwork suggests an alternative or perhaps additional explanation as well. Most of the CUs in these countries were originally borrower dominated. Those that later became saver dominated usually also came to understand the importance of savings mobilization and of other complementary principles, such as managing the CU on a more business-like basis, which includes earning (and capitalizing) profits to buffer negative shocks and help fuel growth.

The four remaining intercept shifters are macroeconomic variables. The inflation rate (INFLAT) is the most significant of the four, possibly reflecting the following explanation. With a given percentage reserve requirement, bank spreads tend to widen as nominal interest rates rise with inflation. This tendency is reinforced if reserve requirements are increased, as they commonly are, to combat higher inflation. Since none of the CUs in this study were subject to reserve requirements, higher inflation rates tend to improve the competitive position of CUs *vis-a-vis* commercial banks, and thus CU profitability.

The growth rate of real GDP (GGDP) has the expected positive effect on short-run profits, reflecting the presence of fixed capital in our profit function and perhaps of fixed overhead costs that do not vary with cyclical increases in business volume (e.g., building rent, equipment, software, insurance, etc.).[20] During cyclical upturns, employees may also work harder to accommodate the increased volume, resulting in higher labor productivity.

The absolute value of the percentage change in the real effective exchange rate (AREERCH) captures a major source of relative price change in these small, open economies. Larger changes may cause private firms to cut back on planned investments as they sense greater macroeconomic volatility.[21] This may lessen the demand for CU loans and hence reduce profits.

The last macroeconomic variable, CRBOOM1, is defined by the formula given in Table 2. It measures whether the lagged increase in nominal commercial bank credit was sufficient to roll over all old credits and their interest payments and to meet the demand for all new credit arising from the growth of real GDP. Larger increases than this in credit yield positive values for

[20] Most of the variation in our sample is cyclical, rather than cross-country. The average sample-period values of GGDP for Bolivia, Guatemala, and Honduras are 4.24, 4.24, and 3.60 percent, respectively.

[21] On the linkage between real exchange rate volatility and aggregate investment, see for example Edwards (1989).

CRBOOM1 (i.e., a credit boom); increases below this level yield negative values (a credit crunch). The underlying hypothesis is that CUs get caught up in credit booms along with the banks and expand their employment to accommodate the increased business volume.[22] The year after the credit boom, when economic conditions are often less buoyant, a CU may have difficulty cutting back on this additional capacity—because of restrictive labor laws and the social orientation of the CUs—and hence suffer reduced profits. Conversely, in response to a credit crunch, a CU may initiate cost-cutting measures that improve profits in the following year, especially if the economy recovers in the same year. The significantly negative sign of CRBOOM1 is consistent with this hypothesis.

Monotonicity of the profit function requires $\partial \ln \pi / \partial \ln p_i$--which equals a_i at the point of sample means--to be positive for output prices and negative for input prices. However, since posted loan rates are used in this study to allow prices and other variables to affect profits through the delinquency channel, the standard monotonicity condition need not hold as a formal requirement for all price variables. As shown in Table 5, monotonicity does hold for the loan price variable at the point of sample means, as it should in view of the earlier result that higher loan rates imply lower delinquency rates. Contrary to the standard monotonicity result, wages had a positive and generally significant coefficient in every profit regression we ran, a strong efficiency wage result that derives from the salutary effect of higher wages on delinquency and may also reflect improvements in management, effort, morale, and turnover costs that accompany higher wages. Similarly, higher deposit rates are often associated with higher profits, as in regression 4, consistent with the hypothesis that higher deposit rates motivate loan repayment.

The point estimates for the regression 5 slack parameters, c_d and c_l, are -0.52 and -0.41,

[22] We use bank credit and loan rates because we do not have good aggregate statistics for CU loan rates in any of the three countries.

respectively. These values indicate that, compared to an efficient (conditional-profit-maximizing) CU, the average CU in this sample maintained about 50 percent less deposits and 40 percent less loans.[23] These and other estimates rather consistently support the hypothesis that the CUs in this sample were mobilizing less in deposits, making less in loans, and generally using/generating less of all five of the inputs and outputs than an efficient CU would at the given vector of prices. This reduced scale may reflect administrative inefficiencies, perhaps in such areas as deposit mobilization, loan extension and collection, and personnel and overall management of the institution. The regressions are far less consistent, however, in their estimates of the percentage shortfalls, with many of the estimated values not statistically significant.

