

Household, Group and Program Factors in Group-Based Agricultural Credit Delinquency

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1. Introduction

Microcredit is one of the major tools used in promoting poverty alleviation and economic development in low-income countries. The Microcredit Summit sought "to launch a global campaign to reach 100 million of the world's poorest families, especially the women of those families, with credit for self-employment ... by the year 2005."¹ In an era of global economic liberalization, microcredit is widely viewed as an intervention that addresses important deficiencies of financial markets in terms of serving the poor without creating others.² Several empirical studies suggest that microcredit can have a substantial positive impact on borrowers' welfare.³

Perhaps most importantly in view of generally tight government budgets, microcredit holds the promise of paying for itself, or at least of coming close to financial sustainability.⁴ Financial sustainability entails low rates of default, lender administrative costs, and borrower transaction costs. What innovations in microcredit promise to keep these costs low?

Most prominently, many microfinance institutions require borrowers to work together in small peer groups. In both solidarity group and village banking methods, the external lender requires groups to assume responsibility for the repayment of their members' loans. In the absence of scarce collateral or cost-effective legal collection, it gives them an incentive to assume that responsibility by making future credit to all members depend in some way on repayment by each member.

Theoretical models suggest that these *joint liability* incentives improve financial sustainability by inducing group members to use their mutual familiarity and close ties in assuming several roles normally played by an external lender. These include screening fellow borrowers for creditworthiness, monitoring their use of borrowed funds, and pressuring them to repay, along with providing mutual insurance.⁵ Despite these positive potentials, it is not yet clear whether group-based methods with joint liability incentives are necessary, or superior to other microcredit methods, especially for agricultural credit. Some researchers question whether the success of group-based credit in some cases is actually due to joint liability, or to other features also common to individual liability credit programs, such as frequent payments and progressively increasing loan sizes or organizational culture.⁶

Innovative individual-based credit programs also number among the outstanding examples of sustainability in microcredit.⁷ Although a large share of the world's poor depend on agriculture for their livelihoods, and most microcredit providers specifically target the poor, relatively few group-based programs worldwide provide credit for agricultural production. Is this for lack of trying, or because group-based methods -- especially the popular solidarity group model -- are not appropriate for the distinct and difficult circumstances of agricultural lending?

Small farmers are more spatially dispersed than other microentrepreneurs, so small groups and frequent meetings cost more travel time, and they face longer investment-return cycles, so frequent installments are difficult to pay. Perhaps

most importantly, because their incomes are more likely to be highly correlated due to common weather and pest problems, mutual insurance may become a liability, rather than an asset of group-based methods. *Strict* joint liability (stopping all future credit to groups with any loan in default) could even scare off poor farmers with low risk-bearing capacity or induce whole groups to default rather than pool funds from their own reduced incomes to repay the loans of defaulting members.

The purpose of this paper is to explore and test several hypotheses about the factors lowering default – a requirement for financial sustainability – in group-based agricultural credit. The next section outlines pertinent questions and hypotheses that have arisen in observation and modeling of group-based credit, as well as from relevant aspects of other types of collective action.

The remainder of the paper is structured as follows. Section 3 describes the economic environment and distinctive characteristics of three group-based credit programs in Chile's central valley. Section 4 summarizes the data collection methods and uses sample data to compare the credit groups and borrower households across programs. Section 5 presents the econometric models of group-based credit repayment performance and discusses the estimation results. Section 6 concludes and proposes future research.

2. Group-Based Agricultural Credit: Key Hypotheses

Fundamental questions about the role of credit groups in controlling delinquency concern the roles of group incentives, actions, and composition, and household characteristics. They are:

- ?? Do stronger joint liability incentives reduce delinquency in group-based credit?
- ?? How important for reducing delinquency is each type of group action to discipline and aid borrowers: screening, monitoring, pressuring, and mutual insurance?
- ?? What aspects of group composition and institutions enhance or impede the capacity for and effectiveness of group actions to discipline and aid borrowers?
- ?? How does group effectiveness depend on borrowing households' varying incentives and capacities for loan repayment, especially under the high and highly correlated risk characteristic of agricultural investments?

We can draw out corresponding hypotheses that are clear for some, but not all, of these questions.

Regarding the first, theoretical models suggest that joint liability must exist to reduce delinquency by inducing appropriate group actions, but more is not necessarily better. J. Stiglitz and M. Ghatak both allow for varying levels of joint liability and show that at low levels it improves the result by inducing borrowers to, respectively, choose lower-risk investment projects (suppressing moral hazard) and form groups homogeneous in members' default risk (preventing adverse

selection).⁸ Assuming *strict* joint liability, T. Besley and S. Coate find that unless capacity for mutual pressuring is high, groups may choose default and not provide mutual insurance under some distributions of investment returns sufficient to do so; the burden of repaying another loan may outweigh the value of future credit.⁹ This ambiguity would be heightened with correlated incomes.

Concerning the second, despite arguments and some evidence for the relevance of each of the four types of group actions, there is no consensus on their relative importance in practice. One reason for this may be – following the third – the importance of group characteristics that condition their use and effectiveness.

All actions to select, monitor and discipline, as well as aid, fellow borrowers are in fact costly, so the coordination problem noted by Besley and Coate is only the tip of an iceberg. Furthermore, we cannot simply presume unified action by larger groups as an extension of the findings of two borrower models. For example, if a group needs to pressure a member to prevent opportunistic default and pressuring is costly, it is not immediately clear whether or why individual members will take on that responsibility. We can, however, draw ideas from studies of collective action by groups in other contexts. These focus on characteristics both of the group's membership, including their number and heterogeneity, and of its developing institutions, which further shape members' incentives, expectations, and even preferences about collective action.¹⁰

In most cases, the likelihood of collective action is predicted to fall as group size grows and dilutes individual benefits from the collective good. In credit, Huppi and Feder characterize group size as a two-edged sword.¹¹ As it

increases, borrowers may pool their risks more broadly and lenders may reduce some transaction costs. However, beyond some point – perhaps between 5 and 20 members – loss of capacity for collective action is likely to overwhelm the benefits. A smaller local group may be both better able to act in screening new members, and better informed about their creditworthiness, but it is also likely to have more correlated incomes and so less opportunity for mutual insurance.

More ambiguity remains about the effects of group heterogeneity. Early arguments indicated that it promotes collective action by increasing the likelihood that some subgroup has a strong enough interest to act unilaterally, even while others free-ride. J.-M. Baland and J.-P. Platteau suggest that collective action is impeded by heterogeneity in other dimensions – culture and the nature of economic interests.¹² They also show that when capacity to contribute may be constrained by wealth, the effect of changes in the distribution of wealth on total provision depends on who gains or loses wealth (contributors or non-contributors, constrained or unconstrained), as well as on the relative cost of contribution to agents of different wealth.¹³ Finally, while heterogeneity may facilitate action by wealthier members to pressure members to repay loans, their wealth may make them immune to the same sort of pressure from other members should they choose to default.

