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Long Term Evidence from Philippine Microcredit Lending Groups

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ABSTRACT

Group liability in microcredit purports to improve repayment rates through peer screening, monitoring, and enforcement. However, it may create excessive pressure, and discourage reliable clients from borrowing. Two randomized trials tested the overall effect, as well as specific mechanisms. The first removed group liability from pre-existing groups and the second randomly assigned villages to either group or individual liability loans. In both, groups still held weekly meetings. We find no increase in default and larger groups after three years in pre-existing areas, and no change in default but fewer groups created after two years in the expansion areas.

I. *Introduction*

Group liability is often cited as a key innovation responsible for the expansion of access to credit for the poor in developing countries (Morduch 1999; Armendariz de Aghion and Morduch 2005; Microcredit Summit Campaign 2005). This contract feature purports to solve a credit market failure by mitigating adverse selection and moral hazard problems. Under group liability, clients have an incentive to screen other clients so that only trustworthy individuals are allowed into the program. In addition, clients have incentives to make sure funds are invested properly and effort exerted. Finally, enforcement could be enhanced because clients face peer pressure, not just legal pressure, to repay their loans. Thus, by effectively shifting the responsibility of certain tasks from the lender to the clients, group liability claims to overcome information asymmetries typically found in credit markets, especially for households without collateral.

Group liability could also be seen as a tax, effectively increasing the net interest rate on borrowers. This could be true particularly for individuals with stable income flows, who perhaps have the best outside alternatives for credit. Little is known about sensitivity to interest rates at the household level (Attanasio, Goldberg and Kyriazidou 2000; Karlan and Zinman 2007a). Measuring the elasticity of demand with respect to group versus individual liability is important both in order to understand the net "demand" effect of this important loan characteristic, but also for forming credit market policy to help deepen the quantity and quality of access to finance for the poor.

The basic empirical question of the relative merits of group versus individual liability has remained unanswered for many reasons of endogeneity. Merely comparing performance of one product versus another, within or across lenders, fails to establish a causal relationship between the contract terms and outcomes such as repayment, selection, or welfare, due to countless unobserved characteristics that drive individual selection into one contract or the other, as well as institutional choices on what to offer, and how. Lenders typically chose the credit contract based on the context in which they operate. Morduch (1999) and Armendariz de Aghion and Morduch (2005) point out in their microfinance reviews that the performance of group liability contracts in developing countries indeed has been very diverse.[1] Thus far, however, since most claims are supported with anecdotes, we still lack good evidence on the relative importance of group liability *vis a vis* the other mechanisms, such as dynamic incentives, regular public repayments, etc. found in "group lending" schemes. Quoting Armendariz de Aghion and Morduch (2005),

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[1] See also Adams and Ladman (1979) and Desai (1983). On anecdotal evidence on the limits to joint liability, see Matin (1997), Woolcock (1999) Montgomery (1996) and Rahman (1999).

"The best evidence would come from well-designed, deliberate experiments in which loan contracts are varied but everything else is kept the same."

This is precisely the goal of the paper. We use two randomized control trials conducted by the Green Bank of Caraga in the Philippines to evaluate the efficacy of group liability relative to individual liability on the monitoring and enforcement of loans. In the first trial, half of Green Bank's existing group-lending centers in Leyte, an island in central Philippines, were randomly converted to individual liability. Note that this implies that the "baseline" clients, those already receiving loans at the time of the conversion, were already screened using *group liability*. We then examine whether, after the peer screening, group liability has any additional effect on the mitigation of moral hazard through improved monitoring or enforcement. In the second trial, we worked with the Green Bank of Caraga in their expansion into *new* areas. Villages were randomly assigned to either be offered centers with group liability, centers with individual liability or centers with phased-in individual liability, that is, centers that would start with group liability which would then convert to individual liability after successful completion of one loan.

The first trial allows us to separate selection from moral hazard, one of the most difficult empirical challenges when studying information asymmetries in credit markets.[2] The "surprise" factor of this design, created by generating a sample of borrowers that select under one contract regime but then monitors and enforces repayment under another, allows for a cleaner test of theory than offering one method to some individuals and another method to other individuals. This is useful both academically and practically in the design of products. However, it also limits the immediate policy prescriptions since the treatment conducted here is not a viable long-term product for a lender (one cannot perpetually "surprise" borrowers). Individuals selected under group liability may be different (e.g., safer) than those selected under individual liability. Although the analysis from this experiment focuses on baseline ("surprise") clients, we also present results from new members, that is, those that joined the program after the removal of the joint liability clause. This allows us to answer some (more limited) questions on selection as well.

This second trial, on the other hand, combines the selection, monitoring and enforcement and evaluates the overall effect of the liability on all three mechanisms. It is thus less precise in testing specific mechanisms, but more policy-relevant in that the intervention is replicable without engaging in ongoing "surprises."

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[2] See Karlan and Zinman (2007b) for an interest rate experiment which also separately identifies adverse selection and moral hazard in a South Africa credit market.

The first trial lasted three years, and we find no change in repayment for those centers converted to individual liability. In earlier work, with one-year results, we also found no change in repayment (Giné and Karlan 2006). We also find higher client growth in converted centers, and evidence that it is because new clients are more likely to remain in the program (whereas the "baseline" clients, who have larger loans, are more likely to leave under the individual liability structure). In auxiliary data collected on internal procedures, we find direct evidence that individual liability leads to less monitoring of each other's loan (although as noted, this lowered monitoring does not lead to higher default). Lastly, we find that those with weaker social networks prior to the conversion are more likely to experience default problems after conversion to individual liability, relative to those who remain under group liability. In sum, as conversions from group to individual liability become more commonplace in the microfinance community, we take an important step towards understanding whether and how such conversions work.

In the second trial, on new areas, we find no statistically significant difference in repayment rates across any of the three groups. We do however find that credit officers were less likely to creating groups under individual liability, and qualitatively this was reported to us as caused by unwillingness of the credit officer to extend credit without guarantors in particular barangays.

II. Background

Microfinance Trends

In recent years, some micro-lenders, such as the Association for Social Advancement (ASA) in Bangladesh, have expanded rapidly using individual liability loans but still maintaining group meetings for the purpose of coordinating transactions. Others, like BancoSol in Bolivia, have converted a large share of its group liability portfolio into individual liability lending. Even the Grameen Bank in Bangladesh, whose founder Mr. Yunus won the 2006 Nobel Peace Prize, has recently relaxed the group liability clause in the Grameen II program by allowing defaulters to renegotiate their loans without invoking group pressure. Many of these groups (e.g., ASA) have made this shift while still keeping the "group" intact. Thus, while *liability* is individualized, the group process helps lenders lower their transaction costs (by consolidating and simplifying loan disbursal and collection logistics) while possibly maintaining some but not all of the peer screening, monitoring or enforcement elements due to reputation and shame. The shift to individual liability is not merely the Grameen Bank and a few other large, well-known lenders, but many lenders around the world are following the lead of the large, well-known lenders. Many policymakers have been advising lenders who seek to expand more rapidly (such as the Green Bank of Caraga, with whom we conducted this field experiment) to engage in individual liability rather than group liability.

This shift from group liability to individual liability loans has accelerated as the microfinance community learns about some of the pitfalls of group liability lending. First, clients dislike the tension caused by group liability. Excessive tension among members is not only responsible for voluntary dropouts but worse still, can also harm social capital among members, which is particularly important for the existence of safety nets. Second, bad clients can "free ride" off of good clients causing default rates to rise. In other words, a client does not repay the loan because she believes that another client will pay it for her, and the bank is near indifferent because it still gets its money back. Third, group liability is more costly for clients that are good risks because they are often required to repay the loans of their peers. This may lead to higher dropout and more difficulty in attracting new clients. Finally, as groups mature, clients typically diverge in their demand for credit. Heterogeneity in loan sizes can result in tension within the group as clients with smaller loans are reluctant to serve as a guarantor for those with larger loans. In sum, while repayment may improve under group liability, outreach may be smaller, so the effect on lender's overall profitability and the poor's access to financial markets is ambiguous.

Throughout this paper we maintain an important distinction between "group liability" and "group lending." "Group liability" refers to the terms of the actual contract, whereby individuals are both borrowers and simultaneously guarantors of other clients' loans. "Group lending" merely means there is some group aspect to the process or program, perhaps only logistical, like the sharing of a common meeting time and place to make payments. The heart of this paper is testing whether the removal or absence of group liability from a "merely logistical" group lending program leads to higher or lower repayment rates, client retention and to changes in group cohesion.

Theoretical Background

The theoretical literature on joint liability builds on an earlier contract theory literature from the early 1990s that studies when a principal should contract with a group of agents to encourage side-contracts between them as opposed to contracting individually with each agent.[3]

In a survey article, Ghatak and Guinnane (1999) summarize the literature on joint liability by identifying four channels through which this contract feature can help institutions improve repayment: (i) *adverse selection:* ascertaining the riskiness of borrowers (Ghatak (1999; 2000), N'Guessan and Laffont (2000), and Sadoulet (2000)) or by the insurance effect that results from diversification even if borrowers do not know each other well (Armendariz de Aghion and Gollier (2000)), (ii) *ex-ante moral hazard:* ensuring that the funds will be used properly (Stiglitz (1990) and

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[3] Examples of this literature include, but are not limited to Holmstrom and Milgrom (1990), Varian (1990) and Arnott and Stiglitz (1991).

Laffont and Rey (2000)), (iii) *monitoring*: ensuring that the borrower tells the truth in case of default about her ability to pay, (iv) *voluntary default, or ex-post moral hazard*: enforcing repayment if the borrower is reluctant to pay (Besley and Coate (1995)). Group liability contracts in theory can lead to higher repayment because borrowers have better information about each other's types, can better monitor each other's investment, and may be able to impose powerful non-pecuniary social sanctions at low cost.

However, there are other theories that suggest that group liability may instead jeopardize repayment. For example, Besley and Coate (1995) point out that borrowers who would repay under individual liability may not do so under group liability. This situation may arise if members realize that they cannot repay as a group. In this situation, since no further loans will be granted (if rules are adhered to), members that could otherwise repay decide to default because the incentive of future credit is not longer present. This model also demonstrates that social collateral can help make joint liability work better than individual liability (baring the strategic default situation mentioned above). However, Sadoulet (2000) argues that "social collateral" induced by group liability is not sufficient to ensure high repayment rates. Chowdhury (2005) develops a model that abstracts from adverse selection but shows that joint liability alone cannot mitigate an ex-ante moral hazard problem. In his model, either sequential lending as introduced by the Grameen Bank, where borrowers in a group do not all get the loan at the same time but sequentially, or monitoring by the lender combined with joint liability, makes group-lending contracts feasible. Despite being less efficient than peer monitoring, if monitoring by the lender is not too costly, then contracts that stipulate only monitoring by the lender may also be feasible, such as the individual liability contract of Green Bank of Caraga in the Philippines studied here (and put forward by ASA in Bangladesh), which keeps the group "logistical" aspects of the program but removes the joint liability.