Like those of the delinquency regressions, R^2 values for the profit equations generally range from 0.55 to 0.60. In general, the inclusion of the share equations did not greatly alter the parameter estimates but did tend to improve their precision, especially when the iterated SUR (seemingly unrelated regressions) estimator was employed. Estimating delinquency equations jointly with the profit functions (and associated share equations) using iterated SUR made very little difference to either the delinquency or the profit functions, as compared to estimating each in isolation.

4. Conclusion

This paper has presented a conceptual framework for explaining credit union (CU) loan delinquency and profitability in developing countries, together with empirical estimation for a unique sample of Latin American CUs. Delinquency and profitability were found to be responsive to the incentives that CUs create for their borrowers to repay loans. These incentives include loan

[23] When slack profit regressions were run with only the c_1 parameter, the estimated values for c_1 clustered around -0.1 with standard errors of less than 0.05. Estimating profit functions with more than two slack parameters gave erratic results and a high frequency of non-convergence problems.

and deposit rates, the use of loan collateral, the extent to which the CU maintains a serious culture of loan repayment, and in the case of delinquency the financial health of the CU. Certain other CU policy variables that operate only partially through borrower incentives were also found to have important effects on delinquency and profitability, including especially the CU wage rate.

Profitability was examined using a translog profit function, extended to reflect two types of inefficiency. One type of departure from profit maximization involved the CU's decision to alter prices (loan or deposit rates) to favor borrowers or depositors. More general departures from efficiency were modelled using a slack variable concept capable of parameterizing inefficient combinations of any inputs and outputs. Within both frameworks, CU price and delinquency control policies were found to be important determinants of profitability. So important was delinquency control to maintaining profitability that higher wage rates and often higher deposit rates were found to *increase* profitability in part because of their beneficial impact on loan repayment, despite the fact that raising these rates directly increases costs.

The issues addressed in this paper have important policy implications for the successful operation of CUs in developing countries and thence for overall economic development. Although economic theory has long suggested certain of the observed linkages, these hypotheses have not yet been widely accepted by industry practitioners in the sample countries. Direct observation of their importance has been previously hampered by the unavailability of sufficiently complete or reliable data; the recently developed dataset used here, incorporating a blend of financial reporting and custom surveys, has permitted an unprecedented test of these issues.

REFERENCES

Arbuckle, Lee (1994), "The Road to Success: Another Crossroads," processed, FACACH, Tegucigalpa, Honduras.

Asch, Latimer (1995), "How the RMA/Fair, Issac Credit-Scoring Model Was Built," Journal of Commercial Lending, June, 10-16.

Avery, Robert B., Raphael W. Bostic, Paul S. Calem, and Glenn B. Canner (1996), "Credit Risk, Credit Scoring, and the Performance of Home Mortgages," Federal Reserve Bulletin, 82, 621-648.

Bank of Japan (1996), Economic Statistics Monthly, 8:1, January, Tokyo.

Banerjee, Abhijit, Timothy Besley, and Timothy Guinnane (1994), "Thy Neighbor's Keeper: The Design of a Credit Cooperative with Theory and a Test," The Quarterly Journal of Economics, 109, 491-515.

Berger, Allen N. (1993), "'Distribution-Free' Estimates of Efficiency in the U.S. Banking Industry and Tests of the Standard Distributional Assumptions," The Journal of Productivity Analysis, 4, 261-292.

Berger, Allen N., Diana Hancock, and David B. Humphrey (1993), "Bank Efficiency Derived from the Profit Function," Journal of Banking and Finance, 17, 317-347.

Beshouri, Christopher and Dennis Glennon (1996), "CRA as 'Market Development' or 'Tax': An Analysis of Lending Decisions and Economic Development," presented at the Federal Reserve Bank of Chicago's Annual Banking Conference, May 3.

Boyes, William J., Dennis L. Hoffman, and Stuart A. Low (1989), "An Econometric Analysis of the Bank Credit Scoring Problem," Journal of Econometrics, 40:1, 3-14.

Deutsche Bundesbank (1995), Monthly Report, 47:3, March, Frankfurt.

Edwards, Sebastian (1989), "Implications of Alternative International Exchange Rate Arrangements for the Developing Countries." In Hans-Jürgen Vosgerau, ed., New Institutional Arrangements for the World Economy, Springer-Verlag, New York.

Ghani, Ejaz (1992), "How Financial Markets Affect Long-Run Growth: A Cross-Country Study," PRE Working Paper 843, World Bank, Washington, D.C.

