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# Repaying Microcredit Loans: A Natural Experiment on Liability Structure

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# Repaying Microcredit Loans: A Natural Experiment on Liability Structure*

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### Abstract

Microcredit loans were traditionally extended to groups of people. However, there is no clear evidence that joint liability does lead to better borrower performance and recent years have seen a shift towards individual liability lending. Utilizing the exogenous shift from individual to joint liability lending by a microfinance organization in Pakistan, we find evidence of significant improvement in borrower discipline. Borrowers are about 0.6 times as likely to miss a payment in any given month under joint liability relative to individual liability. We also use the exogenous variation in number of months borrowers had till the expiry of their individual liability loans at the time of the shift to study the kind of groups they formed. More time that borrowers had, the more likely they were to form groups with people they knew from before and met weekly. The time that borrower had to form group also correlated positively with borrower discipline.

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Keywords: Microfinance, Group lending, Joint liability

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## Non-technical summary

Joint liability microcredit was considered to be the cornerstone of the microfinance movement. This liability structure was believed to overcome the many information asymmetries inherent in lending to poor borrowers. In the last two decades, both economists and practitioners have evaluated and debated the effectiveness of joint liability in practice. The evidence so far is inconclusive and recent years have seen a shift away from joint liability towards more flexible contracts with individual liability or group lending without imposing joint liability.

In this paper we use a natural experiment setting in order to compare the performance of borrowers under both individual and joint liability. The analysis is based on the decision of a Microfinance organization *Akhuwat* in Pakistan to shift from individual liability to joint liability lending in February 2011 without introducing mandatory group meetings. All outstanding loans at the time of the shift continued as individual liability till they matured. Under the individual liability model, each borrower had to be guaranteed by one person and this guarantor could not borrow from the organization till the loan expired. Complaints from the guarantors about this motivated the change in the liability structure. This decision was made centrally and communicated simultaneously to all branches. It is important to note that this was not accompanied by any changes to loan structure - loan amount, duration and repayment frequency remained the same as before.

The relevant sample for our analysis are the set of borrowers who had an outstanding individual liability loan at the time of the announcement of the switch and who go on to take out a loan under joint liability. We use several different identification strategies to estimate the impact of this shift from individual to group lending and find a significant improvement in borrower performance under joint liability as compared to individual liability loans across all specifications. Borrowers are about 0.6 times as likely to miss a payment in any given month under joint liability setting relative to individual liability. This effect is robust to inclusion of controls for number of times the individual had borrowed before, the stage of the loan cycle and branch and calendar fixed effects. It appears that the pressure exerted by joint liability is leading to a beneficial improvement for the organization without having to invest in the administrative cost of group meetings.

There is variation in behavior across groups and we look at the characteristics of group members (information collected through a survey of the borrowers) to try to explain it. By exploiting the exogenous variation in amount of time borrowers had till expiry of their individual liability loan at the time of announcement of the switch, we find that that more time that borrowers from both genders had, the more likely they were to form groups with people they had pre-existing social ties with (as measured by knowing them from before group was formed and meeting them weekly). However, we do not find evidence that other dimensions like informal insurance networks or being from the same caste matter in improving group discipline. This time that borrower had to form group also correlated positively with borrower discipline in making payments.

# 1 Introduction

Joint liability microcredit was considered to be the cornerstone of the microfinance movement. Loans were extended without physical collateral to groups of borrowers who were held jointly responsible for the repayment of loans of all members of the group. This liability structure was believed to overcome the many information asymmetries inherent in lending to poor borrowers. In the last two decades, both economists and practitioners have evaluated and debated the effectiveness of it in practice. This has spanned the range of questions related to the characteristics of people who form groups together and about the mechanisms through which joint liability may work. Recent years have seen a shift away from joint liability towards more flexible contracts with individual liability or group lending without imposing joint liability (see Armendariz and Labie (2011), Giné and Karlan (2014) and de Quidt et al. (2015) for details). Microfinance Institutes (MFIs) such as the BancoSol in Bolivia and the ASA in Bangladesh have converted a large part of their portfolios to individual lending and even the Grameen Bank has relaxed the strict joint liability clause for defaulters. Part of the reason for the shift is that the evidence so far is inconclusive which makes the question of the optimal contract type even more pertinent today.

Theoretical literature has highlighted the benefits of joint liability in alleviating some of the constraints of lending to the poor without collateral in countries with poor contract enforcement. One of these relate to adverse selection where borrowers who are better at repaying are not observable to the MFI. There is also a potential moral hazard issue where borrowers may take too much risk. Both of these can be addressed by imposing strict joint liability where borrowers have an incentive to choose the safer borrowers and to monitor each other. However, as Besley and Coate (1995) first pointed out, the burden of paying for others can actually lead to individuals defaulting on their own loan too. Hence, the theoretical predictions are not always in favour of joint liability loans.