Even if joint liability does not jeopardize repayment, theory also suggests it may do no better than individual liability. Rai and Sjostrom (2004) show that both individual and group liability alone can be dominated by a contract that elicits truthful revelation about the success of the peers' project. In their setup, high repayment is triggered by the ability of banks to impose non-pecuniary punishments to members according to their reports about their success and that of others. More importantly, if borrowers can write contracts with one another (i.e., side-contract), the effectiveness of group liability contracts will be limited.

Despite being the focus of much of the theoretical literature on group liability, repayment is only one outcome of interest to the lender, because its ability to retain good borrowers and attract

new ones is equally important to assess the overall profitability. Indeed, an institution with perfect repayment may be more profitable with lower repayment but a larger client base.[4]

III. Experimental Design and Data Collected

A. Trial #1: Experimental Design in Pre-existing Areas

The Green Bank of Caraga, a for-profit, regulated rural bank operating in Philippines, conducted a field experiment in which they removed the group liability component of their Grameen-style[5] group liability program, called BULAK.[6] Typically a lending center starts with 15-30 individuals residing in the same barangay (community). Centers grow in size as demand increases, without predetermined maximum sizes. Within each center, members divide into groups of five. Under the normal group liability system, those in the group of five are the first layer of liability for any default. Only if those five fail to pay the arrearage of an individual is the center as a whole responsible for an individual. New members joining an existing center are also assigned into groups after mutual agreement is reached. If at one point in time there are enough new members to form a new group of five, they may do so. This trial was conducted on the island of Leyte, and all 169 centers on the island were included in the sample frame.

All loans under the BULAK program are given to micro-entrepreneurial women for their business expansion. The initial loan is between 1,000 - 5,000 pesos (roughly $18 - $90). The increase in loan size depends on repayment of their last loan, attendance at meetings, business growth, and contribution to their personal savings. The interest rate is 2.5 percent per month, calculated over the original balance of the loan. The client has between 8-25 weeks to repay the loan, but payments must be made on a weekly basis during the center meeting.

As part of the BULAK program, clients are also required to make mandatory savings deposits at each meeting. At loan disbursal, each member deposits 100 pesos plus two percent of the loan amount into savings. In addition, each member must pay an additional ten percent of their weekly due amount (principal plus interest) into their individual savings account. Member savings may be used to repay debts and also act as collateral, although in this last case there are no fixed rules. Finally, 20 pesos ($0.18) per meeting are required for the group and center collective savings

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[4] In related papers, Madajewicz (2005) and Conning (2005) study when monitoring is best done by the lender and when it is best left to the peers. They both find that wealthier clients prefer individual liability loans. We cannot test the validity of this prediction because in this field experiment, loans are not backed by any form of physical collateral, so comparable (and relatively poor) borrowers are subject to one or the other form of liability.

[5] This is a Grameen "style" program since the bank conducts some basic credit evaluation, and does not rely entirely on peer selection. The bank's evaluation steps include essentially two components: physically visiting the business or home to verify the presence of the enterprise and its size, and an assessment of the repayment capacity of borrowers based on the client-reported cash-flows of their enterprise.

[6] Bulak ("flower" in Tagalog) stands for "Bangong Ug Lihok Alang sa Kalambuan", meaning "Strive for Progress."

account (10 pesos for the group and 10 pesos for the center savings accounts). The center savings cover mostly the construction of the center meeting building (a small house or hut in the village) and other center activities, or as a last resort to repay member loans if the center is being dissolved and default remains.[7] The group savings is held as collateral to cover arrearage within each group.

In the first trial, the Green Bank randomly converted *existing* centers with group liability loans to individual liability loans. All other aspects of the program remain the same (including attendance at center meetings and weekly payment made in groups).[8] Clients were also not told this was an experiment, and thus had no information from the bank to suggest that a failure to repay could lead to a reversal of the change. The only two features that changed are the group liability and the savings rules.[9] By removing the group liability, no member is held liable for another member's default. Thus, members are no longer forced to contribute towards the repayment of other members in default and no longer required to sign as co-maker of others' loans. This allows us to isolate the impact of group liability on the mitigating moral hazard through peer pressure by comparing the repayment behavior of *existing* clients in group-liability centers and converted centers.

It is important to note that although this change removed the group liability rules, it did not remove all social influences on repayment. Group payments were still done at the weekly meeting. Although after the conversion group meetings did not include a discussion or review of who was in default, the fact that all were at the meeting provided ample opportunity for people to learn of each other's status. Thus, many clients may still repay not out of social pressure, but rather out of concern for their social reputation. One's reputation is important, for instance, in order to secure informal loans in the future from their peers, outside the scope of the lending program.

The second component of the treatment involved the savings policy. The group and center savings were dissolved and shifted into individual savings accounts. The total required savings deposits remained the same.[10] With the conversion of group and center savings into individual

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[7] In our observation, this never occurred.

[8] Although the choice was effectively voluntary (a group could complain about the switch and remain with group liability), not a single group complained. Researchers observed groups clapping when the announcement was made.

[9] All other loan terms remained the same in both treatment and control groups, including the dynamic incentives, the interest rates, the lack of collateral, the length of the loan, the frequency of the payment, etc. If Green Bank had enforced a stricter group liability rule, the change to individual liability would also have entailed the issuing of new loans when other clients were in default. In practice, however, loans were already being issued to clients in good standing even when other individuals were in default.

[10] The new Personal Savings quota will be the previous amount of Personal Savings (based on the loan amount), plus P20, the amount previously given for Center and Group savings.

savings, there no longer were funds set aside to pay for center activities. Thus, all center activities in treatment groups were to be paid for out of individual accounts on a per-activity basis[11].

Our sample includes 169 BULAK centers in Leyte, handled by 11 credit officers in 6 branches. Among these, 161 had been created before August 2004, when the experiment started. Green Bank's main competitors are NGOs (such as TSKI) which mostly offer group-liability loans and cooperatives (such as OCCCI) which offer individual liability loans. At the time of the first conversion, about 28 percent of the existing centers were located in barangays with no other competitor, 53 percent of the centers were in barangays with at least one NGO and 47 percent of the barangays with Green Bank presence had at least one individual liability lender.[12]

Figure 1 shows the timeline of the first trial and data collected. In August 2004, we implemented the first wave of conversions in 11 randomly selected centers (one center per field officer). Three months later, in November 2004, we randomly selected 24 more centers to be converted to individual-liability (wave two). In the sample frame for this randomization, we included 8 additional centers formed after August 2004. Finally, nine months after wave one, in May 2005 we randomly selected 45 more centers from the 125 remaining (wave three). As of May 2007, 34 months after the start of the experiment, the final month for which we have administrative data, there are 56 converted centers and 50 original (group-liability) centers (26 converted and 37 original centers were dissolved in the past three years). Conversions were done in the three waves because of operational and repayment concerns. In particular, Green Bank wanted to assess early results to ensure default did not rise substantially before converting all centers randomly assigned to treatment.[13] We stratified the randomization by the 11 credit officers in order to ensure a fair implementation across credit officers in terms of potential workload and risk and also orthogonality with respect to credit officer characteristics. In addition, we periodically checked with credit officers and conducted surprise visits to center meetings and clients' homes to confirm that converted centers had individual liability and that control centers had group liability.

B. Trial #2: Experimental Design in New Areas

The second trial had two important differences as compared to the first trial. First, it was conducted as part of an expansion into new geographic areas, hence individuals were informed

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[11] Note that Green bank's savings policy changed in January 2006. The banks removed the group savings requirement and increased the mandatory savings toward personal savings account to 20% of weekly amortization for all clients.
[12] We run separate regressions for barangays with individual liability lenders and barangays with group liability lenders. The results do not differ significantly from those of Table 5 using all barangays and thus are not reported.
[13] Note that increased default is not necessarily bad for the bank, since the bank cares about profits not merely default.

whether the loan would be group or individual liability *before* borrowing. Second, there was a new experimental group, a phased-in individual liability group.

Figure 2 shows the timeline of the second trial and data collected. Credit officers in these newly established branches first conducted a market survey to identify feasible communities for Green Bank to enter. The criteria for the community selection were the same as that of pre-existing areas—the number of enterprises and economic condition, safety, and accessibility. Between August 2005 and August 2007, 124 barangays served by eight branches in five provinces were identified by Green Bank as feasible and randomized. The selected barangays were then visited by an independent survey team for a baseline business census,[14] followed by Green Bank's marketing activities. Out of the 124 randomized barangays, the bank opened lending centers in 68 barangays. After the business census and initial community orientations were conducted, 56 communities (45%) were deemed not feasible mainly due to lack of interest from female entrepreneurs and default or safety concerns by credit officers. We will examine this important selection issue in the analysis, given that the success of opening a center is correlated with treatment assignment.

The experimental design then randomly assigned all selected barangays into one of the three types of lending products: 1) group-liability (original BULAK program in pre-existing areas without group savings requirement), 2) individual-liability (original BULAK program, without group savings requirement nor group liability), and 3) phased-in individual-liability (group liability in the first loan cycle only; group liability is removed after successfully paying back the first loan).[15] Similarly to pre-existing areas, all lending centers hold weekly mandatory meetings and payments are made in groups. If a new member joined a phased-in individual liability center after the center had already been formed, then the new member had to be accepted by all center members, and the existing members were liable for new members' *first* loan only. Thus, the third product design tries to balance between group and individual liability: it relies on peer selection mechanism, while removing the potentially excessive peer pressure that may lead to good clients from dropping out of the program in the long run. This experiment was conducted during the bank's three-year expansion, beginning in August 2005.

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[14] The baseline survey was conducted with all female household members who owned small businesses in the village. We collected information on business characteristics, revenue, household assets, demand for credit, and social network.
[15] Initially, there was also a fourth group, a pure control group, which the Green Bank did not enter. The take-up rate was too low however to measure impact, and thus we decided to increase the power on the liability structure test by randomly assigning the control group to one of the three treatment groups and entering all areas, rather than maintaining one no-credit control group.