Institutions, the rules of group interaction, may contribute to solving coordination problems or exacerbate them. For example, support for communication and norms of cooperation will help, and can be fostered by frequent interaction and committed leadership that build expectations of further

cooperation. Alternatively, special privileges may help to elicit leadership, but are prone to abuse in groups with substantial heterogeneity in wealth and political power.

Finally, borrowing household characteristics should affect delinquency through several channels. Stabler income *ex ante*, and greater current income or accumulated assets *ex post*, should help a household to repay without intolerable consumption shortfalls. However, wealth and income may also insulate a household against peer pressure to repay. The benefits of opportunistic default increase with the current loan size, while households with unmet demand for credit or who value associated benefits of membership will make current sacrifices to retain them.

The few econometric studies of group-based credit focus on some of these hypotheses, but with varying results in models of group-level delinquency that do not control fully for variation in household incentives and capacities. B. Wydick, in a study of both rural and urban solidarity groups in Guatemala, focuses on monitoring and pressuring.¹⁴ His logit estimates indicate that group characteristics favorable to peer monitoring – such as spatial and sectoral proximity of members’ enterprises – significantly lower delinquency by helping groups to decide when to provide mutual insurance. Increasing group size, with an average below four, and group longevity also appear to aid mutual insurance, while social homogeneity has no significant overall effects. M. Wenner, surveying 25 village banks in Costa Rica, finds some evidence using probit and tobit models that internal and external delinquency were reduced by practices of

screening of members and formalization of group rules.¹⁵ An index of organizational cohesion created by factor analysis shows no significant effect. A group-level proxy for income shocks is used although household data were collected.

M. Sharma and M. Zeller emphasize group composition and risk management in tobit models of delinquency.¹⁶ In a study of three large rural credit programs in Bangladesh, Sharma and Zeller's estimates show that local initiation of the group (allowing peer screening) reduces delinquency, while kinship among members (aiding monitoring but possible impeding pressuring) has no clear effect. The coefficient on group size is negative, but not significant. The effects of heterogeneity of landholdings and occupation are insignificant or difficult to interpret, as are those of measures more closely linked to risk levels: shares of irrigated land and income shocks. The capacity to bear risk, as measured by average landholdings and dependency ratios, more clearly reduces delinquency. In a study of six credit programs in Madagascar, Zeller's estimates suggest that indicate that social homogeneity and investment heterogeneity both significantly lower delinquency. The interpretation is that cohesive groups (aided by social homogeneity) provide mutual insurance out of heterogeneous investments with less correlated returns, even where heterogeneity involves riskier assets such as unirrigated crop land. Other coefficient estimates generally underscore the importance of common risk and its individual control, through irrigation, for example. Increasing group size, with an average of ten, appears to lower delinquency, perhaps by aiding risk pooling. Neither local initiative to

form the group, nor rules such as keeping written internal financial records and membership fees have significant effects. However, as in Wenner's study, the existence of clear internal rules of conduct contributes to significantly lower delinquency.

The combination of theoretical and empirical studies completed to date leave us with both clear implications about the factors that affect delinquency in group-based credit. Empirical studies have not directly tested the theoretical propositions relating the strength of joint liability incentives to the likelihood of group action to control delinquency. Evidence is also incomplete on the relative importance of the several possible types of group action, as well as on the conditions under which each type functions best. Neither group size nor group heterogeneity has an unambiguous effect on delinquency, theoretically or empirically. Larger groups may have more problems working together, but a greater capacity for mutual insurance. The type, as well as the degree, of heterogeneity matters. Heterogeneity that reduces the correlation of member incomes appears to reduce delinquency, especially where risk of income shortfalls is high. It is less clear whether or where there is a level of correlation among group members' incomes that makes strict joint liability an untenable incentive system for inducing group action to reduce delinquency. Finally, individual incentives and capacities for repayment matter, and must be controlled for in testing the effects of group variables.

The primary contribution of this study is to bring together evidence on each of these types of questions, in econometric estimations using data on

program, group, and household characteristics of three group-based agricultural microcredit institutions in the central valley of Chile. I describe the programs' levels of joint liability incentives and their groups' actions related to delinquency, and incorporate measures of both in a econometric model of delinquency. While partially replicating earlier tests of the effects of group composition and institutions, the model controls better for household incentives and capacities, especially those concerning risk management. The tests seek to evaluate conditions that permit group-based microcredit to work sustainably for agricultural households.

3. Group-Based Credit in Chile's Central Valley

3.1. Economic Environment

The data for this study were collected in the counties of San Ignacio and El Carmen in Nuble province, which harbor a large concentration of small farms. They confront economic challenges and opportunities heightened by Chile's profound economic liberalization, which beginning in 1974 curtailed land reform, subsidies, price controls and trade restrictions on agricultural products. Since then, the agricultural sector has shared with the broader economy a pattern of exclusionary growth, in which small-scale farmers have been marginalized and lack of access to credit may have played a substantial role.¹⁷ Agricultural growth was led by a fresh fruit export boom in which few small farmers participated; instead, most land reform beneficiaries with good irrigated land in the central valley sold it to larger growers.¹⁸ Others with irrigated lands had some success adopting industrial and canning crops.¹⁹

Most small-scale farmers in the study area still raise traditional staple crops and livestock on rainfed slopes of the Andes foothills, using a mixture of traditional and modern technology. A few with better irrigation in the central valley grow sugar beets and other non-traditional crops. Many also run non-agricultural microenterprises or earn wages either nearby or during seasonal migrations to other regions. Pressures for adaptation continue from above and below: forestry companies on a parallel export boom pursue steeper terrain for pine plantations, while the spread of irrigation from the Laja-Diguillín project will bid up land values in the valley. Under these pressures, their survival and growth as farmers depends on financing investment in productivity-enhancing inputs and technologies.

3.2. Credit Program Commonalities and Differences

Three non-governmental organizations – the Rural Action Department of the Diocese of Chillán (DAR), the Agrarian Research Group (GIA) and Agraria – began in the late 1980s to provide credit and technical assistance to small farmers in the study area through local groups mostly formed for that purpose. Each started with international funding for both services, but later provided the technical assistance under contract from government agencies, as they rebuilt services to small farmers in the 1990s. DAR and GIA maintained their own credit systems, while the government’s Agricultural Development Institute (INDAP) assumed provision of credit to Agraria’s farmer clients as part of a pilot project in group-based credit (hereafter INDAP-G).²⁰

During the 1993-94 agricultural season covered by this study, DAR, GIA and INDAP-G all employed features of group-based credit methodologies, but with significant differences in their design and implementation, as well as in the characteristics of the groups they formed. These close contrasts offer a valuable opportunity to test key hypotheses about the effect of group credit design and its operating environment on delinquency.