The empirical analysis of borrower behaviour under different liability structures is a difficult one. Due to selection issues, borrowers across or within microfinance

institutions cannot be compared. Also, institutions may adjust contract features like interest rates to adjust for their perception of the relative riskiness of individual versus joint liability lending. Recent evidence has come through carefully designed Randomized Control Trials (RCTs). Giné and Karlan (2014) conducted two RCTs to study the difference in default rates between individual and joint liability loans for borrowers of a Philippine Bank and found no difference. Attanasio et al. (2011) using village level randomization in Mongolia also do not find any significant difference in repayment rates. On the other hand, Carpena et al. (2013) using a natural experiment setting where they was an organization wide switch to joint liability, find significant improvements in repayment discipline. However, this study has been criticised on grounds of changes in loan contract accompanying the switch to joint liability making it difficult to disentangle the impact of the switch in liability structure from that of other changes to the loan.

The analysis of this paper is based on an organization wide exogenous shift from individual to joint liability lending without group meetings by Akhuwat, a microfinance organization in Pakistan[1] in Feburary 2011. We use this natural experiment setting to analyze if there was any change in performance under joint liability lending. Since there were no other accompanying changes to the loan contract with this shift, it addresses a key concern with existing evidence. Individual liability loans at the time of the announcement of the shift were continued as before till the end of their loan cycle. We use for our analysis the group of borrowers who had an outstanding individual liability loan at the time of the shift and who go on to borrow under joint liability. This gives us a natural control and treatment group to compare the performance under different contract types. We find that likelihood of missed payments significantly decline under joint liability lending. Borrowers are about 0.6 times as likely to miss a payment in any given month under joint liability relative to individual liability. Joint liability is argued to lead to better borrower performance primarily through the channels of selection of safer borrowers and peer monitoring and pressure (Ghatak and Guinnane, 1999). Our sample comprises only

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[1]Akhuwat started its operation from the city of Lahore in Pakistan in 2001. As of December 2014, it had 317,020 active loans in 302 branches across 207 cities of the country.

of the group of borrowers who have been able to form groups and borrow under joint liability. Hence, we are considering the performance of an already selected safer group and so are able to isolate the impact of the latter channel.

Recent empirical evidence has pointed towards the importance of social cohesion fostered by group meetings[2]. However, group meetings can be both difficult and costly to arrange and coordinate for the lender and borrowers, especially in urban areas. Using a more comparable setting than existing literature, we provide evidence that may suggest that the move away from individual liability may not be optimal in all settings. Joint liability without mandatory group meetings may be a cheaper alternative to enforcing group meetings for improving repayment rates unless the organization has reason to believe that there would be insufficient interaction between the borrowers without it[3].

A next natural question is which groups are able to do better than others? Issue of self-selection has made group formation and its impact on performance a difficult empirical question to study. The earlier evidence from studies by Wydick (1999) and Sharma and Zeller (1997) do not find higher social capital to be correlated with better performance. More robust studies that have found some evidence that social capital matters to repayment and default rates were either using exogenously formed groups (Karlan, 2007) or preselected groups (Feigenberg, Field and Pande, 2013). Groups in the case of Akhuwat are based on self-selection with some restrictions relating to inclusion of family members. To address this issue of self-selection, we look at group characteristics and borrower performance by exploiting the exogenous variation in amount of time borrowers had till expiry of their individual liability loan at the time of announcement of the shift in lending methodology. We find that the more time they had, the more likely were borrowers to form groups with members with whom they had pre-existing social ties and they were also in turn

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[2]Giné and Karlan (2014) provide empirical evidence that when group meetings are mandatory, there is no difference in performance of borrowers on individual versus joint liability loans

[3]Feigenberg, Field and Pande (2013) varied the frequency of meeting of groups to find that higher frequency does result in higher degree of social integration. This improvement in informal insurance in these groups then resulted in better repayment rates. However, de Quidt, Fetzer and Ghatak (2014) show that requiring group meetings, even if it leads to creation of social capital, may be inefficient unless there is basis to believe that borrowers will not be able to coordinate meetings on their own.

better disciplined in making payments.

The remainder of the paper is organized as follows. Section 2 has a more detailed review of literature, description of the data set and an outline of the estimation strategy and results for the analysis on comparison of borrower performance under joint versus individual liability lending. Analysis of group characteristics and borrowers performance using survey data is in Section 3. The limitations are outlined in Section 4 and concluding comments are in Section 5.

# 2 Comparison of borrower performance under individual vs. joint liability loans

## 2.1 Review of Literature

In this section, we look in more detail at both the theoretical predictions regarding the effectiveness of joint liability lending in improving borrower performance and at the empirical evidence on it.