C. Data Collected

The first experiment, in pre-existing areas, uses data from five sources. First and most importantly, we use the Green Bank's full administrative data on repayment, savings, loan sizes, number of clients, and client retention rates. We have the data for all 3,285 clients who were active members of the 161 centers at the time of the first randomization in August 2004, as well as the eight new centers opened after August 2004. We use the data from one year prior to the first wave of the experiment to 24 months after the last wave of experiment, thus enabling us to incorporate center-level fixed effects in our analysis with pre and post observations. Second, we use the data from an activity-based costing exercise that credit officers conducted, where for a given week, they had to keep a log of how they allocated their time across the different tasks they typically perform (e.g., attending meetings, assessing new clients, enforcing repayments, etc). The data were collected in January 2006. Third and fourth we use the data from a baseline and follow-up social network survey, conducted in November 2004 and January 2006.[16] Finally, we use a survey of clients in pre-existing areas designed to understand the observed differences between converted and control centers. This survey was conducted in November 2005 (about one year after the start of the experiment in pre-existing areas) and asked about loans from other lenders and clients' knowledge on businesses and repayment performance of other members. In this survey, we employed stratified random sampling from 1) baseline clients, 2) clients who joined the program over the three months prior to the survey, and 3) clients who dropped out within the three months prior to the survey.

The second experiment, in new areas, uses four sources of data. First, we use the complete administrative data for all 68 centers in new areas from the time of center establishment up to May 2008. Second, prior to Green Bank's program introduction in treatment villages, we conducted a census of all households with enterprises. Third, we conduct an activity-based costing exercise in July 2008 that is similar to that conducted in the first experiment. Fourth, we conducted a social network survey of the initial members of each formed center. These social network surveys were collected by credit officers during the first center meeting. Unlike the first experiment, due to budgetary reasons we did not conduct a follow-up social network survey, nor an activities survey about specific monitoring and enforcement activities in each center.

Tables 1A and 1B present summary statistics and orthogonality checks for the clients and communities in the conversion areas sample. Table 1A shows that the randomization yielded observably similar treatment and control groups, when treatment groups are pooled in pre-existing

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[16] Note the social network baseline was conducted after the first wave of conversions but before the second and third waves, hence the social network analysis will not include the first wave of the sample frame.

areas. This holds when we examine group-level measures (Panel A) as well as individual level measures (Panel B). Table 1B presents summary statistics for the second experiment. Panel A and Panel B verify that the initial randomization in new areas also created assignment groups that are similar in village characteristics, in nineteen out of the twenty tests reported in Columns 5 and 6.

IV. Empirical Strategy and Primary Results

We test several hypotheses that emerged in the previous discussion of the relative merits of group versus individual liability. We will organize the results by question, and then within each question we will first show the results for the pre-existing areas (the first experiment) and then for the new areas (the second experiment). The first analysis uses the individual loan-borrower as the unit of observation, and examines the impact on key variables that affect bank profitability, such as repayment, savings deposits held at the Green Bank by borrowers, and loan size (Table 2A and 2B). Then we analyze client drop-out (Table 3), client retention, and success in attracting new clients, as well as loan portfolio at the center level (Table 4A and 4B). All of the above analyses are conducted with the bank's administrative data. Then we examine the difference in the costs of managing individual versus group liability centers, using the data from activity-based cost exercises (Table 5). The rest of the analyses use the survey data on social network, other loans, and members' knowledge about repayment performance of others. We analyze the mechanisms through which activities changed within the bank in pre-existing areas; this provides evidence of the experimental design being implemented as instructed, and also evidence of specific peer screening, monitoring and enforcement activities (Tables 6 and 7). Then we examine heterogeneous treatment effects by social network on default (Table 8) as well as impacts on social networks themselves in pre-existing areas (Table 9 and 10). Lastly, we test the treatment effect on the strength of social network in newly established centers in expansion areas (Table 11).

Throughout the analysis of the first experiment, we define a "treated" loan to be one that matures after the conversion from group to individual liability. In other words, we consider loans that have any exposure to individual liability as treated cycles.[17]

Table 2A Panel A presents the primary results for the first experiment. The specifications use individual loan cycle level data, with standard errors clustered at the center level, the unit of randomization. The sample frame includes only clients that were borrowers at the time of the initial randomization. This allows us to focus analytically on the *ex-post* changes in behavior generated by

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[17] Alternatively, the treated cycle could be defined as all loans released after the conversion. Results are robust to this alternative definition of treated cycle.

group versus individual liability, holding constant a sample frame of individuals screened under a group liability regime.

Specifically, we estimate a difference-in-difference (using pre-post and treatment-control data) model using OLS:

$$y_{igt} = \alpha + \beta T_{gt} + \delta_t + \theta_g + \varepsilon_{igt},$$

where the subscript i refers to the individual, g the group, and t the time period, T is an indicator variable if center g is under an individual liability regime at time t, δ_t are time fixed effects and θ_g are center fixed effects. Thus, β is the coefficient of interest.

Table 2 (Panel A, Columns 1 through 6) shows that the conversion to individual liability had no adverse effect on repayment for the baseline clients, regardless of the measure of default. Given that the default rate is very low, the impact of conversion can be seen as a one-sided test, where at best there is no increase in default. Not only is the point estimate close to zero, but most economically significant effects can be ruled out: the 95 percent confidence bound on proportion of loan balances in default at the time of maturity (Column 3) is -0.034% ± 0.047% and the 95 percent confidence bound on the likelihood of any default 30 days after maturity (Column 6) is -1.058% ± 3.218%. Thus, we do not find strong enough evidence to support the "social collateral" story of Besley and Coate (1995) that predicts higher repayment for group liability loans on average.[18] However, as noted elsewhere, the conversion to individual liability does not remove all "social collateral" since repayment is still public, and someone may repay in order to protect their reputation in the community.

Table 2 Panel B shows similar results for the *new* clients. In this sample frame, selection is confounded with monitoring and enforcement. Yet even here, those selected under individual liability and given individual liability loans are also no more likely to default than those selected under group liability and given group liability loans. The 95% confidence bounds also allow us to rule out economically large effects, although they are slightly larger than those for the baseline clients in Panel A. The second experiment, in new areas, will speak to this question as well, and find similar (null) results.

Table 2 Columns 7 and 8 show savings behavior and loan sizes for both baseline and new clients. We find a reduction in voluntary savings (i.e., savings over and beyond the required cash collateral they have to pay along with loan payments) and a reduction in loan size for all clients. One may have expected higher savings in individual liability since the savings deposits were not

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[18] Below, we will examine heterogeneous treatment effects (Table 9) where we will find evidence that default increases for those with lower baseline measures of social collateral.

held as collateral for other people's loans: the expected return on savings is higher under individual liability (assuming there is some default in expectation under group liability).[19] Greater reduction in loan sizes on new clients under individual liability could be due to several mechanisms: an indication of the selection of new entrants (poorer individuals were screened out under group liability, and are now able to join); more restrictive lending by credit officers, and/or lower appetite for larger loans since borrowers no longer rely on the implicit insurance that group liability provides. In qualitative interviews, credit officers deny that they restrict loan sizes of clients under individual liability centers. Anecdotes from credit officers tell us a different story: the clients in converted centers see that their savings are accumulated more quickly (because the required personal savings increased) and decide to withdraw the savings for various purposes at the end of the loan cycle—this, in return, lower their capacity to borrow in the subsequent loan cycles. While this may not be a favorable outcome for the bank profits, the client welfare under individual liability may increase if they use more savings and borrow less. However, we do not have quantitative data to provide strong evidence to support a particular mechanism.

Of course, the conversion to individual liability does imply both a reduction in peer pressure and a potential increase in bank pressure to repay (see Chowdhury, 2005). The above empirical analysis concludes that the net effect is nil. To confirm that in fact the conversion was adhered to and group liability was not imposed in the treatment centers, we ask current members the reason that others left. Appendix Table 1 shows these results. Under individual liability, individuals are less likely to be forced out of the center in net (Column 1), but importantly Column 2 shows that individuals are less likely to be forced out by their peers and more likely by the credit officer.

We now turn to the second experiment, on new areas. Table 2B presents the primary results. The specifications use individual loan cycle level data, with standard errors clustered at the center level. Because the second trial took place in expansion areas and there is no pre-intervention data, we simply compare the post-intervention outcomes across treatment and control groups, using the credit officer and time fixed effects. Table 2B Panel A shows the average effects of all loans. Similarly to the pre-existing areas, the coefficients are close to zero and statistically insignificant.

Table 2B Panels B and C show the same analysis separately for the first cycle loans and repeat loans. The results in Panel B are consistent with the overall analysis in Panel A—coefficients are small and insignificant, indicating that there is no difference in repayment performance across group, individual, phased-in individual liability clients. Table 2 Panel C shows that repeat loans

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[19] This assumes that the substitution effect is larger than the income effect for savings elasticity.

under individual liability actually have a *lower* probability of defaulting by 3 percentage points at the 30 days after maturity date (Column 6), although this is the only significant result out of six measures of default, and two sample frames, and thus this result is not robust.

Table 3 uses a Cox proportional hazard model to estimate the likelihood of dropout in both pre-existing and new areas. While in pre-existing areas we find that the baseline clients are slightly *more* likely to stop borrowing as a result of conversion to individual liability, for new clients we find the opposite, that those under individual liability are *less* likely to stop borrowing (Table 3 Panel A). Table 3 Panel B shows the results in new areas. There is no significant difference (both statistical and in magnitude) in the likelihood of clients' dropout between clients under individual and group liability, while clients under phased-in individual liability are significantly less likely to drop out. Dropout as an outcome variable is naturally ambiguous: from a borrower's perspective this could be a sign of success, that the loan successfully addressed their cash needs in the enterprise or their personal life and they no longer need credit. Or, alternatively, and especially for new clients, dropout could be a sign that once in the program the client learns that it is not good for them, that it causes issues in their personal life, social life, or business to have the debt burden.

Table 4A examines the main outcomes at the center level in pre-existing areas. We estimate the following specifications using OLS:

$$y_{gt} = \alpha + \beta T_{gt} + \delta_t + \theta_g + \varepsilon_{gt},$$

where y_{gt} is either center size, retention rate,[20] new accounts, number of dropouts, total loan disbursement, or center dissolution for center g at time t, δ_t is an indicator variable equal to one for time period t (time fixed effect), θ_g is a center fixed effect, and T_{gt} is an indicator variable equal to one if group g at time t had been converted to individual liability. The time fixed effects refer to three-month time periods (since individuals within centers do not get issued loans at the same time). The coefficient of interest is β. We test whether the liability rule matters by examining whether the coefficient β is significantly different from zero. Note that here, since the unit of observation is the center (at a certain point in time), we use information from *all* clients who belonged at each point to the center between August 2003 and May 2007.

We find that individual liability is much better at attracting new clients (Panel A, Column 2), leading to larger centers (Column 1) and that individual liability makes existing centers 13.7% points less likely to be dissolved (Panel B Column 2). This final result is the largest, and has

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[20] The retention rate between t and t+1 is defined as the percentage of clients at t that are still clients at t+1.

important practical implications, since dissolution of groups after two to three years is a commonly cited concern among microfinance institutions.