The programs' common features include their general types of loans and borrowers, and a stated policy requiring group responsibility for the repayment of the individual loans of members. Loans were mostly seasonal and disbursed in-kind in the form of agricultural inputs such as fertilizer, seed and chemicals, with real interest rates positive but below bank rates.²¹ All loans were for activities related to agricultural production, and were made to relatively small farmers without restrictions on their forms of land tenancy. In general each program required attendance at a minimum number of monthly meetings for eligibility for loans, although most groups set their own specific rules in this regard. Each group was to meet to jointly process loan applications, transport and distribute loaned supplies, and/or collect loan payments, with the goal of reducing transaction costs. And each group was expected to act to ensure that its members repay their individual loans.²²

Underlying their common rhetorical commitment to group responsibility for loan repayment were, in policy and practice, very different levels of effective incentives for implementation of that commitment. Incentives for group responsibility stem mainly from the form and severity of the consequences for a

credit group of loan delinquency by individual members. Each program stated a policy making the amount of future credit for all group members contingent on each individual member's repayment -- a form of joint liability -- but in very different levels and consistency, and with apparently corresponding effects on groups' actions.

DAR consistently required that at least 80% of a local group's total debt be paid and that the remaining 20% be formally rescheduled before any new credit would be granted to its paid-up members. In most cases, the rescheduling depended on payment of at least half of the individual debt in question, as well as on a good credit history and/or evidence of hardship due to circumstances beyond the borrower's control. Issuing the new loans would weaken the incentive for groups to ensure that the new payment schedules were followed, but not eliminate it, since DAR required full repayment of all rescheduled loans before making the next season's loans. The executive director made exceptions only in cases where he judged the delinquency to be beyond the capacity of the group to both avoid and remedy.²³ In addition, groups with a perfect record of on-time repayment during the previous two years were exempted from costly notarization of their credit contracts.

GIA's stated policy was that individual delinquency would result in proportionate reduction of the amount loaned to the group in the next season.²⁴ New members would always be admitted to replace delinquent borrowers who left, so the same number of borrowers would be sharing a reduced amount of credit and on average each would receive less. However, in practice delinquency

resulted in credit reductions that were not concentrated at the group level, but rather spread across all twelve groups in the program, so that the direct effect of an individual's delinquency on the credit access of the other group members was small. Payment rescheduling was informal, except in long-overdue cases, and failure to make payments on the new schedule also had no substantial direct effect on other members' future credit.

INDAP-G set out even weaker consequences for groups with delinquent debtors, promising only to withhold the 20% real annual expansions of credit access otherwise available in the absence of delinquency, and that only after a year's grace period.²⁵

These differing levels of effective incentives for group responsibility were associated with roughly corresponding levels of group action during the study period, across two broad roles.²⁶ First, the extent to which group members worked together to assume and reduce the transaction costs of credit and input purchases generally increased with the strength of the financial incentives for group responsibility. Groups borrowing from DAR consistently took on the most responsibility for helping to process loan applications, transport and distribute borrowed inputs, and collect loan payments. Several made joint grain sales, through an associated firm, from which payments were deducted. Groups in GIA's program also met to process applications and sent representatives to the meetings at which program decisions were made on credit allocation and policies. Most of the INDAP-G groups met to process their applications together and a few

collectively transported and distributed inputs, while one failed to come together even for those limited tasks.

Second, the extent to which groups took part in selecting borrowers, allocating credit, and dealing with delinquency also generally increased with the strength of the financial incentives for group responsibility. DAR groups played a consistently substantial role in not only selecting their members, but also determining their access to credit. Their elected leadership boards filled out and rated members' credit applications and made recommendations on their loan amounts which were reviewed by the assembled members, who would also vote on formal petitions for admittance to membership.²⁷ In case of delinquency, DAR's agents limited themselves to reminding the group of the consequences of failure to pay or reschedule. The leadership or other members would be left the often uncomfortable task of inquiring about, reminding, negotiating with, and occasionally pressuring the delinquent borrower, and they consistently took it on when needed.²⁸ In several previous instances when a borrower failed to pay or reschedule as needed and no exception was made, groups pooled funds to repay the delinquent debt. This took place in cases both of accident -- where mutual insurance was needed -- and of opportunistic default.

By contrast, with a couple of exceptions, GIA groups took on fewer of these roles, leaving them to GIA's agents. They selected their own members, but with less formal criteria and procedures. GIA's agents completed the loan applications, while the groups contributed to loan allocation decisions only through their representatives to the program level Credit Committee. In only a

few groups did their leaders and members take significant steps to deal with absent delinquent borrowers, and even when delinquent borrowers attended group meetings GIA's agents tended to dominate the discussions. The agents generally led the meetings from start to finish, in contrast with many DAR groups in which elected leaders chaired meetings where the agent spoke only when given the floor. Reschedulings were negotiated between borrower and GIA's agent, and no group had ever pooled funds to repay a member's loan.

Most INDAP-G groups formally selected their members, but none took any role in allocating credit to its members or in dealing with delinquent borrowers. INDAP's loan officers attended only one or two meetings in which members made loan applications and received approvals, visiting delinquent borrowers individually as needed. Despite a stated policy of holding groups responsible for pressuring their delinquent members to repay, INDAP's officials made no use of the groups for that purpose, following the same collection procedures as for strictly individual loans.

Only INDAP-G regularly used court action to compel repayment; although generally requiring no collateral for small loans, its loan officers identified borrowers' assets, and would act to attach and seize them if necessary. GIA turned to legal collection only when accumulating losses on clearly opportunistic delinquencies. By contrast, DAR had taken no measures outside the groups to compel repayment. In fact, the only court action brought against a delinquent debtor of DAR was by one of the groups, which sued a member over a debt it had to repay for him, only to have the case thrown out by an unsympathetic

judge. He ruled that the group had no legal standing to sue its member, since the debt was to DAR, not to the group.

I will next discuss the patterns by program of delinquency, the underlying conditions of credit groups and member households, and the data collection process.

4. Data Collection Methods and Comparisons

4.1. Data Collection

In field research for this study, as well as interviewing credit program managers and staff, I reviewed program records, and administered surveys of program borrowers and elected leaders of their local groups, based on a two-stage cluster sample.²⁹ Each borrower provided information about his credit group participation and his household's credit market activities, income, production, factor endowments, factor usage, and demographics. Each leader responded to questions about his group's formation, purposes, and current policies and practices regarding membership and credit management, as well as providing a history of actions taken in response to delinquency.

4.2. Program Dimensions

DAR operated the largest, as well as the oldest, group-based credit program of the three, while INDAP-G was only part of INDAP's total lending in the area under its national individual-based credit system for small and medium-scale farmers.³⁰ During the study period, the group-based credit programs of DAR, GIA, and INDAP-G were locally substantial in terms of population coverage and amounts of credit. As shown in Table 1, they together served nearly

1,000 borrowers representing about 17% of the counties' rural households, and made over US\$275,000 in loans. Most loans were seasonal, disbursed in winter and spring and coming due in early fall through early winter. DAR served by far the most farmers in San Ignacio and El Carmen, with 25 groups and 619 borrowers. GIA served a third as many borrowers in half as many groups. INDAP served only half as many as GIA with its group credit program, but provided strictly individual credit under its principal programs to another 642 borrowers in the area. GIA provided the smallest loans, averaging US\$253, with DAR slightly larger at US\$282 and INDAP-G substantially larger at US\$413, though still below INDAP's individual loans at US\$452.