### 2.1.1 Theoretical Background

There are several theories that discuss the potential benefits of joint liability lending. Ghatak and Guinnane (1999) in a survey article and Armendariz and Labie (2011) in their book highlight several problems faced by formal credit institutions that joint liability can help alleviate. One of these relate to adverse selection. Since borrower characteristics are not observable to credit institutions they invest in collecting information on characteristics and use varying levels of collateral and interest rates to separate the good from the bad borrowers. In the case of microfinance institutions, borrowers do not possess physical collateral and collecting information is even more costly due to institutes relying on volume to compensate for the small loan size. Lending in groups can help since borrowers have access to local information networks and can be expected to use these when selecting group members. Ghatak (1999) argues that borrowers form homogenous groups on the basis of riskiness and this leads to pool of borrowers improving with time since likelihood of a risky type and

his/her risky group members defaulting are higher. Ahlin (2009) found evidence of this positive assortative matching using data from Thailand. Groups tended to sort on levels of risk and hence were not diversified. To capture anti-diversification and to measure the degree of shock, percentage divergence of income from expected income was used.

Joint liability also incentivizes group members to closely monitor the use of the loan and to take action in case of misuse. This can help mitigate the problem of moral hazard that arises due to lack of collateral leading to borrowers not fully internalizing the cost of defaulting. It can also replace the costly and difficult monitoring that credit institutions otherwise have to do. Microfinance organizations face enforcement issues where the borrowers are either too poor or contract laws so weak that they have no way of making a delinquent borrower repay. In such a situation, the joint liability nature of the contract can be useful inducing borrowers to repay on behalf of their unsuccessful partners. However, this burden could actually lead to these individuals defaulting on their own loan too. There is also the issue of ex-post moral hazard with joint liability where it may lead to borrowers choosing riskier projects due to this insurance effect and not repaying after personal negative shocks which are usually not punished the same way as reneging for other reasons [4]. Fischer (2013) on the other hand argues that the reduction in ex-post moral hazard due to joint liability may actually lead to group members discouraging risk taking since any loss has to be compensated but high returns are not shared. This then results in too little risk being taken and could be a possible explanation for the observed lack of growth of these enterprises.

### 2.1.2 Empirical Evidence: Liability Structure and Performance

There are a handful of studies that provide robust empirical evidence on joint liability lending. Gin et al. (2010) explore the impact of group liability loans through experimental games in Peru. Their study reveals that group liability does lessen chances of default but there are concerns of free-riding particularly when groups are arbitrarily formed. Fischer (2013) also find through lab experiments with

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[4]Besley and Coate (1995)

microfinance clients in India that joint liability leads to problems of free-riding and that it also sharply reduces risk taking possibly due to peer monitoring. Hence, in an experimental setting, borrowers appear to be responding to the liability structure. While games allow the researcher to have control, Karlan (2007) and others point to the downside of them being staged.

Giné and Karlan (2014) in their study in Philippines conduct two RCTs with a Bank lending to women in rural areas for business expansion. The bank operated through the formation of lending centres in communities and from within these centres, loans were given to borrowers in groups of 5. One of the experiments used Banks expansion into new areas. Borrowers in comparable villages were randomly assigned to receive individual liability, joint liability or phased in individual liability (to switch to individual liability after one successful cycle of group liability loans) with mandatory group meetings in all areas. The study find no difference in default rates and Banerjee (2013) points out how this might be attributable to lending pattern adjustments whereby loans under individual liability were smaller. Attanasio et al. (2011) also use village level randomization in Mongolia but without weekly group meetings. They randomized across 35 villages on loans extended to first time women borrowers (men in the area continued on individual loans). They find no significant difference in repayment rates[5].

The other RCT by Giné and Karlan (2014) involved randomly selected pre-existing areas with lending centres being converted to individual liability lending. By the end of the randomization process which took about one year, there were 80 converted centres and 89 centres in the control group. Over 3,000 borrowers belonging to these centres were part of the study. Other aspects of the loan like contract features as well as mandatory centre meetings and repayments in groups remained the same in the converted centres. Hence, apart from strict joint liability, all other group liability features of lending continued after the conversion. They find no statistically significant difference in pre and post default rates across several

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[5]They also study other aspects like consumption and entrepreneurship where they find significantly positive impact on households borrowing under group liability but no such impact are found for individual liability loans.

measures[6]. Banerjee (2013) questions their finding on the ground that if groups are good at screening, then no change seen in defaults under individual liability might be due to the selection of reliable borrowers by groups in the first place. However, we should still be able to observe if there is any impact of peer monitoring.

A study very closely related to ours is that of Carpena et al. (2013) who use the switch in lending from individual to joint liability loans by an Indian microfinance institute. They find large improvements in missed payments under group liability loans. The data for their study was from the organizations database maintained for accounting purposes and so did not contain information on the instalment amount due every month. Hence, they were unable to establish when borrowers overpay or control for other loan characteristics. The study also suffers from loan contract features like interest rate and instalment amount due every month (amount was fixed under group liability but tended to vary under individual liability depending on loan amount outstanding) changing after the switch in liability structure which brings into question the findings of the study[7]. Furthermore, the very high rate of missed payments by borrowers on first time individual liability loans (49%) raises concerns about possible issues with the organization making it a questionable comparison period.