Gropper, Daniel M. (1991), "Empirical Investigation of Changes in Scale Economies for the Commercial Banking Firm, 1979-1986," Journal of Money, Credit, and Banking, 23:4, November, 718-727.

Hancock, Diana (1991), A Theory of Production for the Financial Firm, Kluwer, Boston.

Huppi, Monika and Gershon Feder (1990), "The Role of Groups and Credit Cooperatives in Rural Lending," The World Bank Research Observer, 5:2, 187-204.

IDB (Inter-American Development Bank) (1995), "The IDB and Microenterprise: Promoting Growth with Equity," Microenterprise Unit, Inter-American Development Bank, Washington, D.C.

ILO (International Labor Organization, Regional Office for Latin America and the Caribbean) (1996), Panorama Laboral '95, Lima, Peru.

Jayaratne, Jith and Philip E. Strahan (1996), "The Finance-Growth Nexus: Evidence from Bank Branch Deregulation," The Quarterly Journal of Economics, 111:3, 639-670.

King, Robert and Ross Levine (1993), "Finance and Growth: Schumpeter Might Be Right," The Quarterly Journal of Economics, 108:3, 717-737.

Klein, Michael (1971), "A Theory of the Banking Firm," Journal of Money, Credit and Banking, 3:1, 205-218.

Magill, John (1991), "Credit Unions: A Formal Sector Alternative for Financing Microenterprise Development," US AID GEMINI Working Paper No. 22, Washington, D.C.

Mester, Loretta (1989), "Testing for Expense Preference Behavior: Mutual versus Stock Savings and Loans," RAND Journal of Economics, 20:4, 483-498.

Poyo, Jeffrey (1987), Development without Dependency: Financial Repression and Deposit Mobilization among the Rural Credit Unions in Honduras, Ph.D dissertation, Department of Economics, Syracuse University, Syracuse, New York.

Richardson, David and Barry Lennon (1994), "The Impact of Credit Unions in Guatemalan Financial Markets," presented at the Brookings Institution/US AID Conference on Financial Services and the Poor, Sept. 28-30, Washington, D.C.

Sealey, C.W. and James T. Lindley (1977), "Inputs, Outputs, and a Theory of Production and Cost at Depository Financial Institutions," Journal of Finance, 32:4, 1251-66.

Smith, Donald J. (1984), "A Theoretic Framework for the Analysis of Credit Union Decision Making," Journal of Finance, 39:4, 1155-68.

_____, Thomas F. Cargill, and Robert A. Meyer (1981), "Credit Unions: An Economic Theory of a Credit Union," Journal of Finance, 36:2, 519-528.

Stiglitz, Joseph and Andrew Weiss (1981), "Credit Rationing in Markets with Imperfect Information," American Economic Review, 71:3, 393-410.

Viganò, Laura (1993), "A Credit Scoring Model for Development Banks: An African Case Study,"

Savings and Development, 17:4, 441-482.

Westley, Glenn (1994), "Financial Liberalization: Does It Work? The Case of Latin America," DES Working Paper No. 194, Inter-American Development Bank, Washington, D.C.

WOCCU (World Council of Credit Unions) (1995), 1994 Statistical Report, Madison, Wisconsin.

TABLE 1				
Micro- and Small Enterprise Share of GDP or GDP Components				
Country	Microenterprise Share	Micro- and Small Enterprise Share	Reference Year	Coverage
Brazil [A]	16%	43%	1985	Manufacturing, commerce, and services sectors
Mexico [B]	26%	48%	1993	All GDP
Dominican Republic [C]	31%	--	1991	All non-agricultural GDP
Belize [D]	--	39%	1994	Manufacturing, commerce, services (except government), transportation, and utilities sectors

[A] Source: 1985 Economic Census. Microenterprises are defined as having 9 or fewer workers in the commerce and services sector and 19 or fewer in industry. Small enterprises have 10-49 and 20-99 workers, respectively.

[B] Source: 1993 Economic Census. Microenterprises are defined as having 15 or fewer workers, small enterprises as having 16-100.

[C] Source: Fondomicro's (extensive) national survey of microenterprises. Microenterprises are defined as those with 10 or fewer workers.

[D] Source: Central Statistical Office. Micro and small enterprises are defined as those with gross output of less than US $250,000.