4.3. Delinquency by Program

As summarized in Table 2, the average delinquency rate (overdue balance as a percentage of the amount due) on seasonal loans is very similar at first for DAR and INDAP-G, dropping from under 20% at the due date to 8% at three months past due.³¹ In late spring, a uniform date of comparison when the last new agricultural credit is needed, delinquency falls to nearly zero for INDAP-G, and to 5% for DAR. Meanwhile it is higher for GIA at all points except at three months past due. This pattern is largely consistent with the strength of the unique instruments used by each lender to induce repayment: stronger group pressure for DAR, fairly prompt legal actions by INDAP-G, and neither consistently by GIA. The delinquency rates of the three programs do not match those of the best non-agricultural microcredit programs, but are quite good for agricultural microcredit.³²

Better attribution of the sources of variation in delinquency rates requires multivariate analysis. We turn to that next, beginning with derivation and discussion of patterns of interest in the group- and household-level explanatory variables to be used.

4.4. The Credit Groups

The effective rules of each credit program allowed groups considerable autonomy, which they exercised to select members and leaders, shape goals and rules and choose activities. Consequently, we see substantial variation among groups in aspects of group composition such as heterogeneity, size and age, in institutions and their formalization, as well as the level and particular practices of group action.

As shown in Table 3, 64% of the leaders surveyed indicated that their groups were formed at local initiative, and 55% formed with other goals beside credit, such as technical assistance and community projects. The GIA groups stood out in their exclusive focus on credit and external initiative in formation. Because of a cap on group size, they tended to be smaller. That DAR groups maintain such a high level of collective activity is impressive in view of their average size of 27 members, comparable to village banks rather than to small solidarity groups.

The groups had been in existence more than three years on average, the DAR groups oldest by a small margin. The presidents of DAR groups tended to be longer serving, as well as older, than those in the other programs, while the presidents of the INDAP-G groups -- who included a former teacher -- were the

most educated and youngest on average. Beside biennial elections, the majority of groups in each program observed some other procedural formalities, such as taking minutes at meetings. All DAR groups did so. Most groups set a minimum level of attendance for retaining membership and credit access, leading to average attendance rates above 70% for each program, led by the GIA groups at nearly 90%. Given the attendance requirements and limited loan sizes -- especially for new members of GIA and DAR groups -- caps on farm size and wealth stipulated by the programs appeared unlikely to impinge on groups' decisions concerning membership selection and screening.

Responses to questions about the types of actions groups took to avoid loan delinquency were also fairly consistent with the differing strengths of incentives for group responsibility. The DAR groups were most likely to screen new members on the basis of their reputation for responsibility, at 75%, followed by two-thirds of the GIA groups and only half of the INDAP-G groups. Many groups also charged initial membership fees, possibly as a screening mechanism as well as a charge for some of the infrastructure created by existing members. The DAR groups' fees were the largest, averaging nearly twice the customary daily wage. Two-thirds of DAR group leaders emphasized communication, in contrast with only 17% of GIA leaders and none of the INDAP-G leaders. A quarter of both DAR and INDAP-G group leaders mentioned promoting solidarity, while no GIA leader did.

For measures of group heterogeneity, I calculated the coefficients of variation of household loan size, productive wealth, and head's years of education

for each group, using data from the borrower household survey. The DAR groups show the least heterogeneity, especially in education and wealth, as might be expected with active member screening. The GIA groups show greater heterogeneity of loan size, possibly a result of bringing together larger numbers of part-time field laborers needing fewer inputs with farmers of high quality irrigated land that can be cultivated intensively.

A principal component analysis of the group-level variables serves to better explore and combine the common themes in these diverse measures. It reproduces the total variation of the underlying variables in a small number of linear combinations that can be interpreted to represent distinct aspects of the underlying set of variables.³³

For interpretation of the components, refer to the rotated pattern matrix shown in Table 4, the elements of which provide information on the magnitude and direction of the linear relationships between components and underlying variables. Component 1 is associated with older and longer serving group leaders, greater formality and higher attendance at group meetings, and local initiative in forming groups. It appears to represent *organizational maturity*. It may be associated with homogeneity of member education levels because groups with high scores for Component 1 tend to be located in more remote areas where secondary education is not available. Component 2 is associated with formation of groups for more than credit access, and with group practices that link credit access to meeting attendance, set larger costs of admittance, and promote solidarity and communication within the group, though the last linkage is weak. I

interpret this component as representing *organizational cohesion*, which may be fostered by pre-existing social ties, as well by group interaction over time.

Component 3 is most strongly associated with *member heterogeneity* in loan size, wealth and education. Its strong negative association with screening of new members may stem from groups being more likely to know well and judge as responsible -- or otherwise favor -- those who are most like the existing members.

Assigning the component scores to the groups' members and comparing them across credit programs and delinquency status as of the due date reveals instructive contrasts. The estimates in Table 5 suggest that the least heterogeneous groups faced with the strongest joint liability incentives -- those imposed by DAR -- were the most cohesive. DAR groups attained the highest levels of organizational cohesion and maturity -- as measured by the component scores -- in spite of having group sizes of 29 members on average. This is not only larger than the average group sizes for INDAP-G and GIA, but much larger than the norm for group-based credit programs. The average organizational cohesion score of GIA's groups is very low, in spite of having the smallest average size, only 18. DAR groups also had the least heterogeneous membership, followed by INDAP-G and GIA groups, respectively. The maturity and cohesion scores are negatively related to delinquency, as shown in Table 6, although the delinquent and non-delinquent households' means are not significantly different at the 5% level.

4.5. The Member Households

An overview of the household-level statistics in Tables 5 and 6 shows that, although members may be relatively homogeneous within some groups, there is wide variation across the full sample. The measure of seasonal group credit shown sums the loans of multiple borrowers from the same household, as in Table 2, and applies a conservative standard in measuring delinquency as of the due date.

The sample reflects that San Ignacio and El Carmen are among the poorest counties in Chile. Household earned income averaged Ch\$1,160,000, or US\$2,908 total and US\$682 per adult equivalent household member. Even with unearned income, it remained below one-fifth of per capita GDP. GIA member households were the poorest on average in terms of both income and productive wealth, though the differences among means are not statistically significant. Productive wealth includes the value of land, buildings, equipment and livestock, of which land usually makes up the vast majority.³⁴ DAR member households earned a higher rate of return on productive wealth, on average, resulting in the highest average earned income of all the programs. That rate of return should reflect latent household characteristics and climatic shocks relevant to repayment capacity.³⁵

For each household, I decomposed the rate of return into its group average and the household deviations from the group average, to better measure the degree of covariate (within-group) and idiosyncratic variation in income. One source of that variation is exogenous shocks to income that mutual insurance may

address, and that may -- if sufficiently covariate -- destabilize groups held strictly liable for each other's loans. With panel data, it might be possible to isolate the exogenous shocks, as household-specific random effects. With the current dataset, such separation is impossible, but these measures do capture variation in repayment capacity and the degree to which that is common to the group.