## 2.2   Natural Experiment Setting

Under the individual liability model of Akhuwat, each borrower had to be guaranteed by a person who could then not borrow from the organization till the loan they had guaranteed finished. Complaints from guarantors about this motivated the shift to joint liability lending. The decision was made centrally and communicated simultaneously to all branches. All outstanding loans at the time of the switch continued as individual liability till they matured. There were no accompanying changes to loan structure with this switch - loan amount, duration and repayment

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[6]They also looked at a variety of centre specific factors and find that under individual liability, centres tend to be larger and less likely to be dissolved. They also looked at how branch officers allocated their time and find no statistically significant difference in both pre-existing and new areas.

[7]Both Banerjee (2013) and Giné and Karlan (2014) question the findings of the study on this ground.

frequency remained the same. The loans continued to be repaid in equal monthly instalments at the local Akhuwat office in each area. Anyone from the group could make the instalment payment each month as long as the full amount due for the group was paid. Staff was given training to inform them about the additional procedures related to joint liability lending such as group size and location of members. All individual liability lending procedures related to verification and appraisal of borrowers continued as before. Thus, the organization did not rely exclusively on peer selection.

Akhuwat did not introduce any mandatory group meetings with joint liability. In their understanding, calling borrowers for monthly meetings in an urban area is not feasible since being away from their business could result in potential loss of income and repute. The only time borrowers in a group are required to come together are to inform them regarding the terms and conditions of joint liability and then at the time of the formal guaranteeing of the loans. The organization also does not require the group to appoint a leader or a manager to avoid dominance of any one person and potential issues with him/her leading to the whole group defaulting.

## 2.3   Data and variables of interest

For this study, we use data for all loans issued between the 1st July 2010 and 30th June 2013 period for 14 branches in Lahore, Pakistan. These are the oldest branches of the organization and hence allowed us to obtain data for at least 3 years. The data comes from the central database of the organization and gives detailed information on the loan characteristics and month wise instalment payment by the borrowers. From the overall dataset, we select the set of borrowers who had an outstanding individual liability loan at the time of the announcement of the switch in February 2011. Of the 6,675 clients who had an outstanding loan at the time of the announcement, 2,029 (30%) go on to borrow under joint liability and these borrowers form the relevant sample for this study. Since the organization increases both the loan amount and duration with each loan cycle, the average for these is larger for joint liability loans in our sample (Table 1).

[Table 1 here]

## 2.4   Measuring Borrower Performance

To measure borrower performance we look at monthly missed payments. If we define the measure as taking a value of 1 if the borrower missed a payment and 0 otherwise, it is possible that borrowers overpaid in the past and so even after missing an instalment the borrower is still on time in making payments. In such a case it would be wrong to categorise it as a missed payment and so we only consider a payment to be missed if borrower does not make an instalment payment and is behind in making payments. It is possible that even after making an instalment payment, the borrower is still behind. So we define another measure missed & behind which is based on if the borrower is on time in making principal repayment irrespective of whether a payment was made in that month or not.

A look at raw data shows a significant improvement across all measures of borrower performance after switch to joint liability (Table 2 and Figure 1). The likelihood of missing a payment is higher (the variable 'missed' in Table 2) when we use the definition of Carpena et al. (2013) since it does not consider the possibility of over payment by borrowers in previous periods as compared to the other measure 'missed & behind'.

Using missing payments as a measure for borrower performance has been criticized by Banerjee (2013) on account of these payments being eventually made up. He argues that it might be that loan officers are more tolerant of missed payments as compared to fellow group members. However, in the case of Akhuwat, missed payments were taken very seriously even under individual liability and loan officers had to investigate the reason for payment being missed and contact the guarantor. Hence, missed payments are costly to the organization because of enforcement costs. Also, given the extremely low levels of default experienced by microfinance organizations at large and by Akhuwat in particular (under 0.2%), we believe that missed payment is a more relevant measure of borrower performance than default rates.

[Table 2 here]

[Figure 1 here]

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## 2.5 Empirical Specification and Results

We set up the following equation to study the impact of switch from individual to joint liability loans:

$$Y_{ilt} = \alpha + \beta_i \mathbf{T}_{il} + \gamma_i \mathbf{X}_{il} + \sum_{t=2}^{12} \tau_t + \sum_{m=2}^{14} \theta_m + \varepsilon \tag{1}$$

where $Y_{ilt}$ is a dummy variable to capture loan repayment discipline in month $t$, for individual $i$, loan $l$. $\mathbf{T}_{il}$ is a dummy variable $=1$ if loan $l$ for individual $i$ is a joint liability loan and 0 otherwise. The coefficient of interest is $\beta_i$ since it captures if there are any differences between behaviour of borrowers on individual and joint liability loans. $\boldsymbol{X}$ is a vector of individual characteristics like gender and number of previous loans, $\tau_t$ and $\theta_m$ are month and branch fixed effects. $\varepsilon$ is the error term.