Table 4B shows the center-level analysis on institutional outcomes in the second experiment. The center-level analyses are also conducted with all loans (Panel A), first cycle loans only (Panel B), and repeat loans only (Panel C). Since 46% of the villages randomized were not entered by Green Bank, the analyses on active accounts and loan disbursement are conducted for villages successfully entered by Green Bank (Columns 1 and 4) as well as for all villages randomized (Columns 2 and 5). While there is no significant difference in the center size and total loan size at the center-level across three product groups when restricting the analysis to the villages entered by Green Bank, the analysis with all randomized villages including those not entered by Green Bank show that the center size is significantly smaller on average for both individual liability and phased-in individual liability groups. This is a consequence of either Green Bank staff reluctance or inability to enter villages assigned to individual liability and phased-in individual liability (see discussion in next section). A village-level regression on the likelihood of Green Bank entering (Panel C) confirms that Green Bank was less likely to enter the villages assigned to individual or phased-in individual liability on average, although this effect on individual liability is not statistically significant.

V. Additional Results on Specific Mechanisms

We now turn to four sets of auxiliary data.[21] First, we examine the results of the activity-based costing exercise for both experiments completed by the credit officers in order to measure the change in their allocation of their time across centers. Second, for just the first experiment, we examine the results of a client follow-up survey conducted in November 2005 (over one year after the initial conversion) on clients in both the treatment and control groups. This survey questions were designed to tell us more about three possible mechanisms that could be influenced by the liability structure: center activities, selection and the flow of information (monitoring). The survey was conducted during center meetings and was administered to a sample of active members, including individuals who were members at the time of the conversion as well as new clients who entered afterwards.[22] Third, for the first experiment we use social network data collected before the intervention and again one year later to examine the impact on social networks, as well as

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[21] The results here from the first experiment were also reported in an unpublished working paper (Giné and Karlan 2006), but are being combined into this paper in order to provide the richer context and understanding of mechanisms that are behind the results.

[22] Since meeting attendance is compulsory, we should not be concerned with having a bias sample of survey respondents. In any event, we compared past repayment between respondents and non-respondents in converted and control centers and found no statistical differences across samples (largest t-stat is 0.82).

heterogeneous treatment effects for groups with different preexisting levels of social networks. Fourth, for the second experiment, we use baseline social network data to examine how screening differed across treatment groups.

A. Lender Costs: Activity-Based Costing Exercise

It is important from a sustainability perspective to examine the complete impact on the lender of such a change from group to individual liability. If the lender spends more money on credit officer labor in order to screen, monitor and enforce loans then this is a necessary component of the analysis. In order to evaluate to what extent this was true, we conducted an activity-based costing exercise in which each credit officer kept a detailed diary of all activities for one week. We then attributed their activities to either repayment (preparing for center meetings plus collection and processing of repayments outside of the meetings), center meeting, monitoring, enforcement and/or re-loan activities. Table 5 Panel A and Panel B report these results in pre-existing areas and new areas respectively. In pre-existing areas we find no statistically significant differences in the way credit officers allocated their time, and furthermore the point estimates are actually the opposite of what one may have expected on enforcement. On approval and processing of new loans (Column 7), credit officers do spend more time under individual liability, although again this result is not statistically significant. On the other hand, in new areas credit officers spend more time on repayment activities (monitoring, and enforcement) in individual liability centers than in group liability centers. In particular, the time spent on repayment activities per individual liability center is 90 minutes more per week than that per group liability center on average, and this effect is statistically significant. There are no statistically significant differences between time spent in phased-in individual liability centers and group lending centers. Given that each credit officer manages around 10-15 centers and collects repayment from all clients on weekly basis, this result implies a shift of activity away from program introduction and marketing activities (although statistically insignificant) and towards repayment activities. This is consistent with the lower probability of forming an individual liability center discussed above (although it was not significant). More importantly, we may fail to see a difference in repayment across treatment groups in new areas (Table 2B) precisely because the credit officer is deliberately spending more time in repayment activities of individual liability centers.

B. Center Activities, Survey Results from First Experiment

The client follow-up survey asked questions about center penalties for missing meetings, leaving early and missing payments as well as various activities such as anniversary, Christmas and snacks during the meeting. Table 6 reports changes in penalties (columns 1 and 2) and activities

between treatment and control centers. We find that treatment centers impose lower penalties, possibly because meetings run smoother now that there is less need to enforce peer pressure among clients. However, the conversion to individual liability may have resulted in lower center cohesion as evidenced by the lower probability of social events (not significant) and the lower amount spent (significant for Christmas parties).

C. Selection and Monitoring, Survey Results from First Experiment

Four sets of analysis provide insight into the changes in the selection of clients and monitoring resulting from the change in liability. We asked each member how well they knew the new members that had joined the center since intervention began. Table 7 Columns 1 and 2 show these results. We find that the prior members are *more* likely to know new members well under individual liability than under group liability. This is striking, given the typical assumption that group lending programs encourage peers to screen each other. However, this is consistent with evidence that the depth of family relations within a group is correlated with default (Ahlin and Townsend 2007). Under individual liability, peers no longer fear the acrimony of having to punish someone close to them if there is default, and hence are more willing to invite in their closest friends and family. New members, on the other hand, are *less* likely to know the other new members. Since new members are typically not the ones who bring in new members, this indicates that groups are making fewer *group* decisions on whom to admit and instead individuals are inviting their close friends or family. Thus prior members are closer to the new members, and new members are more distant to the other new members. This is also consistent with the fact that new members in treatment centers are less concerned with screening and monitoring other new clients.

Second, we examine how well individuals know the "type" of the other members in the group. We report these results in Table 7 Columns 3-12. We asked each individual five questions: (1) What is the business of person X? (Columns 3 and 4), (2) What is the required installment amount for person X? (Columns 5 and 6), (3) How many weekly installments did person X miss over the past three months? (Columns 7 and 8), (4) Did person X miss any payments over the past three months? (Columns 9 and 10), and (5) Do you think person X will miss some payments over the next three months? (Columns 11 and 12). We do not find any change in ability to report the peers' businesses, but we do find *lower* levels of ability to report who has missed payments (hence suggestive evidence of reduced monitoring, although also explained by simply not having to participate in repaying that person's missed payments) and lower levels of ability to *predict* who

will or will not default. Again, this is evidence of lower monitoring, since it implies individuals are less informed about the status of each other and, hence, their ability to repay their loans.[23]

The third result on selection looks at the distribution of ability to pay (rather than observed repayment) among existing clients and new clients in treatment and control centers. We asked how many times in the last 3 months they had difficulty in repaying the loan, regardless of whether or not they ended up completely repaying the loan installment. We believe that this measure (rather than observed default) captures the combination of "type" (selection) and ex-ante moral hazard (effort) that is generated from group versus individual liability because being in default is only observed when the member does not have enough cash *and* other members fail to contribute toward the installment. Since side contributions are compulsory in control centers but only voluntary in treatment centers, differences in default rate would come from not only different ability to repay but also different contribution levels from fellow group members.

In a world where creditworthiness is verifiable through a costly screening process, there are two groups of borrowers that would join only individual liability centers. On one end of the creditworthiness distribution, bad risks would be screened out and rejected from group liability centers, but could be allowed into individual liability centers because current borrowers lack the incentive to screen (and the lender may be unable to screen as effectively as the peers). On the other end of the distribution, good risks may have little to gain and much to lose from the implicit risk-sharing agreement imposed by group liability. They decide not to join group liability centers because they fear being forced to help other members repay more frequently than they will receive help. Yet, they join individual liability centers because repayment only depends on their performance. The left panel of Figure 3 plots the distribution of the number of times new clients had difficulty making their payments, while the right panel plots the same distributions for baseline clients (those borrowing at the time of conversion, hence screened under group liability). Interestingly, the distributions of baseline clients in treatment and control centers look alike, but the distribution of new clients in treatment centers is more concentrated around zero than that for control centers. This suggests that good risks were reluctant to join group liability centers but do so after these centers are converted to individual liability. We do not find evidence of bad risks also joining individual liability centers. A Kolmogorov-Smirnov test of equal distributions between treatment and control centers is rejected at 10 percent for new clients but not for baseline clients.

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[23] Note, Chowdhury (2005) and Ghatak and Guinnane (1999) use the term monitoring to denote information about project choice, while we measure knowledge about missed payments, perhaps closer to auditing.

The fourth and last result on selection focuses on the interaction between demand and the competitive setting. Did individuals increase or decrease their borrowing with other lenders after the Green Bank converted to individual liability? The results are reported in Table 8, where it is clear that the answer depends entirely on whether the other lender is a group or an individual liability lender. If we restrict the analysis to barangays in which the competition is engaged in *group* lending, then we find that baseline Green Bank clients are more likely to borrow from them after their group is switched to individual liability. This indicates perhaps that *some* individuals among baseline clients prefer group liability (perhaps for the risk-sharing component of group liability) and hence when the group liability is removed they remain with the Green Bank but also then seek a loan from a separate group liability program. On the other hand, when the competition only offers individual liability, we see a *reduction* in the likelihood that baseline clients seek a loan (although this result is only significant in the tobit specification on loan size, and has a p-value of 0.17 for the probit specification). This indicates that when the Green Bank switches to individual liability, individuals who prefer individual liability are more satisfied, and individuals who prefer group liability seek supplementary loans from other group lending programs. Results are less conclusive for the new clients, perhaps due to the lower sample size.

D. Heterogeneous Treatment Effects with respect to Social Networks

Theoretically, the shift to individual liability may have worked better or worse in groups with different levels of preexisting social networks. If social collateral keeps repayment high, then "releasing" the collateral by converting to individual liability (and replacing the social collateral with bank pressure and mere public disclosure of default, but not group liability) may lead individuals with higher social capital to have lower repayment rates. On the other hand, if individuals have higher social capital because of their stronger and more trustworthy characters, then the shift to individual liability should be less likely to influence their decision to repay (since they are a "trustworthy" type, perhaps irrespective of whether social collateral is at stake or not).

We test the net effect of these possible mechanisms in Table 9 by interacting treatment with one of various social network measures. The social network data were collected during the center meetings in all centers in between the first and second wave of the randomization (for this reason, the first wave centers are removed from this analysis, since their "baseline" occurred *after* the treatment began). The survey procedure was simple: in public, in the meeting, a surveyor asked an individual to stand up and then asked all other members in the group to raise their hand if their answer to a specific question about their relationship with this person was "yes." This method prevents one from asking highly personal questions (e.g., "Would you lend to X if they asked

you?") but does allow for higher precision on questions which are of public knowledge (since one has the attention of everyone in the group to facilitate answering the questions). We categorize the social network questions as either "knowledge" or "trust". "Knowledge" includes: family, friend since childhood, buys products or services, or visits once a week for social purposes. "Trust" includes has given a loan to the other person outside of the Green Bank program, voluntarily helped them pay their Green Bank loan, or turns to this person for advice or help.