Access to other institutional sources of credit, such as banks, processors, and INDAP's individual credit program that can be used similarly to group-based credit, should lessen incentives for repayment of group credit. Constraints on access to credit may increase them, as group credit loosens constraints. Fewer than half as many GIA households -- only 4% -- had access to other institutional sources of credit as did households borrowing from the other programs, possibly because they had fewer assets usable as collateral guarantees. More than 30% of households from each program reported being constrained in access to credit.³⁶ Demographic averages differed little across programs, but delinquent households tended to have slightly older heads, possibly reflecting a correspondingly lower valuation of future credit access.

Two measures that reflect favorable attitudes toward group participation that should reduce delinquency are fairly high on average for each program. At least 70% of households borrowing from each program participate in their neighborhood associations. At least 75% from each program would continue participating in their groups -- for technical assistance or socializing -- even if they could not borrow.

5. Econometric Models of Repayment Performance

For multivariate analysis of the many possible factors in delinquency, a tobit model utilizes more information on delinquency as of the due date than would a probit or logit, while recognizing its censoring at zero. The group-, household- and program-level independent variables incorporate factors in all the areas discussed.³⁷

5.1. Specification

Assume that each household has a desired proportion of delinquency, D_i^* , observed only when positive and censored otherwise, in which case the observed proportion of delinquency, D_i , is zero. Further assume that D_i^* is a linear function of a vector of household-level measures X_i (including group and program characteristics assigned to the corresponding household), with unknown parameters β , and a residual prediction error ϵ_i distributed standard normal:

$$D_i^* = \beta' X_i + \epsilon_i, \quad \epsilon_i \sim N(0, \sigma^2), \text{ i.i.d.}, i = 1, \dots, n. \quad (1)$$

I estimate the parameters of this tobit model by maximum likelihood, and from them derive estimates of the marginal effect on the delinquency rate of each household-level variable.

5.2. Hypotheses and Estimation Results

Here we will review and compare our hypotheses to the corresponding maximum likelihood estimates of the tobit model coefficients. The following hypotheses all refer to the expected partial effects of the variables in question, and are summarized in Table 7.

The predicted signs of the effects of group size and heterogeneity are ambiguous because they depend on the unknown balance in the studied groups between opposing effects. The general difficulty of maintaining cooperative effort in large groups should lead to a positive effect of group size on delinquency, but only if mutual insurance (which greater size should aid) is not an important feature of group action. Especially if mutual insurance is important, increases in repayment capacity reflected in the group average rate of return to assets should reduce delinquency. This does appear to be the case, as the coefficient is estimated to be significantly negative at the 10% level. Heterogeneity as measured here may make group screening, monitoring, and pressure less effective against socially distant members even while it makes it more likely that members with an intense interest in credit access will make sure that the necessary action is taken. In fact, neither coefficient is estimated to be significantly different from zero, although the point estimate for group size is fairly large and positive, suggesting that its negative effect on capacity for collective action may be more important here.

On the other hand, it is clear that the greater the maturity and cohesion of a group, the greater should be its ability to select reliable members and induce them to repay, so these should reduce delinquency. Both coefficients are estimated to be negative and significantly so at the 5% level. It is hard to gauge the magnitude of their effects, since they are standardized measures of combinations of several factors, even with reference to the predicted marginal effects. However, these estimates are a strong indication that group capacities and conduct do affect loan

delinquency in group-based agricultural credit, above and beyond the effects of incentives available to individually-based credit systems.

At the program level, relative to the features of GIA's credit system, the stronger effective incentives established by DAR for group responsibility should induce lower delinquency, all else equal. Hence, the coefficient on a dummy variable for DAR borrowers should be negative. In the case of INDAP-G, in spite of the absence of incentives for group responsibility, its consistent and effective use of the courts for collection should also lead to lower delinquency, on average. Both point estimates are of the expected sign, but not significantly different from zero, though the INDAP-G coefficient comes close to the 10% level. Given the relatively steep decline in INDAP-G's delinquency rates over time, this effect might be expected to be more important for delinquency measured in the spring. In estimates of the same model with that revised delinquency measure, the point estimate for the INDAP-G dummy variable was much larger and negative, but still marginally insignificant. However, no other coefficient was estimated to be significantly different from zero at any standard level, either. Estimation becomes very difficult with such an extreme degree of censoring: only 11% delinquency remained at that date.

Household characteristics should affect delinquency primarily through their influences on: (1) current household capacity to repay without intolerable consumption shortfalls, (2) the gains from opportunistic default, and (3) the value of future group participation for credit and other benefits. In the first category, wealth increases income and ability to self-insure against income shocks, but also

by reducing dependence on others may insulate a household against peer pressure exerted by group members, so its predicted effect is ambiguous. The insignificant coefficient reflects that. Use of irrigation reduces yield variability and so should reduce delinquency caused by income shortfalls. The coefficient is estimated to be significantly negative, as predicted, at the 10% level, and suggests that controls on income risk may be especially important in agricultural enterprises.

Household deviation from the local average return to assets should in general be positively related to delinquency. To the extent it is due to exogenous shocks, and if it is substantial enough, it may have no effect where mutual insurance is effective -- as groups compensate for their members' shortfalls -- and a significant effect where it is not. It is estimated to have no significant effect, but we cannot clearly attribute this to effective mutual insurance. Although a greater dependency burden may reduce the free income above subsistence needs from which households repay, by increasing dependence on others it may also heighten its sensitivity to peer pressure from group members, and its predicted effect is ambiguous. Its estimated effect is negative, and although not significant, suggestive that its effect on sensitivity to peer pressure may be more important.

In the second category, given a household's productive wealth, increased loan size will increase its leverage and its gains from delinquency, and should be associated with greater delinquency. The coefficient is positive as expected, but not significant. In the third category, assuming that it will continue in the future, current access to other institutional credit will reduce a household's need for future group credit and contribute to increased delinquency. The point estimate is

positive as expected, but not quite significant. Households that are credit constrained will place a higher marginal value on credit access, and will be less likely to be delinquent in repayment. The insignificant coefficient is puzzling, but may be due primarily to error in eliciting self-assessments of this complex concept. Since the value of retaining access to credit will be less for households the closer they get to the end of their productive life cycle, households with older heads may be less likely to repay. The positive but not very significant coefficient provides suggestive but inconclusive support. Households that value other aspects of group participation enough to want to participate even without credit will be less likely to be delinquent, since if they stay they will be hassled about their outstanding balance, and if the delinquency is serious and extended, they may be expelled. Finally, participation in other local organizations reflects a commitment to cooperation and good relations with neighbors and should be associated with lower delinquency. Both coefficients are very insignificant, but as with credit constraint, the measures of these concepts were crude and error-prone.