### 2.5.1 Estimation strategy

To estimate equation 1, we first consider only the overlapping months in which both individual and joint liability loans were simultaneously active. In order to make a comparison, we need a sufficient number of both types of loans in each month. Immediately after the switch, there were very few joint liability loans and so we only consider the period post April 2011. We end the sample period in April 2012 to have a sufficient number of individual liability loans still outstanding (see Figure 2).

[Figure 2 here]

Each month, individual liability loans still active form the control group while loans issued to borrowers who had paid their individual loans and had borrowed as part of a group form the treated group. This estimation strategy has the advantage that it allows a comparison at the same point in time. Hence, organization wide changes cannot be argued to be the reason for any differences in behaviour. However, since individual liability loans would always be older in any month as compared to joint liability loans, we cannot control for loan age[8] when comparing borrower behaviour. This is likely to be important since borrower behaviour can be expected to vary with the time it has been since the loan was issued.

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[8] Loan age and dummy for group liability loan will be highly correlated.

An alternate strategy is to consider the entire individual and joint liability loan cycles of the borrowers. Even though this means that borrower performance is not being compared at the same time, discussions with the organization staff present at the time of the switch in lending methodology make us comfortable in concluding that there were no other accompanying changes to operations.

To estimate equation 1 with the full sample of months, we can use a fixed effects model or pool observations. While estimates from panel fixed effects model allow for all unobserved time invariant factors to be differenced out, it will only include observations for borrowers who do at least miss one payment (i.e. there is some variation in the dependent variable). It would also be difficult to separate out the impact of joint liability lending from that of it being a subsequent loan cycle as both are likely to be highly correlated. On the other hand, when we pool observations, we can control for the number of previous loans of the borrower.

### 2.5.2 Results

Results in Table 3 show a significant improvement in borrower performance under joint liability across all specifications. These results are based on monthly loan cycle data with standard errors clustered at the borrower level. Results are robust to the inclusion of controls for the number of times the individual had borrowed before, the stage of the loan cycle and branch and calendar fixed effects. The size of the coefficient on the group dummy for the panel fixed effects[9] estimator is similar to that of estimates based on pooled sample. To account for intra-group correlation in borrower performance, we also cluster standard errors by the group (in column 4) and find similar results.

[Table 3 here]

Quite expectedly, as loan ages, there is a higher likelihood of people missing a payment. This might be the reason for the lower odds ratio in column 1 when overlapping months are used. Since in this case, older individual liability loans are being compared with comparatively newer group liability loans, we find a larger improvement in borrower performance.

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[9]Hausman test was carried out which rejected the random effects model in favour of fixed effects.

The estimates in Table 3 are based on the entire sample of borrowers irrespective of whether their joint liability loan had expired or not by the end of our sample period. Since, borrowers tend to miss more payments as loans mature, we might be overestimating the impact of switch to joint liability by not considering the months near maturity for borrowers whose loans had not expired. To check if this is the case, we estimate equation 1 for the sample of borrowers for whom the joint liability loan had also expired. We find very similar results (in Table ) to those for the full sample and so estimates in Table 4 are not driven by the behaviour of individuals who borrowed close to the switch to joint liability.

[Table 4 here]

It appears that the pressure exerted by joint liability is leading to a beneficial improvement for the organization without investing in the administrative cost of group meetings. To measure borrower discipline, if we use a definition similar to that of Carpena et al. (2013), our estimates are larger. It appears that by not considering the possibility of overpayment by borrowers, they may be overestimating the impact. Using our alternate measure of borrower discipline (on time in making payment), we still find that those on joint liability loans are significantly more likely to be disciplined (results in Table 5).

[Table 5 here]

## 2.6   Robustness Checks

Next, we check the internal validity of the results based on the discussion in Carpena et al. (2013). Those on group liability loan may be displaying better performance due to or at least in part due to the experience of having borrowed before (learning effect). Since our sample period starts less than a year before the switch to joint liability loans, we cannot observe borrowers over two consecutive individual liability loans. To test for the presence of a possible learning effect, we take two complete joint liability loan cycles of borrowers. If the improvement that we find is due to the experience of having borrowed before, then borrower performance should also significantly improve between two cycles of joint liability loans. Second joint loan is a dummy that takes on a value of 1 for the second

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round of borrowing under joint liability and is 0 for the first round of joint liability loans. We estimate equation 1 with the sample of borrowers with two complete joint liability loans using the second joint loan dummy instead of the group dummy. Results in Table 6 show that the coefficient on the variable of interest is insignificant. Even when we add other controls (in column 3), we find no difference in the performance of borrowers between two rounds of joint liability loans. Hence, our findings cannot merely be a result of learning effect.