We then examine the primary repayment measure: percentage of loan past due at the time of maturity. We find that default is lower for those with *stronger* social networks relative to those with weaker social networks. This is true both for "knowledge" measures of social capital (Column 5) and the pooled aggregate index (Column 10), but not for the "trust" measures (Column 9).

These results may be an indication that those identified as having stronger "trust" social networks are in fact a more trustworthy "type," hence the shift to individual liability has no adverse effect on their likelihood of repaying. In other words, being "trustworthy" is a personal characteristic that determines ones social networks and also leads to higher repayment of loans. This is consistent with results from Karlan (2005), in which trustworthy behavior in a lab experiment in the field predicted repayment of loans one year later to a microcredit organization in Peru. An alternative hypothesis is that those with stronger social networks must repay their loan in both setups in order to protect their social networks. Those with weaker social networks have less to lose from the "shame" of being seen in default (less social collateral, in the model of Besley and Coate (1995)), and hence the shift to individual liability generates higher default. Of course, we cannot say conclusively why this result is heterogeneous, but it does suggest that the existing literature on the link between social capital and repayment within group lending is an important literature, and that more needs to be learned about the circumstances under which social capital helps versus hurts both the repayment and growth in lending programs.

E. Impact on Social Networks, Conversion Areas Only

Next, we examine how the liability structure affects the social network among center members in both conversion and new areas. In Table 10 we show the results of the analysis on changes in social network in pre-existing areas. As we have both baseline and follow-up data on social networks, we are able to employ a difference-in-difference empirical specification. We find only one social network channel to have changed: likelihood to help another person with a side-loan in order to help her make her loan payment. Social networks should change under individual liability for many reasons. First, with fewer incentives to monitor, the *quantity* of interaction may fall. On the other hand, the *quality* of the interaction may increase since they no longer have to

pressure each other to repay. From selection, as found earlier, we find groups more connected because individuals are inviting closer friends and family to join the center. However, in net, we find no significant impacts on social networks, except the reduction in side loans.

F. Selection Effects with Respect to Social Networks, New Areas Only

When entering into new areas, we examine how the liability rules influence the social capital that exists amongst the initial members. The theoretical prediction is ambiguous. One may expect group liability centers to have stronger social network, because members are directly held liable for other members' loans. Alternatively, if group liability imposes excessive pressures on members, close friends and neighbors may be more likely to join individual liability centers, where they do not have to risk their social capital. Table 11 presents the effect of the liability structure on the social networks amongst those who borrow. The results show that there is no consistent and significant difference in the social network among center members across group, individual, phased-in individual liability centers, with the exception that those who join individual liability centers have a lower average proportion of members who know other members since childhood. This is consistent with the finding in conversion areas that new members were less likely to know each other well, but since this is the only one of five social network measures that finds a difference, we consider this result suggestive at best.

VI. Conclusion

The choice of group or individual liability is perhaps one of the most basic questions lenders make in the design of loan products in credit markets for the poor. Despite the importance of this decision, past empirical research on group and individual liability has not provided policymakers and institutions the clean evidence needed to determine the relative merits of the two methodologies. In this study, we use two randomized control trials to evaluate the impact of group liability on the performance of clients and the profitability for the lending institution. Naturally, these are from one lender in a few regions of the Philippines, but this is a transition we are witnessing around the world; thus this is not a highly unusual lender for wanting to make this conversion. As with all empirical research, many questions persist as to whether these findings will hold in other countries, in other cultures and with other lenders. Although this decision by the bank to shift from group to individual liability is not unusual, we still must ask whether the culture or macroeconomic conditions, for instance during the three year time period of this study, led to similar outcomes for both individual and group borrowers, and whether under different external conditions differences in repayment would arise. Social science, just like physical sciences, needs replication in order to solve these issues.

The results are striking, however, in three respects. First, we find that individual liability compared to group liability leads to no change in repayment but did lead to larger lending groups, hence further outreach and use of credit, for pre-existing groups. Second, in new areas, we found the bank officers *less* willing to open groups despite no increase in default. Thus supply constrained the growth of the lending program, whether for good cause or unwarranted fear by the employee is outside the scope of our data to assess. Third, we do find statistically significant evidence of some of the *mechanisms* discussed in the group liability literature, such as screening and monitoring, but we simply do not find that it adds up in an economically meaningful way to higher default.

One could argue that the results from the first experiment lend support to the adverse selection story of Ghatak (2000) because borrowers that selected into the program under joint liability would tend to be safer. The finding that after the removal of group liability monitoring goes down but repayment does not change, suggests, at the very least, that peer monitoring or peer pressure are unimportant. However, the lack of default for *new* members too suggests that the answer is not that simple, that even new clients brought into centers built under group liability repay their loans. This could be a result of group liability creating well-functioning groups, and even new members adhere to the practices and policies of the pre-existing members.

The larger new centers, combined with the lack of increased default, suggest that the screening process has changed without worsening repayment. The findings seem consistent with the model of Chowdhury (2005), where the removal of group liability has probably resulted in an increased monitoring and screening done by credit officers, although we did not find an increase in their workload.

Our findings are also consistent with the work of Greif (1994) in a rather different context. He suggests that collectivist societies, like joint liability institutions in our setting, are based on the ability to impose social sanctions to players that deviate from the agreed norms of conduct. But this requires a level of trust and knowledge among players that may hinder expansion of the set of players thus leaving efficient trades unrealized. A more individualistic society requires fewer exchanges of information among players and is thus able to grow faster. It does necessitate, however, well-functioning formal institutions to enforce contracts. In our context, shifting some of the burden from clients to credit officers strikes this balance successfully. The institutional enforcement is sufficient to recover loans without group liability, and the individual liability allows for more growth and outreach for the lender.

In sum, the recent trend of microfinance institutions expanding their individual lending products (or in some cases, shifting from group liability to individual liability) may help deepen

outreach and provide more flexible microfinance products for the poor. Our findings suggest that the innovators finding methods of lending individually (and more flexibly, see Karlan and Mullainathan (2009)) to the poor may be moving in the right direction. Certainly, as with all empirical research (experimental or non-experimental), replication is imperative for both policy and theory in order to learn when these findings hold and when they do not.

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Figure 1: Experimental Design Trial #1

Administrative Data Begin

Baseline Social Network Survey

Follow-up Mechanism Survey

Follow-up Social Network Survey

Final Administrative Data (34 months)

August 2003 | August 2004 | November 2004 | May 2005 | November 2005 | January 2006 | May 2007

8 New centers opened

Wave 1
11 Centers Converted

Wave 2
24 Centers Converted

Wave 3
45 Centers Converted
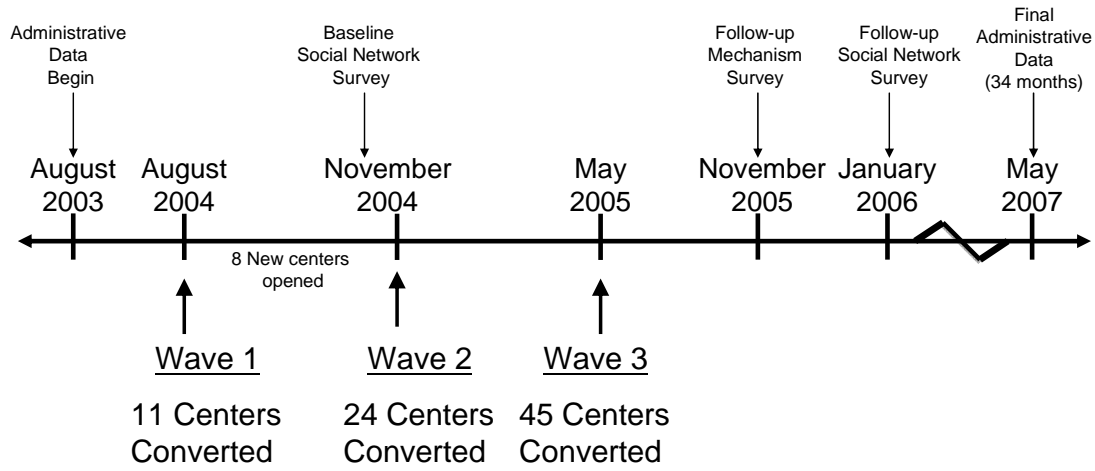
Total 169 Centers
80 Treatment
89 Control

Figure 2: Experimental Design Trial #2

Administrative Data Begin/ Social network data for Area 1

Social network data for Area 2

Social network data for Area 3

Social network data for Area 4

Social network data for Area 5

Final Administrative Data

October 2005 | May 2006 | October 2007 | May 2008 | July 2008

August 2005 | January 2006 | March 2006 | May 2007 | August 2007

Area 1
Business census survey

Area 2
Business census survey

Area 3
Business census survey

Area 4
Business census survey

Area 5
Business census survey

Activity-Based Costing Exercise

Total 124 Centers
43 Group Liability
41 Individual Liability
40 Phased-in Individual Liability

Figure 3: Kernel Density: Number of weeks that clients had difficulty repaying
3 months prior to the November Survey, Center average

The left panel shows the kernel densities of the center average of the number of weeks in difficulty repaying over the three months prior of the survey in November 2005 for treatment centers (red) and control centers (blue). The right panel plots the same distribution for baseline clients. The sample includes clients who attended the center meeting when the survey was conducted.