TABLE 2
Variable Definitions

Delinquency Regressions

DELINQ	loan delinquency rate, measured as the % contaminated portfolio at end of year
ILDIFE	(CU's effective loan rate) - (commercial bank loan rate, national average), annual %
RELWAGE	(CU's average wage level)/(average wage level in the country's financial sector)
ROA1	CU's return on assets, lagged one year (decimal terms)
RSDTD	weighted average of real savings and time deposit rates, from quarterly data (annual %)
GRACE	grace period before monetary penalties are imposed on late loan payments (in days)
FINLAG	# days after end of month (or other accounting period) before financial reports are ready
FINPERIOD	period (in months) between financial reports
LNPOPM	ln(weighted average population of localities in which CU's main and branch offices are located, weighted by # members in each office)
CHARGE-OFF	percentage of loans more than one year overdue that are charged off
MORTMOVE	share of loans collateralized by either real or movable property (decimal terms)
LOANS$/EMP	(average yearly loan stock in December 1993 dollars)/(average # employees for the year)

Profit Regressions

π	real profits, in 1993 U.S. dollars
p_h	real, *ex post* interest rate on investments (annual %), deflated by local CPI
p_l	real, posted loan rate, from quarterly data (annual %), deflated by local CPI
p_d	real, *ex post* interest rate on all deposits, shares, and borrowing (annual %), deflated by local CPI
p_w	real average wage rate, in 1993 U.S. dollars
p_m	real price of materials (i.e., of non-wage administrative costs), defined as the ratio of nominal non-wage administrative costs to nominal total assets
x_F	real value of fixed assets, in 1993 U.S. dollars
MORTGAGE	share of loans that are collateralized by real property (decimal terms)
SAVER	dummy variable, =1 for saver-dominated CUs, =0 otherwise
NEUTRAL	dummy variable, =1 for neutral CUs, =0 otherwise
GGDP	growth rate of real GDP (annual %)
INFLAT	December-over-December consumer price inflation rate (annual %)
AREERCH	absolute value of December-over-December percentage change in the real effective exchange rate (annual %)
CRBOOM1	CRBOOM lagged 1 year, where CRBOOM = [1+c]/[(1+r) (1+g)] is a measure (annual %) of whether there is a commercial bank credit boom in the current year, c is the growth rate of nominal commercial bank credit to the private sector, r is the nominal commercial bank loan rate, and g is the growth rate of real GDP.

Note: exchange rates were in reasonable equilibrium in the three countries in 1993, which (for example) preceded the exchange rate overvaluation in Guatemala and Honduras from the 1994 coffee boom. *Ex post* or implicit nominal interest rates for investments and for deposits plus external borrowing were obtained by dividing the annual amount of interest by the average yearly stock. In contrast, posted rates were used for the nominal loan rate to allow policy variables to affect profits through changes in repayment rates, a key channel we wish to explore. Because the CUs in this study received little income from loan commissions and fees, the major difference between posted and implicit loan rates is from loan default.

TABLE 3				
Means, Standard Deviations, Minimums, and Maximums				
VARIABLE	***MEAN***	***STD. DEV.***	***MINIMUM***	***MAXIMUM***
DELINQUENCY REGRESSIONS				
DELINQ	.189	.115	.0131	.490
GRACE	47.6	85.2	1	360
FINLAG	12.24	6.52	2	40
FINPERIOD	1.14	1.08	1	12
ILDIFE	4.58	6.64	-7.18	55.54
RELWAGE	.804	.352	.272	1.680
ROA1	.0108	.0430	-.298	.109
RSDTD	-1.78	6.31	-16.5	8.60
LNPOPM	10.07	1.647	7.364	13.96
CHARGE-OFF	57.0	46.7	0	100
MORTMOVE	.428	.258	0	.995
LOANS$/EMP	57,061	44,873	6170	230,065
PROFIT REGRESSIONS				
π	24,927	73,529	-282,560	335,182
$\mathbf{p_h}$	25.79	69.56	-21.15	535
$\mathbf{p_l}$	8.24	7.93	-10.01	43.1
$\mathbf{p_d}$	-4.07	6.14	-18.1	6.54
$\mathbf{p_w}$	2193	984	752	6730
$\mathbf{p_m}$	4.11	2.33	-1.10	12.1
$\mathbf{x_F}$	83,162	140,068	3212	1,076,889
MORTGAGE	.387	.239	0	.995
SAVER	.111	.316	0	1
NEUTRAL	.190	.394	0	1
GGDP	3.81	2.54	-1.40	6.23
INFLAT	13.6	7.48	6.50	28.9
AREERCH	7.12	2.73	.760	10.2
CRBOOM1	-5.92	7.70	-16.1	5.53