[Table 6 here]

Another concern relates to borrowers performing better under joint liability due to it being a new experience. To test this, we compare the performance of first time borrowers on individual liability loan with first time borrowers on joint liability loans. Using a sample of 13,053 first time joint liability loans, we find that borrowers miss 4% of the payments while the 5,139 borrowers on an individual liability loan miss significantly more (6%)[10] . It might be argued that even if the borrower is taking out a loan for the first time, the experience of others in the group may be important and contributing to better performance. To check for this, we restrict the sample to first time borrowers who are in a group with all other members also on a first time loan. We still find that these borrowers miss fewer payments as compared to those on a first time individual liability loan[11] . Results for learning effect above also negate this hypothesis since borrowers performance did not get worse during the second round of joint liability loans. If borrowers did well under joint liability loan only because it was a new experience, then we would have expected their performance to get worse under a second joint liability loan.

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[10]The t-test on the mean difference has a value of -15.38.

[11]The sample decreased to 7,128 borrowers and the t-test on the mean difference has a value of -13.86.

# 3 Group characteristics and borrower performance

While we find that there is an improvement in missed payments under joint liability, there is considerable variation across groups in performance[12] . In particular, we find that borrower performance on joint liability loans improve with time (see Figure 3). This could be due to organization side learning where with experience they improve and develop a better understanding of the kind of monitoring required for individual versus joint liability lending. It is also possible that borrowers who had longer till the expiry of their individual liability loan at the time of the announcement of the switch had more time to think carefully about who to form groups with. They also had the opportunity to learn directly from the experiences of those who borrowed before them under joint liability and from any advice given by the organization based on their understanding of the type of group members that work best together.

[Figure 3 here]

Why might some groups perform better than others? The degree of social capital emerges from literature as one explanation. More specifically, Cassar et al. (2007) point to the relational and informational aspects of this social capital as possible mechanisms through which it operates. They find through a series of field experiments that it is personal trust and social homogeneity that improves group performance and not the general level of trust of the group members in the society.

Measuring social capital is complex and in the context of microfinance, quantifying its impact on group performance is further complicated by the formation of groups on the basis of self-selection. Hence, any analysis is subject to issues of endogeneity since individuals are likely to sort themselves into groups with certain characteristics which may be unobservable. Karlan (2007) used exogenously formed groups by a MFI in Peru to counter the issue of endogeneity as well as the potential simultaneity problem[13] to study how social connections impact the discipline of

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[12]The average likelihood of missing a payment is 4% and the standard deviation is 20%. Under joint liability, 25% of the borrowers miss a payment at least once and 12% miss a payment more than once.

[13]Successful groups may simultaneously result in better social connections and better performance of business.

borrowers. He concludes that stronger social connections as measured by geographic and cultural proximity do in fact lead to higher repayment and savings.

However, the evidence on the impact of social ties on group performance is mixed since studies by Wydick (1999) and Ahlin and Townsend (2007) find that stronger the social ties, the poorer the group performance due to these hindering social sanctions. Wydick (1999) uses a small data set from Guatemala to study three types of social cohesion  peer monitoring, social ties and borrowing group pressure. He finds that peer monitoring affects performance through stimulating intra group insurance instead of the degree of pre-existing social ties. Ahlin and Townsend (2007) find similar evidence using data from Thailand. They warn that some social ties as measured by sharing among non-relatives and clustering of related and village run savings and loan institutions actually has a negative impact on repayment rates. Strength of correlated returns and informal sanctions is what positively impacts it. Hence, groups formed between relatives where sanctions are difficult to impose are likely to harm borrower performance rather than improve it.

Another channel through which joint liability loans may lead to improvement in performance is mandatory group meetings. These help foster linkages and an informal insurance network amongst borrowers. A series of experiments have been conducted to try to understand how repayment frequency correlates with the formation of social capital and default[14]. However, this is not a relevant channel in the case of Akhuwat.

## 3.1   Selection of group characteristics

We want to understand if the time that borrowers had to form a group to re-borrow had any impact on the choice of group members. Are groups formed between members with pre-existing social capital and/or an informal insurance structure? The existing evidence on the importance of social ties is mixed and we draw on literature for the selection of group characteristics for our analysis.

To capture the degree of social connection, we look at whether group members knew each other from before the group was formed and their frequency of meeting.

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[14]Feigenberg et al. (2013), Feigenberg et al. (2014), Field and Pande (2008)

We also consider the caste of the group members. While it is likely to be a more important factor in a rural setting, it might still be relevant in understanding the degree of connection in an urban area.

Some studies have highlighted the importance of the group leaders social ties and quality in running the group as factors leading to superior repayment performance and reducing moral hazard (Paxton et al., 2000; Hermes et al., 2005, 2006). However, since Akhuwat does not require any group member to act as a leader, we cannot look at this. Similarly, we cannot explore the geographic variation highlighted by Karlan (2007) to be important since this has been enforced by the organization[15]. Since all groups were formed for the first time, prior experience of borrowing with each other is not relevant. Their experience of borrowing in groups in other microfinance organizations may be important but we cannot control for it. However, we do consider if they have experience of doing business together. The group member's linkages with the community may also play an important role and we use the number of years the borrower has lived in the community as a proxy for it. Finally, we also consider the degree of trust which we measure by whether the borrower would have asked for a loan in time of need from the group member before the formation of the group.