Among the coefficient estimates, it is noteworthy that the estimated coefficient on access to irrigation is so large, as well as significantly different from zero at the 10% level. The corresponding marginal effect is -1.01, and statistically significant at the 5% level, indicating that a percentage point increase in operated land irrigated would lead to a commensurate reduction in delinquency. This may be of special importance in the study area, in much of which the availability of irrigation is being greatly improved by the construction of the Laja-

Diguillín irrigation project. The marginal effect of the group mean return to assets is less than a third as large at -0.281, and significant only at the 10% level, but given the much larger potential range of the variable, is not insubstantial either.

6. Conclusion

This study has examined the factors in group-based credit for small farmers that support the first leg of sustainability -- low delinquency. It distinguishes four groups of fundamental research questions about the functioning of credit groups in controlling delinquency, concerning the roles of group incentives, actions, and composition, and household incentives and capacities. It unifies and clarifies where possible the hypotheses suggested by theoretical models and empirical studies of group-based credit and collective action.

The descriptive and econometric analyses presented here serve to highlight the importance of group capacities and conduct in controlling delinquency under joint liability incentives. The estimation results support the hypotheses that group action reduces delinquency and that capacity for it develops and formalizes over time. They also reflect the ambiguity of the relationship between delinquency and group size and heterogeneity, both variables considered to be of considerable importance as well as complexity of effects. The results also control for and highlight the importance for delinquency of risk and its management both by households and groups. While conclusive results may only be achievable with similar panel data, the measures used do suggest that group-level covariance of incomes is a significant influence on delinquency in

agricultural credit, and that access to risk-reducing technology may contribute to reducing delinquency.

Low delinquency is only one requisite of financial sustainability. Practice in the field of group-based credit increasingly emphasizes enlarging programs (not groups) to reap economies of scale in credit administration, as well as improvements in management quality dependent on the use of computer-based financial information systems. Scaling up also holds the promise of protecting lenders against some of the risks of localized lending to borrowers with both incomes and seasonal credit needs that are highly correlated. Once again, experimentation on the application of these ideas to agricultural credit lags behind, and should be the object of further research on the financial sustainability of microcredit.

Notes

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¹ Microcredit Summit, *Declaration and Plan of Action*, (Washington, D.C.: RESULTS Educational Fund, 1997).

² Formal models from J. Stiglitz and A. Weiss ("Credit Rationing in Markets with Imperfect Information," *American Economic Review* 71 [1981]: 393-410) onward explain credit rationing as an equilibrium strategy of imperfectly informed lenders facing borrowers without full collateral, and thus problems of adverse selection or moral hazard. Amid widespread anecdotes of rationing, the evidence from econometric studies is inconclusive even where applying similar methods. For example, D. Mushinski ("An Analysis of Offer Functions of Banks and Credit Unions in Guatemala," *Journal of Development Studies* 36, no. 2 [1999]: 88-112) and M. Zeller ("Determinants of Credit Rationing: A Study of Informal Lenders and Formal Credit Groups in Madagascar," *World Development* 22 [1994]: 1895-1907) find more rationing than A. Kochar ("An Empirical Investigation of Rationing Constraints in Rural Credit Markets in India," *Journal of Development Economics* 53 [1997]: 339-371). D. Adams, D. Graham, and J.D. von Pischke (*Undermining Rural Development with Cheap Credit* [Boulder, CO: Westview Press, 1984]) document the failures of targeted and subsidized traditional lending to overcome rationing in developing countries. By contrast, many innovative developing country microfinance institutions effectively target poor borrowers (C. Churchill, "Bulletin Highlights," *Microbanking Bulletin*, no. 5 [2000]: 29-35).

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- ⁶ Morduch (n. 4 above); P. Jain, "Managing Credit for the Rural Poor: Lessons from the Grameen Bank," *World Development* 24 (1996): 79-89.
- ⁷ Churchill (n. 2 above).
- ⁸ Stiglitz (n. 5 above); Ghatak (n. 5 above).
- ⁹ Besley and Coate (n. 5 above).
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- ¹¹ M. Huppi and G. Feder, "The Role of Groups and Credit Cooperatives in Rural Lending," *World Bank Research Observer* 5 (1990): 187-204.
- ¹² J.-M. Baland and J.-P. Platteau, *Halting the Degradation of Natural Resources: Is There a Role for Rural Communities?* (Oxford: Clarendon Press, 1996).
- ¹³ J.-M. Baland and J.-P. Platteau, "Wealth Inequality and Efficiency in the Commons Part I: The Unregulated Case," *Oxford Economic Papers* 49 (1997): 451-482.
- ¹⁴ B. Wydick, "Can Social Cohesion be Harnessed to Repair Market Failures? Evidence from Group Lending in Guatemala," *Economic Journal* 109 (1999): 463-475.

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- ¹⁶ M. Sharma and M. Zeller, "Repayment Performance in Group-Based Credit Programs in Bangladesh: An Empirical Analysis," *World Development* 25 (1997): 1731-42; M. Zeller, "Determinants of Repayment Performance in Credit Groups: The Role of Program Design, Intragroup Risk Pooling, and Social Cohesion," *Economic Development and Cultural Change* 46 (1998): 599-620.
- ¹⁷ M. Cox, A. Niño de Zepeda, and A. Rojas, *Política Agraria en Chile: Del Crecimiento Excluyente al Desarrollo Equitativo (Agrarian Policy in Chile: From Exclusive Growth to Equitable Development)* (Santiago: CEDRA, 1990); L. Jarvis, "The Unraveling of Chile's Agrarian Reform, 1973-1986," *Searching for Agrarian Reform in Latin America*, (Boston: Unwin Hyman, 1989).
- ¹⁸ M. Carter, B. Barham and D. Mesbah, "Agro-Export Booms and the Rural Poor in Chile, Guatemala and Paraguay," *Latin American Research Review* 31 (1995): 33-65.
- ¹⁹ J. Echenique and N. Rolando, *Tierras de los Parceleros: Dónde Están? (Lands of the Agrarian Reform Beneficiaries: Where Are They?)* (Santiago: Agraria, 1991).
- ²⁰ Prior to the study period, DAR combined with the association of its client groups to form a firm, Socoder, Ltd., that took some control of credit and technical assistance. For simplicity I will refer to the combined program as DAR.
- ²¹ Each program also made a few loans of longer durations for the purchase of machinery, livestock, etc., but this study will focus on the seasonal loans.
- ²² For example, the instructions for INDAP-G's rotating credit fund operation state that, "For its part, the [borrowers'] Organization has the responsibility to pressure the delinquent debtor to repay." Author's translation. (INDAP, "Envía Operatoria: Fondo Rotatorio de Credito" [Operational Instruction: Rotating Credit Fund], Memorandum No. 2075, Bío-Bío Region Operations, 1992.)
- ²³ This and other reports on group incentives and actions are from interviews with borrowers, group leaders and program staff, observations of their interactions, and reviews of credit records.