TABLE 4: Delinquency Regressions[1]			
	1	**2**	**3**
RSDTD	-.00363 (2.87)	-.00299 (2.37)	-.00283 (2.24)
ILDIFE	-.00427 (2.73)	-.00473 (3.06)	-.00422 (2.67)
RELWAGE	-.0568 (2.26)	-.0674 (2.69)	-.0911 (3.97)
ROA1	-.284 (1.44)	-.298 (1.54)	-.344 (1.77)
GRACE	.000483 (5.58)	.000461 (5.41)	.000432 (5.09)
FINLAG	.00714 (5.49)	.00667 (5.18)	.00687 (5.38)
FINPERIOD	.0295 (3.29)	.0281 (3.18)	.0270 (3.05)
LNPOPM	.0127 (2.61)	.0142 (2.96)	.0118 (2.33)
CHARGE-OFF	-.000476 (2.76)	-.000364 (2.08)	
MORTMOVE		-.0739 (2.42)	-.0950 (3.22)
LOANS$/EMP			.000000357 (2.04)
Constant	.00716 (.14)	.0376 (.73)	.0474 (.91)
R^2	.5608	.5824	.5819

[1] Ordinary least squares estimates, with asymptotic t-statistics in parentheses.

Table 5									
Profit Regressions [1]									
	4		**5**			**4**		**5**	
Variable	***Estimate***	***t-statistic***	***Estimate***	***t-statistic***	***Variable***	***Estimate***	***t-statistic***	***Estimate***	***t-statistic***
Constant	-.0636	1.02	.0591	.20	$\ln p_l \ln p_d$	-6.02	1.13	-8.32	1.33
FINPERIOD	-.0235	1.58	-.0193	1.28	$\ln p_l \ln p_w$	-.210	.39	-.0775	.14
LNPOPM	-.00846	2.26	-.00675	1.86	$\ln p_l \ln p_m$	-4.31	1.21	-4.99	1.46
MORTGAGE	.0861	1.18	.126	1.77	$(\ln p_d)^2$	1.88	.29	2.97	.38
(MORTGAGE) [2]	-.109	1.37	-.160	2.07	$\ln p_d \ln p_w$	.420	.84	.282	.55
SAVER	.0368	2.05	.0338	1.93	$\ln p_d \ln p_m$	3.21	1.03	5.03	1.85
NEUTRAL	.0164	1.19	.00612	.45	$(\ln p_w)^2$	.0958	1.81	.0975	1.71
INFLAT	.0104	4.15	.0135	5.25	$\ln p_w \ln p_m$	-.383	1.65	-.371	1.85
AREERCH	-.00425	1.45	-.00493	1.74	$(\ln p_m)^2$	2.27	.79	.829	.47
GGDP	.00962	1.80	.00633	1.29	$\ln p_h \ln x_F$	.0369	2.47	.0305	1.67
CRBOOM1	-.00140	1.63	-.00176	2.08	$\ln p_l \ln x_F$	-.687	3.76	-.729	3.56
$\ln p_h$	-.104	3.37	.0534	.37	$\ln p_d \ln x_F$	.385	2.32	.532	2.52
$\ln p_l$	.280	1.22	1.49	1.39	$\ln p_w \ln x_F$	-.0352	2.23	-.0338	1.92
$\ln p_d$	.770	4.05	-.887	.93	$\ln p_m \ln x_F$	.300	3.95	.200	2.49
$\ln p_w$	.0760	4.53	.197	2.17	$(\ln x_F)^2$	-.0210	2.81	-.0216	2.78
$\ln p_m$	-.0229	.11	.150	.32	c_l			-.412	1.07
$\ln x_F$	-.00272	.52	-.0348	.58	c_d			-.516	1.20
$(\ln p_h)^2$	.0596	.73	.114	1.27					
$\ln p_h \ln p_l$	.137	.19	.287	.37	**Profit eq.** R^2	.5630		.5968	
$\ln p_h \ln p_d$	.514	.71	.0322	.05	**Investment eq.** R^2	.0143		.0028	
$\ln p_h \ln p_w$	.0770	.99	.0686	.97	**Deposit eq.** R^2	.0031		.0065	
$\ln p_h \ln p_m$	-.788	1.46	-.501	1.33	**Wage eq.** R^2	.00085		.0034	
$(\ln p_l)^2$	10.4	1.94	13.1	2.04	**Materials eq.** R^2	.000033		.00042	

[1] Iterated SUR estimates, using profit and all share equations except that for loans.