New Clients   Baseline Clients
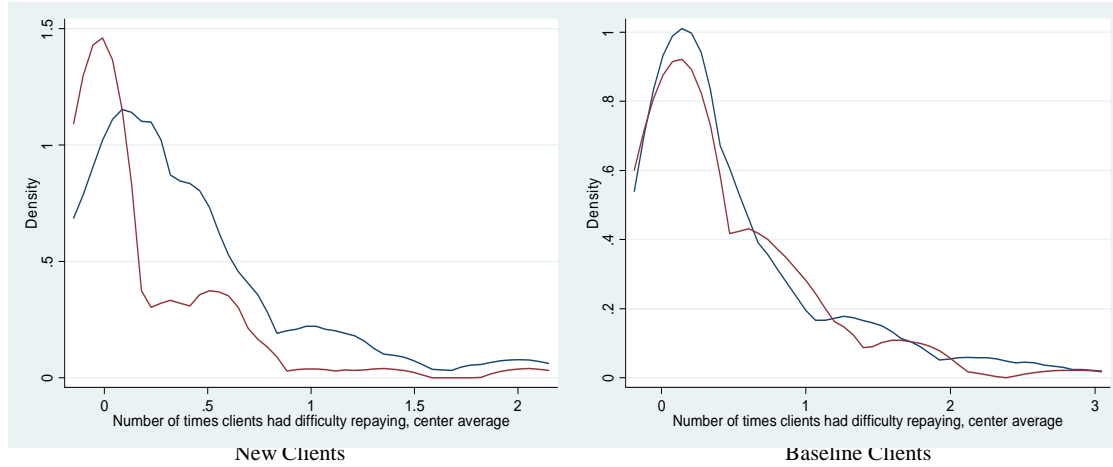
Kolmogorov-Smirnov Test

	New Clients	Baseline clients
P-value	0.109	0.556
(corrected value)	0.076	0.494

Table 1A: Baseline Summary Statistics, Conversion Areas

	All	Group Liability	Individual Liability	p-value on t-test of difference: (2) - (3)	Treatment Wave 1	Treatment Wave 2	Treatment Wave 3	p-value on F-test for (5), (6) and (7)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
A. Center Performance, pre-intervention (Aug 2004)								
Total number of active accounts	20.224	20.262	20.182	0.964	20.727	18.666	20.756	0.914
	(0.884)	(1.245)	(1.263)		(2.649)	(2.684)	(1.663)	
Number of new clients	3.159	3.641	2.644	0.190	2.800	1.350	3.209	0.274
(May-Aug 2004)	(0.380)	(0.594)	(0.460)		(1.459)	(0.509)	(0.655)	
Number of dropout clients	1.603	1.551	1.658	0.802	1.000	0.700	2.256	0.124
(May-Aug 2004)	(0.211)	(0.212)	(0.374)		(0.298)	(0.179)	(0.612)	
Retention	0.904	0.900	0.909	0.685	0.944	0.949	0.883	0.282
(May-Aug 2004)	(0.012)	(0.017)	(0.016)		(0.019)	(0.017)	(0.024)	
Proportion of missed weeks over cycle	0.060	0.054	0.068	0.332	0.113	0.054	0.063	0.264
(May-Aug 2004)	(0.007)	(0.009)	(0.011)		(0.049)	(0.016)	(0.013)	
Pastdue (maturity) / Scheduled total amortization due (in 100s)	0.092	0.000	0.193	0.258	0.005	0.329	0.000	0.397
	(0.085)	(0.000)	(0.178)		(0.005)	(0.304)	(0.000)	
Pastdue (30d) / Scheduled total amortization due (in 100s)	0.001	0.000	0.001	0.298	0.005	0.000	0.000	0.082
	(0.001)	(0.000)	(0.001)		(0.005)	(0.000)	(0.000)	
Pastdue (90d) / Scheduled total amortization due (in 100s)	0.000	0.000	0.000	--	0.000	0.000	0.000	--
	(0.000)	(0.000)	(0.000)		(0.000)	(0.000)	(0.000)	
Total loan amount	122,922.4	124,142.9	121,590.9	0.853	110,636.4	108,500.0	130,377.8	0.771
	(6868.4)	(10580.5)	(8616.4)		(17828.1)	(15613.8)	(12075.5)	
Average Loan size	6,033.2	5,996.1	6,073.7	0.806	5,196.8	6,030.0	6,308.5	0.425
	(157.5)	(220.6)	(226.2)		(473.2)	(410.0)	(312.4)	
Number of active centers, August 2004	161	85	76		11	21	44	
Number of centers in the sample	169	88	81		11	24	46	
B. Individual-level Performance, pre-intervention (Aug 2004)								
Proportion of missed weeks over cycle	0.062	0.059	0.065	0.324	0.083	0.065	0.059	0.185
	(0.003)	(0.004)	(0.005)		(0.016)	(0.008)	(0.005)	
Indicator for having at least one missed week	0.483	0.467	0.501	0.190	0.343	0.557	0.537	0.000
	(0.013)	(0.018)	(0.019)		(0.040)	(0.045)	(0.024)	
Proportion of past due balance, at maturity date	0.080	0.040	0.125	0.439	0.000	0.062	0.184	0.674
	(0.055)	(0.022)	(0.115)		(0.000)	(0.055)	(0.184)	
Past due balance, 30 days past maturity date (binary)	0.001	0.000	0.001	0.286	0.000	0.008	0.000	0.010
	(0.001)	(0.000)	(0.001)		(0.000)	(0.008)	(0.000)	
Total excess savings	319,924.5	286,583.4	357,940.0	0.625	223,869.7	216,725.5	441,811.5	0.740
	(72780.0)	(82775.0)	(123967.1)		(74987.2)	(57842.1)	(197449.3)	
Loan amount	6,107.2	6,143.6	6,069.1	0.570	5,558.4	5,772.7	6,368.7	0.003
	(65.5)	(93.1)	(92.2)		(180.3)	(193.7)	(125.5)	
Number of active clients, August 2004	3,285	1,708	1577		298	394	885	

Standard errors in parentheses. In Panel A, the number of active centers is less than 169 in August 2004 because there are 8 centers that started after the first conversion and added to the sample. P-values reported in column (4) are the probability of (column (2) - column (3)) being zero. P-values in Column (8) are the probability that eacg treatment wave are jointly equal to zero. The associated F-statistic comes from a regression of the outcome variable of interest on a set of indicator variables for each of the treatment waves. The exchange rate at the time of the experiment was 52 pesos = US$1.

Table 1B: Baseline Summary Statistics, New Areas

	All (1)	Group Liability (2)	Individual Liability (3)	Phased-In Individual Liability (4)	p-value on t-test of difference: (2) - (3) (5)	p-value on t-test of difference: (2) - (4) (6)
Panel A: All barangays identified as feasible						
Total number of businesses	110.347	103.047	118.902	109.425	0.480	0.764
	(8.976)	(14.674)	(16.955)	(15.257)		
Average weekly business revenue (in 1000 pesos)	2.112	2.233	2.084	2.010	0.554	0.361
	(0.099)	(0.181)	(0.172)	(0.160)		
Proportion of business owners who want to borrow now	0.465	0.438	0.490	0.469	0.132	0.410
	(0.014)	(0.026)	(0.022)	(0.026)		
Average number of household members involved in businesses	0.858	0.876	0.897	0.797	0.865	0.529
	(0.049)	(0.089)	(0.081)	(0.087)		
Average number of non-household members involved in businesses	0.138	0.154	0.124	0.134	0.397	0.569
	.01373	(0.026)	(0.023)	(0.022)		
# of barangay		43	41	40		
Panel B: Barangays identified feasible and entered by Green Bank						
Total number of businesses	83.338	81.630	98.217	66.889	0.495	0.465
	(9.173)	(15.042)	(19.252)	(9.374)		
Average weekly business revenue (in 1000 pesos)	2.087	2.186	2.048	1.989	0.689	0.592
	(0.140)	(0.246)	(0.234)	(0.249)		
Proportion of business owners who want to borrow now	0.404	0.385	0.456	0.366	0.083	0.661
	(0.017)	(0.028)	(0.029)	(0.031)		
Average number of household members involved in businesses	1.014	1.053	0.947	1.041	0.478	0.940
	(0.061)	(0.110)	(0.095)	(0.115)		
Average number of non-household members involved in businesses	0.161	0.174	0.120	0.192	0.322	0.763
	(0.023)	(0.038)	(0.037)	(0.044)		
# of barangay		27	23	18		

Standard errors in parentheses. Panel A includes all barangays (villages) identified as feasibles by Green Bank staff. Panel B reports on only those barangays where a center was created. Data comes from the entreprise census. P-values reported in column (5) are the probability of (column (2) - column (3)) being zero. P-values in Column (6) are the probability of (column (2) - column (4)) being zero. The exchange rate at the time of the experiment was 52 pesos = US$1.

Table 2A: Institutional Impact at the Loan Cycle Level, Conversion Areas

OLS

Dependent Variable: Specifications	Proportion of missed weeks OLS (1)	Indicator for having at least one missed week Probit (2)	Proportion of past due balance, at maturity date OLS (3)	Indicator for having past due, at maturity date OLS (4)	Proportion of past due balance, 30 days after maturity date OLS (5)	Indicator for having past due, 30 days after maturity date OLS (6)	Total excess savings OLS (7)	Log of loan size OLS (8)
Panel A: Baseline clients								
Individual liability	0.005	-0.009	-0.001	0.006	-0.000	0.011	-309.973**	-0.087***
	(0.014)	(0.093)	(0.001)	(0.012)	(0.001)	(0.011)	(131.414)	(0.032)
Observations	14333	14328	14280	14280	14182	14182	14333	14333
R-squared	0.102	0.079	0.035	0.226	0.024	0.243	0.303	0.208
Mean of dependent variable	0.075	0.430	0.002	0.044	0.001	0.031	842.271	8.654
Panel B: New clients								
Individual liability	0.005	0.023	-0.002	0.011	-0.000	0.025	-239.652	-0.109***
	(0.006)	(0.073)	(0.001)	(0.019)	(0.001)	(0.018)	(170.740)	(0.025)
Observations	6050	6047	5966	5966	5662	5662	6046	6050
R-squared	0.096	0.092	0.017	0.094	0.014	0.114	0.063	0.102
Mean of dependent variable	0.069	0.386	0.008	0.167	0.003	0.129	1895.368	8.457

Robust standard errors clustered by lending centers in parentheses, * significant at 10%; ** significant at 5%; *** significant at 1%. Treatment variable equals one if the loan cycle ends after the conversion in treatment centers; zero otherwise. All regressions use fixed effects for each credit officer and month of the maturity date. The sample frame for Panel A is baseline clients, i.e., those who were active at the first conversion in August 2004; the sample frame for Panel B is new clients, i.e., those who joined the program after August 2004 in the control group or after the conversion in each of the treatment groups. Proportion of missed weeks is calculated by the number of weeks in which the client did not make the full installment divided by the number of installments. Total excess savings is defined by the excess amount of savings that the client deposit beyond the required savings amount over a loan cycle (the value takes zero if the total deposit does not reach the required savings amount).