²⁴ "The producer committee operates as a guarantee group, in other words, as co-debtors in solidarity. If a producer does not repay the loan in the agreed fashion -- excepting cases of accidents, etc. -- he will be eliminated from the program in the next season and the amount loaned to the committee will diminish proportionately." Author's translation. (GIA, "Proyectos Micro-Regionales de Desarrollo Agrícola: La Experiencia del GIA en Diguillín" [Micro-Regional Agricultural Development Projects: The Experience of GIA in Diguillín], manuscript [Santiago, Chile: GIA, 1991].)

²⁵ C. Nisbet reports that in its first years of existence INDAP made widespread use of group-based credit; its repayment performance was poor, as support for the land reform took political precedence over good credit management ("Supervised Credit Programs for Small Farmers in Chile," *Inter-American Economic Affairs* 21 [1967]: 37-54).

²⁶ Since the patterns of group action had evolved over time, their relationship to the level of joint liability incentives was more complex than a single-period cause and effect. The degree of previous success with group collective action to control delinquency should influence formation of expectations and norms, and hence current action. However, to the extent that policies and underlying conditions were consistent over time, this would reinforce the current period effect.

²⁷ DAR and GIA limited loans to new borrowers to less than half of the maximum available to ongoing borrowers. INDAP-G's loan conditions depend on a four-level risk classification in which new borrowers start out in the middle, with limited loan sizes as well as possible requirement of supplemental guarantees.

²⁸ The discomfort of pressuring borrowers to repay was witnessed by an otherwise faithful member of a DAR group who dropped out, when he foresaw being elected group president, to avoid having to do it.

²⁹ I sampled half of the DAR and GIA groups, and two-thirds of the INDAP-G groups, selecting the groups with probability proportional to size, then their members with equal probability.

³⁰ DAR, with projects in almost every county, had some 2,800 borrowers in Nuble, while INDAP had about 70,000 individual borrowers nationwide. B. Peirano and H. Possinger describe several

Chilean Catholic Church programs with rural credit services similar to DAR's (*Créditos y Fondos Rotatorios en el Trabajo Social de la Iglesia* [Aachen, Germany: MISEREOR/D.A.S., 1989]).

³¹ Where a household includes multiple group members, their delinquency measures are combined. Since each seasonal loan has a balloon payment schedule with a single due date, the overdue balance as a percentage of the amount due for the program as a whole measures the rates of both arrears and portfolio at risk.

³² The spring delinquency rates are representative of both corresponding population rates and the programs' prior records. DAR's sample rate matched DAR's population rate exactly, while GIA's sample slightly overstates its population rate of 4%. INDAP-G's population rate was not available. In the prior year, roughly corresponding rates were 8% for DAR, 7% for GIA, and 6% for small individual loans of INDAP's local area. DAR and GIA reported rates of 2% and 3%, respectively, for the previous years with complete information.

³³ Following the initial components analysis, a scree test indicated retaining the first three components. To these I applied an oblique promax rotation, which lifts the now unnecessary restriction that the resulting components be uncorrelated. The correlations between three factors remained small, all below 0.14.

³⁴ The land values used in the wealth measure are the fitted values of a regression of reported values on observed soil, water, and locational characteristics of the corresponding land parcels. Bias due to non-reporting of land values is possible.

³⁵ The rate of return measure nets out imputed opportunity costs of usufruct land parcels and family labor.

³⁶ A household was classified as constrained if it reported asking for more credit than it was able to obtain, or if it did not ask for more credit for reasons including expected denial, excessive transaction costs and risk exposure.

³⁷ The model takes a unitary household perspective, ignoring the intrahousehold issues that would be crucial in credit groups with a substantial number of women members.

Appendix: Tables

Table 1
Overview of Group-Based Credit Programs

Characteristic	Credit Program		
	DAR	INDAP-G	GIA
Number of Groups	25	6	12
Number of Borrowers	619	119	217
Total Amount on Loan (Ch\$)	69,893,581	19,683,740	22,001,012
Average Ch\$/Borrower	112,914	165,410	101,387
Inception Date	1986	1992	1989
Real Interest Rate	1%	4%, 7.2%	1%, 3%, 5%
Due Dates of Seasonal Loans	3/31, 4/31	4/10, 5/10	3/31, 7/31

Notes: Approximate exchange rate for Chilean pesos: US\$1 = CH\$400.

Table 2
Seasonal Loan Delinquency

Date Measured	% Balance Overdue		
	DAR	INDAP-G	GIA
At Due Date	17%	19%	29%
1 Month Past Due	9%	13%	18%
3 Months Past Due	8%	8%	8%
Late Spring	5%	0.4%	7%
n	63	19	24

Note: Data for sampled households, from lender records.

Table 3
Group Statistics by Credit Program

Variable	Units	DAR		INDAP-G		GIA	
		Mean	S.D.	Mean	S.D.	Mean	S.D.
Formed at Local Initiative	{1,0}	0.75	0.45	0.75	0.50	0.33	0.52
Group Formed for More than Credit	{1,0}	0.75	0.45	0.75	0.50	0.00	0.00
Number of Members with Credit		27.42	6.19	22.00	4.55	18.33	1.63
Age of Group	Years	4.25	1.86	4.00	0.00	3.00	0.89
Age of President	Years	45.42	9.00	38.50	5.26	41.50	10.33
Education of President	Years	7.67	3.37	9.50	5.74	7.00	1.55
Rotation of President	Elect./Pres.	1.53	0.78	1.75	0.96	1.67	0.75
Minutes Taken at Meetings	{1,0}	1.00	0.00	0.75	0.50	0.67	0.52
Initial Membership Fee	Ch\$1000	2.75	2.45	0.63	1.25	0.03	0.08
Meeting Attendance Rate	%	75.83	9.00	70.00	18.26	87.50	10.37
Attendance-Based Credit Screening	{1,0}	1.00	0.00	0.50	0.58	0.67	0.52
Reputation-Based Member Screening	{1,0}	0.75	0.45	0.50	0.58	0.67	0.52
Group Promotes Solidarity	{1,0}	0.25	0.45	0.25	0.50	0.00	0.00
Group Promotes Communication	{1,0}	0.67	0.49	0.00	0.00	0.17	0.41
Heterogeneity of Education	Coeff.Var.	0.48	0.23	0.63	0.17	0.68	0.57
Heterogeneity of Wealth	Coeff.Var.	0.84	0.27	1.07	0.19	1.00	0.45
Heterogeneity of Loan Size	Coeff.Var.	0.55	0.18	0.52	0.23	0.61	0.10
n		12		4		6	

Notes: Approximate exchange rate US\$1 = Ch\$400.