## 3.2 Survey

In the case of Akhuwat, groups are formed by the borrowers on the basis of self-selection and have to be comprised of three to six members. An important condition is that immediate family members cannot be in the same group. However, unlike conventional microfinance organizations, Akhuwat does not place any minimum requirement on the number of women in a group. Hence, there are all female, all male and mixed groups that take out loans as a group.

In order to obtain data on the degree of social connection of the borrower with the group, we conducted a short telephone survey with a sub-sample of the borrowers who we used for the first part of the analysis on borrower performance. This survey

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[15]Borrowers have to be from the same neighbourhood and preferable live not farther away than a lane from each other.

was carried out between August and September 2014 with a stratified random sample of borrowers. The selected borrowers were asked questions about each group member in turn. The sample was stratified on both the gender mix of the group and the loan cycle of the borrower in order to have a proportionate representation of borrowers with prior experience of borrowing.

We find that in our survey sample, men have been oversampled from within the mixed groups leading to a larger proportion of men (71%) as compared to the full sample[16] (63%). We will control for the gender of the borrower in our analysis to account for this. The reason for this might be the cultural make-up of the society in Pakistan where women are more reluctant to talk to strangers on the phone or may not be in possession of the mobile phone number provided. This is a downside of carrying out a telephone survey and so it may be the case that we have sampled a special group of women who are different from the overall group of female borrowers. However, a comparison of the individual and loans characteristics of the sample of women surveyed to the overall sample reveals that there are no significant differences (see Table 7).

[Table 7 here]

While the refusal rate was quite low (3.5%), there were a large number (around 30%) of calls that were either not picked up or the number was not responding[17]. This may result in borrowers who had taken out a loan more recently being oversampled since there would be a lesser likelihood of their number being changed. To counter this, all replacements borrowers were drawn from the same month of loan issue and so the survey sample is representative of the full sample (Table 8 gives a month wise distribution of loans).

[Table 8 here]

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[16]Full sample here refers to the borrowers who we observe taking out a loan under both individual and joint liability.

[17]Possible reasons for this might be that the borrower has several SIMs or a switch in network used. Within the income group under study, these are common practices.

### 3.2.1 Survey Data

Data on 1,821 group members collected from 755 borrowers reveals that a large number (87%) knew their group members from before the group was formed. Of the group members they knew from before, they met 82% of them weekly. This results in around 66% of our sample comprising of individuals who knew all their group members from before and met them weekly. We do not find any significant differences across gender in the proportion of group members they knew from before and how frequently they met them (see Table 9). Borrowers from both genders are also equally likely to have neighbours in their group though women are slightly more likely to have a relative. While there is low variation in these characteristics, women are significantly more likely than men to form a group with someone who they could have borrowed in times of need or had done a business with before. Hence, it appears that women are choosing group members more on the basis of people they know well than men.

[Table 9 here]

We also find difference in behaviour if we consider the gender mix of the groups. More than 70% of all male and all female groups are comprised of people the borrower knew from before and met weekly while in mixed groups, the ratio drops to 52%. This might be attributable to the make up of the Pakistani society where it is rare for men and women to interact with each other and these groups are formed with the spouse or sibling of someone of the same gender that they know rather than a direct connection.

## 3.3   Issue of endogeneity

As discussed above, group characteristics are endogenous and so we cannot directly estimate the impact of these on borrower performance. To counter this inherent problem of endogeneity, we utilize the exogenous variation in the time the borrower had to form a group to borrow again. Due to the staggered nature of introduction of group loans, those who had just started their individual liability loan at the time of the announcement of change to joint liability lending had much longer till the expiry

of their loan to look for potential group members. On the other hand, borrowers whose individual loans were close to expiry had less time. In fact, we have borrowers who had between 0 and 18 months to the expiry of their loan at the time of the announcement with average time around 7 months.

Discussions with Akhuwat management reveals that the decision to switch was made by the Head Office and implemented across all branches of Akhuwat simultaneously and is thus unlikely to be endogenous. It can be argued that borrowers have the option of delaying borrowing again and so this time they had till expiry of their loan is not important. However, we find that the average amount of time borrowers take to re-borrow is between one and two months and with more experience, this time decreases. Hence, while borrowers have the option to delay re-borrowing, this is something that we do not observe them doing. This might be attributable to them relying on these loans to finance their working capital and so any delay in borrowing again is costly for their enterprise.

We can expect people to think more carefully when they have more time to form a group instead of being rushed into it. More time also means they have the time to convince the people they consider more trustworthy to form a group with them. When they are short on time they may have to compromise. This may be one of the reasons why repeat borrowers who had less time had a higher proportion of first time borrowers in their group. We find no link between gender mix and number of months- time people had to form a group does not result in a greater likelihood of any one type of group.