Table 2B: Institutional Impact At the Loan Cycle Level, New Areas

Specifications	Proportion of missed weeks OLS (1)	Indicator for having at least one missed week Probit (2)	Proportion of past due balance, at maturity date OLS (3)	Indicator for having past due at maturity date OLS (4)	Proportion of past due balance, at due balance, 30 days after maturity date OLS (5)	Indicator for having past due, 30 days after maturity date OLS (6)	Log of loan size OLS (7)
Panel A: All cycles							
Individual liability	-0.004	0.027	-0.005	-0.018	-0.002	-0.018	-0.017
	(0.016)	(0.161)	(0.006)	(0.026)	(0.004)	(0.014)	(0.032)
Phased-in individual liability	-0.001	0.218	-0.004	-0.010	-0.004	-0.015	-0.052
	(0.016)	(0.163)	(0.006)	(0.026)	(0.004)	(0.013)	(0.035)
Number of observations	4869	4816	4869	4869	4704	4704	5352
R squared	0.151	0.189	0.115	0.138	0.123	0.187	0.182
Mean of dependent variable	0.098	0.099	0.023	0.122	0.014	0.068	8.324
Panel B: First cycle only							
Individual liability	-0.002	0.119	0.002	-0.013	0.002	-0.011	-0.036
	(0.015)	(0.175)	(0.007)	(0.035)	(0.005)	(0.016)	(0.027)
Phased-in individual liability	0.002	0.009	-0.003	-0.011	-0.004	-0.009	-0.082***
	(0.017)	(0.208)	(0.006)	(0.030)	(0.005)	(0.014)	(0.024)
Number of observations	2137	2006	2137	2137	2112	2112	2203
R squared	0.274	0.258	0.258	0.211	0.254	0.258	0.314
Mean of dependent variable	0.086	0.408	0.024	0.125	0.015	0.072	8.168
Panel C: Second cycle and after							
Individual liability	-0.013	-0.131	-0.013	-0.030	-0.007	-0.031*	-0.037
	(0.020)	(0.187)	(0.008)	(0.026)	(0.004)	(0.016)	(0.037)
Phased-in individual liability	-0.002	0.294	-0.006	-0.009	-0.004	-0.020	-0.036
	(0.020)	(0.183)	(0.008)	(0.031)	(0.005)	(0.018)	(0.041)
Number of observations	2732	2619	2732	2732	2592	2592	3149
R squared	0.120	0.116	0.032	0.121	0.017	0.184	0.125
Mean of dependent variable	0.107	0.575	0.023	0.119	0.013	0.064	8.433

Robust standard errors clustered by lending centers in parentheses, * significant at 10%; ** significant at 5%; *** significant at 1%. All regressions use fixed effect for credit officers and months of maturity dates. Panel A reports on all loan cycles, Panel B uses the first loan while Panel C uses subsequent loans.

Table 3: Impact on Dropout
Cox proportional hazard model, failure = dropout
Dependent Variable: Binary variable equal to one if the client has dropped out

	(1)	(2)
Panel A: Conversion Areas		
Sample frame:	Baseline clients	New clients
Individual liability	1.121*	0.857***
	(0.071)	(0.042)
Observations	8310	7157
Panel B: New Areas		
Sample frame:	All clients	
Individual liability	0.973	
	(0.48)	
Phased-in individual liability	0.794***	
	(3.31)	
Observations	3610	

* significant at 10%; ** significant at 5%; *** significant at 1%. The model estimated is the Cox proportional hazard. Reported are hazard ratios and standard errors in parentheses, calculated assuming within-center clustering. Lower hazard ratio (<1) indicates that clients in Treatment centers stay longer in the program and that conversion into individual-liability is associated with lower likelihood of dropping out.

Table 4A: Institutional impact At the Center Level, Conversion Areas
OLS, Probit

Panel A: Center Growth

Dependent variable:	Active accounts	New accounts	Retention rate	Number of dropouts	Loan Disbursement	Coefficient Variation of loan amount
Specification:	OLS	OLS	OLS	OLS	OLS	OLS
	(1)	(2)	(3)	(4)	(5)	(6)
Individual liability	2.828**	0.840***	0.025	0.199	3,566.337	-0.021
	(1.396)	(0.263)	(0.016)	(0.332)	(9,934.659)	(0.024)
Mean of dependent variable	15.36	2.51	0.80	3.16	98387.23	0.44
Observations	2507	2017	2017	2017	2507	2130
Number of centers	169	169	169	169	169	169
R-squared	0.21	0.06	0.28	0.18	0.25	0.09

Panel B: Center Dissolution

Dependent variable:	Dissolved center	
Specification:	OLS	Probit
Individual liability	-0.013	-0.137*
	(0.012)	(0.078)
Mean of dependent variable	0.03	0.37
Observations	2017	169
Number of centers	169	
R-squared	0.080	

Robust standard errors in parentheses, * significant at 10%; ** significant at 5%; *** significant at 1%. "Treatment" is an indicator variable equal to one if the center has been converted for a given observation. All regressions except Panel B, Column 2 use fixed effects for credit officers and months of maturity dates, and standard errors are clustered by lending centers. Every center has an observation on each outcome for every three month between August 2003 and May 2007. Panel B, Column 6 uses fixed effects for credit officers and reports the marginal effects for the coefficient on treatment. Total loan amount is the aggregated loan amount disbursed in a center, and average loan amount is the average loan size per client. Both numbers are in pesos (1 US $ = 52 pesos). Panel A, Columns 2-4 excludes centers that had been dissolved in the previous time periods; The sample for Panel A, Column 1 is active centers in which there are matured accouts in each time period.

Table 4B: Institutional Impact At the Center Level, New Areas

OLS, Probit

	(1)	(2)	(3)	(4)	(5)	(6)
Sample restriction	Villages entered	All villages	Villages entered	Villages entered	All villages	Villages entered
Dependent variable:	Active accounts	Active accounts	Number of dropouts	Loan Disbursement	Loan Disbursement	Coefficient Variation of loan amount
Fixed effects	Credit officers & time	Branch & time	Credit officers & time	Credit officers & time	Branch & time	Credit officers & time
	(1)	(2)	(3)	(4)	(5)	(6)

Panel A: Center Growth (OLS)

i. All cycles

	(1)	(2)	(3)	(4)	(5)	(6)
Individual liability	-1.111	-4.603	-0.369	-3709.109	-14800	-0.039**
	(2.024)	(3.240)	(1.103)	(5834.107)	(10603.096)	(0.019)
Phased-in individual liability	-0.267	-6.796**	-0.744	-4295.913	-22700**	-0.037
	(2.073)	(3.301)	(1.238)	(6255.684)	(10914.781)	(0.028)
Mean of dependent variable	13.32	6.48	8.55	38563.38	25372.95	0.25
Number of observations	637	1309	508	579	880	498
R squared	0.29		0.40	0.12		0.30

ii. 1st cycle only

	(1)	(2)	(3)	(4)	(5)	(6)
Individual liability	-1.071	-4.276***	0.344	1012.558	-2964.157	-0.000
	(1.178)	(0.413)	(0.270)	(2149.187)	(6188.784)	(0.019)
Phased-in individual liability	-0.438	-4.314***	0.204	-313.888	-12700**	0.040
	(1.295)	(0.419)	(0.223)	(1637.798)	(6372.020)	(0.027)
Mean of dependent variable	6.71	4.55	1.08	12161.31	8328.27	0.15
Number of observations	633	934	637	654	955	324
R squared	0.29		0.25	0.39		0.29

iii. 2nd cycle and after

	(1)	(2)	(3)	(4)	(5)	(6)
Individual liability	-0.057	-1.840	-1.493	-5269.785	-20600***	-0.068***
	(0.948)	(1.675)	(1.127)	(4371.366)	(1770.957)	(0.022)
Phased-in individual liability	0.163	-3.042*	-0.733	-3459.051	-18300***	-0.072**
	(0.839)	(1.700)	(1.169)	(4917.377)	(1779.249)	(0.030)
Mean of dependent variable	6.99	4.67	6.79	22149.00	15131.26	0.26
Number of observations	606	907	645	649	950	362
R squared	0.25		0.27	0.23		0.24

Panel B: Center Creation and Dissolution (Probit)

Dependent variable:	Created	Dissolved
Individual liability	-0.054	0.155
	(0.096)	(0.115)
Phased-in individual liability	-0.168*	0.089
	(0.088)	(0.135)
Number of observations	124	77
R squared	0.286	0.319

Robust standard errors in parentheses, * significant at 10%; ** significant at 5%; *** significant at 1%. Regressions in Panel A use fixed effects for credit officers and months of maturity dates, and standard errors are clustered by lending centers. In Panels A and B, every center has an observation on each outcome on every three month between September 2005 and August 2008. Regressions in Col (1) - (3) in Panel A and B control for the number of active accounts in the previous time period.

Table 5: Activity-Based Costing Analysis: Time Spent on Different Activities by Center

OLS

	Time on expansion	Time on reloan	Time on expansion/reloan	Time on repayment activities	Time on loan monitoring	Time on following up with delinquent clients	Time on loan enforcement
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: Conversion Areas							
Individual liability	0.927	11.438	12.365	-2.374	-4.712	-4.347	-7.696
	(1.812)	(10.464)	(9.999)	(12.882)	(4.187)	(3.405)	(4.369)
Mean of dependent variable	3.04	29.47	32.51	155.88	10.43	9.50	12.18
Observations	146	146	146	146	146	146	146
R-squared	0.00	0.11	0.11	0.23	0.09	0.07	0.08
Panel B: New Areas							
Individual liability	-1.957	-60.142	-61.561	90.086**	-9.715	20.963	9.110
	(1.866)	(41.156)	(42.037)	(36.120)	(6.648)	(14.635)	(7.463)
Phased-in individual liability	-1.419	-25.512	-26.704	12.932	-9.043	10.603	5.904
	(2.090)	(45.302)	(46.272)	(40.455)	(7.446)	(16.392)	(8.358)
Mean of the dependent variable	0.682	51.091	51.773	108.273	9.409	17.455	8.159
Number of observations	44	44	44	44	44	44	44
R-squared	0.201	0.207	0.208	0.290	0.418	0.245	0.171

Robust standard errors in paretheses. * significant at 10%; ** significant at 5%; *** significant at 1%. All regressions use fixed effect for credit officers. Each cell reports the average time in minutes spent on indicated activity per center in a given week in January 2006. Expansion includes marketing activities, orientation for potential clients, and conducting trainings for new clients. Reloan includes conducting credit evaluation, filling/reviewing of loan forms, and releasing the loan. Repayment includes preparing for center meetings, travel time, center meetings, and handling the collection. Monitoring involves making reports, answering clients' questions; enforcement includes loan utilization check and following up with delinquent clients.

Table 6: Center Activities, Conversion Areas

Sample framework: Wave 2 and 3 Centers Only (because data collected during social network survey)

	Total penalties	Total enforced penalties	No activity	Anniversary		Christmas parties	
				Likelihood of having a party	Amount spent, conditional on having a party	Likelihood of having a party	Amount spent, conditional on having a party
	OLS	OLS	Probit	Probit	OLS	Probit	OLS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Individual liability	-10.095*	-9.548*	-0.004	-0.066	-582.518	-0.002	-695.057*
	(5.583)	(5.613)	(0.059)	(0.096)	(871.233)	(0.076)	(396.256)
Mean of dependent variable	47.85	47.58	0.12	0.46	2047.93	0.76	1218.34
Standard error of dependent variable	2.94	2.96	0.03	0.04	438.30	0.04	198.92
Observations	131	131	113	131	60	131	99
R-squared	0.19	0.20	0.03	0.04	0.30	0.04	0.14

Standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Penalties include not attending, leaving early from, being late to the meeting, and missing payments. All regressions use fixed effect for credit officers.