Data from group leader survey and lender records.

Table 4
Principal Components Analysis

Variable	Rotated Pattern Matrix (Standardized)		
	Comp. 1	Comp. 2	Comp. 3
Age of President	<i>0.700</i>	-0.060	0.100
Minutes Taken at Meetings	<i>0.670</i>	0.300	-0.030
Meeting Attendance Rate	<i>0.640</i>	-0.380	0.270
Formed at Local Initiative	<i>0.600</i>	0.140	-0.420
Rotation of President	<i>0.540</i>	0.000	0.080
Heterogeneity of Education	<i>-0.610</i>	0.030	0.520
Group Formed for More than Credit	0.060	<i>0.770</i>	-0.070
Initial Membership Fee	-0.200	<i>0.670</i>	-0.060
Attendance-Based Credit Screening	0.300	<i>0.600</i>	0.290
Age of Group	-0.130	<i>0.540</i>	0.170
Group Promotes Solidarity	0.230	<i>0.460</i>	-0.100
Group Promotes Communication	0.260	<i>0.260</i>	0.080
Heterogeneity of Loan Size	0.240	-0.080	<i>0.720</i>
Heterogeneity of Wealth	-0.020	-0.270	<i>0.620</i>
Education of President	0.070	0.420	<i>0.500</i>
Reputation-Based Member Screening	0.080	-0.270	<i>-0.770</i>
n		22	

Note: Data from group leader survey and lender records.

Table 5
Household-Level Statistics by Credit Program

Variable	Units	DAR		INDAP-G		GIA	
		Mean	S.D.	Mean	S.D.	Mean	S.D.
<i>Household Characteristics</i>							
Delinquency Rate at Due Date	Proportion	0.12	0.26	0.20	0.36	0.36	0.43
Seasonal Group Credit	Ch\$1M	0.15	0.11	0.22	0.16	0.09	0.06
Earned Income	Ch\$1M	1.29	1.22	1.04	0.84	0.92	0.52
Rate of Return on Assets	Proportion	0.09	0.35	-0.01	0.17	0.00	0.24
Group Mean		0.02	0.08	-0.01	0.05	0.00	0.06
Household Dev. From Group Mean		0.07	0.34	-0.01	0.17	0.00	0.25
Total Productive Wealth	Ch\$1M	9.12	9.52	9.25	12.51	6.39	6.69
Operated Land Irrigated	Proportion	0.06	0.14	0.02	0.03	0.07	0.15
Age of Household Head	Decades	4.79	1.43	5.04	1.22	4.78	1.25
Dependency Ratio	Adult Equiv.	1.36	0.31	1.42	0.28	1.52	0.41
Other Institutional Credit	{1,0}	0.11	0.32	0.11	0.32	0.04	0.20
Self-Reported Credit Constraint	{1,0}	0.30	0.46	0.37	0.50	0.38	0.49
Would Participate without Credit	{1,0}	0.98	0.83	0.89	0.32	0.75	0.44
Member of Neighborhood Assoc.	{1,0}	0.71	0.46	0.95	0.23	0.88	0.34
<i>Group Characteristics</i>							
Number of Members with Credit	10's	2.87	0.63	2.27	0.42	1.83	0.15
Component 1: Organizational Maturity Standardized		0.29	0.82	-0.35	1.25	-0.16	0.95
Component 2: Organizational Cohesion		0.52	0.79	0.02	0.58	-1.14	0.50
Component 3: Member Heterogeneity		-0.21	0.78	0.14	1.22	0.42	1.03
n		63		19		24	

Note: All monetary values are in millions of Chilean pesos (approx. US\$1 = CH\$400).

Table 6
Household-Level Statistics by Delinquency Status

Variable	Units	Delinquent		Not Delinquent	
		Mean	S.D.	Mean	S.D.
<i>Household Characteristics</i>					
Seasonal Group Credit	Ch\$1M	0.16	0.16	0.14	0.10
Earned Income	Ch\$1M	1.14	0.92	1.17	1.11
Rate of Return on Assets	Proportion	-0.01	0.23	0.08	0.33
Group Mean		0.01	0.08	0.01	0.07
Household Dev. From Group Mean		-0.02	0.25	0.07	0.32
Total Productive Wealth	Ch\$1M	8.84	11.14	8.37	8.77
Operated Land Irrigated	Proportion	0.01	0.03	0.07	0.15
Age of Household Head	Decades	5.07	1.30	4.71	1.37
Dependency Ratio	Adult Equiv.	1.38	0.24	1.42	0.37
Other Institutional Credit	{1,0}	0.11	0.32	0.08	0.28
Self-Reported Credit Constraint	{1,0}	0.29	0.46	0.35	0.48
Would Participate without Credit	{1,0}	0.89	0.32	0.93	0.82
Member of Neighborhood Assoc.	{1,0}	0.77	0.43	0.80	0.40
<i>Group Characteristics</i>					
Number of Members with Credit	10's	2.61	0.78	2.49	0.63
Component 1: Organizational Maturity	Standardized	0.00	1.06	0.10	0.93
Component 2: Organizational Cohesion		-0.19	0.98	0.18	0.95
Component 3: Member Heterogeneity		0.03	1.00	-0.02	0.94
n		35		71	

Notes: All monetary values are in millions of Chilean pesos (approx. US\$1 = CH\$400).
Delinquency Status is measured as of the due date.

Table 7
Tobit Model Predictions and Estimates

Variable	Coefficient		
	Predicted Sign	Mean	Estimates (S. E.)
<i>Household Level</i>			
Group Loan Amount	+	1.545	(1.024)
Return to Assets: Deviation from Group Mean	-	-0.201	(0.369)
Total Productive Wealth	?	-0.013	(0.015)
Proportion of Operated Land Irrigated	-	-4.650 *	(2.494)
Age of Household Head	+	0.100	(0.082)
Dependency Ratio	?	-0.411	(0.325)
Other Institutional Credit	+	0.545	(0.371)
Self-Reported Credit Constraint	-	-0.008	(0.224)
Would Participate w/o Credit	-	-0.030	(0.152)
Member of Neighborhood Assn.	-	0.088	(0.251)
<i>Group Level</i>			
Return to Assets: Group Mean	-	-1.292 *	(0.772)
Number of Borrowers	+	0.273	(0.235)
Organizational Maturity	-	-0.257 **	(0.130)
Organizational Cohesion	-	-0.410 **	(0.181)
Member Heterogeneity	?	-0.024	(0.112)
<i>Program Level</i>			
DAR Borrower	-	-0.163	(0.489)
INDAP-G Borrower	-	-0.555	(0.368)
Intercept		-0.806	(0.963)
?		0.695 **	(0.105)

n = 106 ; Log likelihood = -60.190

Notes: * Significantly different from 0 at the 10% significance level (two-sided).

** Significantly different from 0 at the 5% significance level (two-sided).

The dependent variable is proportion of delinquency as of the due date.