Table 7: Knowledge About Other Members of the Center, Conversion Areas

Clients were asked about (a) how well they knew incoming members who joined the center, and
(b) other members' performances over three months prior to the survey

Sample Frame: Clients who were present at the survey which took place during a center meeting in November 2005

	Knowledge about new members only				Knowledge about all other members							
	Knew the new member well when they entered the center		Knew Business		Negative absolute value of difference between reported and actual amount of installment		Negative absolute value of difference between reported and actual number of defaults		Knew whether or not the client defaulted		Predicted default	
Sample Frame:	Baseline Clients	New Clients	Baseline Clients	New Clients	Baseline Clients	New Clients	Baseline Clients	New Clients	Baseline Clients	New Clients	Baseline Clients	New Clients
Dependent Variable:	Ordered probit	Ordered probit	Probit	Probit	OLS	OLS	OLS	OLS	Probit	Probit	Probit	Probit
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Individual liability	0.317***	-0.278**	-0.000	0.018	-4.585	-1.970	-0.091*	-0.259**	-0.018	-0.019	-0.018	-0.059**
	(0.105)	(0.124)	(0.019)	(0.025)	(5.582)	(6.363)	(0.048)	(0.100)	(0.019)	(0.026)	(0.024)	(0.029)
Observations	1692	970	4015	1908	2902	1376	4128	2178	4161	2194	3684	1926
R-squared			0.06	0.08	0.03	0.06	0.29	0.19	0.12	0.15	0.11	0.09
Mean of Dependent variable	1.28	1.13	0.52	0.49	81.92	79.84	-0.67	-0.65	0.78	0.76	0.74	0.78

Robust standard errors clustered by respondents in parentheses, * significant at 10%; ** significant at 5%; *** significant at 1%. Marginal coefficients reported for the probit specifications. All regressions use fixed effect for credit officers. Dependent variable for regressions in columns (1) and (2) is a categorical variable for how well the respondent knew the new member before she joined the program; 0 if did not know at all, 1 if knew a little, 2 if knew well, 3 if knew very well.

Table 8: Current Borrowing from Other Lenders, Conversion Areas

Sample Frame: Clients who were present at the survey which took place during a center meeting in November 2005

Sample Frame:	Barangays with NGOs offering group-liability loans only				Barangays with Coops offering individual-liability loans only			
	Has loan from competitor		Loan size from competitor		Has loan from competitor		Loan size from competitor	
Dependent Variable:	Baseline Clients	New Clients	Baseline Clients	New Clients	Baseline Clients	New Clients	Baseline Clients	New Clients
	Probit	Probit	Tobit	OLS	Probit	Probit	Tobit	OLS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Individual liability	0.062*	-0.021	5,039.825***	-70.743	-0.049	-0.028	-8,703.439*	-541.297*
	(0.034)	(0.051)	(1,907.141)	(284.211)	(0.035)	(0.029)	(4,856.900)	(287.193)
Observations	474	269	474	269	476	257	476	257
R-squared	0.07	0.14	0.07	0.11	0.07	0.10		0.09
Mean of dependent variable	0.11	0.16	653.38	912.64	0.10	0.06	1303.361	464.98

Robust standard errors clustered by lending center in parentheses, * significant at 10%; ** significant at 5%; *** significant at 1%. Marginal effects reported for the probit specifications. All regressions have fixed effect for credit officers. Dependent variable for columns (1)-(2) are binary variable equal to one if the client currently has loans from NGOs; that of columns (3)-(4) are binary variable equal to one if the client currently has loans from COOPs.

Table 9: Impact of Social Network on Default, Conversion Areas

OLS

Dependent variable: Proportion of past due balance at the maturity date

Sample Frame: Clients who were present at the meeting during the baseline social network baseline survey

	Knowledge				Knowledge index	Trust			Trust index	All
	Family	Friends	Buy products	Visit once a week		Given loan	Voluntary help	Go for advice		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Individual liability	0.326	0.086	0.621**	0.188	0.860**	0.346	0.277	0.096	0.116	0.871**
	(0.294)	(0.366)	(0.295)	(0.344)	(0.384)	(0.307)	(0.282)	(0.412)	(0.429)	(0.405)
Social network measure	0.123	-0.007	0.218	-0.434	0.331	0.099	1.850	-0.416	-0.143	0.277
	(0.541)	(0.568)	(0.271)	(0.402)	(0.255)	(0.583)	(1.357)	(0.377)	(0.452)	(0.246)
Individual liability x Social network measure	-0.929	2.159	-0.980**	0.196	-1.197**	-2.077	-2.566	1.458	0.976	-1.170**
	(0.969)	(2.258)	(0.399)	(0.722)	(0.493)	(1.575)	(2.161)	(2.781)	(2.247)	(0.505)
Observations	4224	4224	4224	4224	4224	4224	4224	4224	4224	4224
Number of center fixed effects	154	154	154	154	154	154	154	154	154	154
R-squared	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Mean of social network measure	0.111	0.046	0.291	0.132	0.411	0.363	0.015	0.072	0.093	0.419
Standard error of social capital measure	(0.003)	(0.002)	(0.006)	(0.004)	(0.006)	(0.006)	(0.001)	(0.003)	(0.003)	(0.006)

Robust standard errors clustered by lending centers in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. All regressions use fixed effect for time and centers. Social network variable is

Social network variables are defined as below:

1 Family: Have known this person since either one was a child (grandparents, parents, siblings, spouses, children, grandchildren, and cousins).
2 Friends: Have known this person since either one was a child (non-family members/relative)
3 Bought products: Have bought products or services from this person
4 Visit once a week: Visit this person house for social purposes at least once a week.
5 Knowledge index: Aggregate of 1 through 4
6 Given loan: Have given this person a loan outside of Bulak.
7 Voluntarily helped: Have voluntarily helped this person repay loans in Bulak.
8 Go for advice: Turn to this person for advise or help for any type of life problem; health, financial, or emotional.
9 Trust: Aggregate of 6 through 8
10 All: Aggregate of 1through 4, and 6 through 8.

Table 10: Impact on Center-level Social Network, Conversion Areas
OLS, Difference-in-Difference

	Knowledge					Trust				
	Family	Friends	Buy products	Visit once a week	Knowledge index	Given loan	Voluntary help	Go for advice	Trust index	All
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Individual liability	-0.006	-0.001	-0.019	0.006	-0.018	0.017	0.022	0.011	0.005	-0.012
	(0.041)	(0.005)	(0.041)	(0.026)	(0.045)	(0.020)	(0.020)	(0.024)	(0.024)	(0.043)
Post	-0.015	0.054***	0.002	0.112***	-0.040	0.052***	0.004	0.072***	0.073***	0.066*
	(0.033)	(0.009)	(0.036)	(0.028)	(0.039)	(0.014)	(0.008)	(0.024)	(0.024)	(0.035)
Individual liability x Post	-0.031	0.000	0.030	-0.048	0.018	-0.045*	-0.018	-0.035	-0.029	0.013
	(0.045)	(0.012)	(0.050)	(0.037)	(0.051)	(0.024)	(0.022)	(0.036)	(0.037)	(0.050)
Observations	273	273	273	273	273	273	273	273	273	273
R-squared	0.09	0.35	0.24	0.27	0.26	0.17	0.07	0.22	0.21	0.28

Robust standard errors clustered by lending center is in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. The dependent variable, social network density, is calculated by the number of links divided by the maximum number of possible links. Baseline social network data collected in November 2004. Follow-up data collected in January 2006. All regressions use fixed effect for credit officers.

Social network variables are defined as below:
 1 Family: Have known this person since either one was a child (grandparents, parents, siblings, spouses, children, grandchildren, and cousins).
 2 Friends: Have known this person since either one was a child (non-family members/relative)
 3 Bought products: Have bought products or services from this person
 4 Visit once a week: Visit this person house for social purposes at least once a week.
 5 Knowledge index: Aggregate of 1 through 4
 6 Given loan: Have given this person a loan outside of Bulak.
 7 Voluntarily helped: Have voluntarily helped this person repay loans in Bulak.
 8 Go for advise: Turn to this person for advise or help for any type of life problem; health, financial, or emotional.
 9 Trust: Aggregate of 6 through 8
10 All: Aggregate of 1 through 4, and 6 through 8.

Table 11: Social Network Among Clients Who Formed Centers, New Areas
OLS

Dependent variable:	Proportion of other members in the group for whom this member knew the directions to their house	Proportion of other members in the group who were known to this members since childhood.	Proportion of other members in the group who have bought products or services from this member	Proportion of other members in the group who have given this member a loan outside of BULAK	Proportion of other members in the group who turn to this member for advise or help for any type of life problems
	(1)	(2)	(3)	(4)	(5)
Individual liability	-0.018	-0.199***	-0.064	0.036	-0.005
	(0.028)	(0.072)	(0.070)	(0.048)	(0.075)
Phased-in individual liability	-0.031	-0.099	-0.075	0.065	0.101
	(0.030)	(0.073)	(0.098)	(0.069)	(0.100)
Mean of dependent variable	(0.049)	(0.098)	(0.140)	(0.103)	(0.113)
Observations	571	571	571	571	571
R-squared	0.24	0.54	0.23	0.68	0.63
Mean of dependent variable	0.94	0.69	0.62	0.21	0.42

Robust standard errors in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%. Standard errors in Columns (1) - (5) are clustered by lending centers and all regressions use fixed effect for branch. Regressions in Columns (1) - (5) includes initial members of the lending centers when they were first formed. Dependent variable in Column (6) is the herfindahl index of microenterprises among the initial members of the centers. The regression controls for the herfindahl index at the barangay level.

Appendix Table 1: Reasons for Dropout, Conversion Areas
Sample Frame Restricted to clients who dropped out from the program
within the three months prior to the follow-up survey.

	Forced Out Probit (1)	Forced Out by Center or Credit Officer Multinomial Logit (2)
Dependent Variable: Forced Out		
Individual liability	-0.089***	
	(0.006)	
Dependent Variable: Forced Out by Center Members		
Individual liability		-0.521***
		(0.032)
Dependent Variable: Forced Out by Credit Officer		
Individual liability		0.621***
		(0.060)
Observations	550	550
R-squared	0.007	0.016

Robust standard errors clustered by respondents in parentheses, * significant at 10%; ** significant at 5%; *** significant at 1%. Marginal coefficients reported for the probit specifications. The omitted variable for the multinomial-logit model in column (2) is voluntary dropout. "Forced out" and "Forced out by center members" include those clients who "voluntarily" dropped out because she was embarrassed for her bad performance. Dependent variable in column 1 is a categorical variable which equals to one if any respondent reported that the client was forced out by center members or by credit officers, and zero otherwise. Dependent variable in column 2 is a categorical variable which equals to one if any respondent reported that the client was forced out by center members, equals to two if anyone reported that the client was forced out by credit officer, and zero otherwise.