## 3.4   Measures of group characteristics

Since we only have one exogenous variable and several group characteristics, we want to combine them into a single linear index. In order to do this, weight to be given to each characteristic needs to be decided. As Filmer and Pritchett (2001) point out, while using equal weights is the simplest solution, there is no justification for doing this. Since there is no theoretical ground to assign the weights, we use the statistical technique of Principal Component Analysis (PCA) to obtain them. The first principal component is a linear combination of the original variables with

the weights based on the correlation matrix that captures the largest amount of information in the variables used. The characteristics used for the PCA along with the factor weightings are in Table 10. The index obtained based on the first principal component is a continuous scale of the relative social connection of the groups.

[Table 10 here]

In order to comment on specific channels, we also consider each characteristic separately. Since groups have between 3 and 6 members, using proportion of group members for whom the borrower answered 'yes' for that characteristics results in a peculiar variable. This is because there are an increasing number of possible values that the variable can take as group size becomes larger. So, we give away the variation and convert it into a binary variable based on different proportions of the group meeting the criterion. The proportions used are all group members, half the members and at least one member (this translates into 20% for the maximum group size of 6).

## 3.5   Empirical Analysis

We find that with time after the announcement of the switch to joint liability lending, there is a decline in the average missed payments for all borrowers and not just those who we observe borrowing under both individual and joint liability (see figure 4). As discussed above, this may be attributable to organization-side learning and adjustment to the procedures of lending under joint liability which leads to improvement in borrower discipline with time. Since the number of months to expiry has a high correlation (72%) with the actual months after the announcement that the borrower took out another loan, the effect of time on group performance may not only be through the selection of group members. Hence, the number of months to expiry does not satisfy the exclusion restriction and so we do not estimate a two stage least squares and instead look at separately the first stage and the reduced form.

[Figure 4 here]

We specify the following equation to estimate the impact on borrower performance of time that they had at the time of the announcement of the switch to the expiry

of their individual liability loan:

$$Y_{it} = \alpha_i + \beta_i NM_i + \gamma_i \mathbf{X} + \sum_{m=2}^{14} \theta_m + \varepsilon \qquad (2)$$

where $Y_{ilt}$ is a dummy variable=1 to capture loan repayment discipline in month $t$, for individual $i$, loan $l$. $NM_i$ are the number of months to expiry of the individual liability loan at the time of the switch. $\mathbf{X}$ is a vector of controls like gender, proportion of years lived in the same area, number of previous loans, loan age and loan age squared. $\theta_m$ are the branch fixed effects.

Estimates in table 11 are based on the performance of 755 borrowers on joint liability from whom primary data was collected. Results in column 1 for the reduced form confirm that $\beta$ is negative and so there is a significant decline in missed payments with time that borrowers had till the expiry of their individual liability loan at the time of the announcement. As discussed above, a possible explanation for this could be better selection of group members. To check if this is the case, we estimate the impact of this time that borrowers had on the characteristics of the group members they choose to borrow with:

$$GC_i = \pi + \delta_i NM_i + \rho_i \mathbf{X} + \sum_{m=2}^{14} \theta_m + \nu \qquad (3)$$

where $GC_i$ is the measure for group characteristics of borrower $i$ and $\delta_i$ is the coefficient of interest. The rest of the variables are as defined above for equation 2.

We first introduce the aggregate index constructed using PCA directly into a regression on the dependent variable of interest monthly missed payments (in Column 2 in Table 11). We find that the impact is marginally significant and negative. Estimates of equation 3 where we address issue of endogeniety by using the exogenously determined time to form groups are in column 3. We find that when borrowers had more time, they were significantly more likely to choose along our measures of social ties and this could in part explain the improvement in borrower performance that we find.

[Table 11 here]

Next, we try to unbundle the channels by estimating equation 2b separately for each characteristic. A dummy variable is specified for every characteristic which

takes a value of 1 if group members satisfy the criterion at a particular threshold and 0 otherwise. We vary the threshold so as to understand at which level a particular characteristic is important (or not). For example, in the first row in (in Table 12), 100% refers to the group characteristics variable =1 if all group members meet the criterion and 0 otherwise. We find that when people have more time, they are significantly more likely to choose people they knew from before and met weekly. Measures of cultural similarity and informal insurance network (if would have borrowed in time of need) are insignificant at all thresholds while only the likelihood of having an all-neighbour group increases with time.

[Table 12 here]

# 4 Limitations

The analysis in this paper is based on behaviour of borrowers in a large metropolitan city and it is likely that borrowers in a smaller urban city or rural setting may behave very differently. The organization extends interest free loans which has the advantage of keeping the loan contract consistent across the two types of liability structures but again raises questions about external validity and comparability with conventional microfinance organizations.

In our analysis on group characteristics, we are unable to control for how other group members interact with each other since we only have information on the person who was interviewed. Due to the strict joint liability nature of the contracts, interaction of others in the group with each other may also be important and so this study presents at best a partial picture of group interaction. We are also unable to comment on how these connections evolved through the course of the loan and how that in turn impacted borrower performance. We only comment on the degree of pre-existing connections of the borrower we surveyed with the rest of the group members.

# 5  Conclusion

Using a natural experiment setting, we find significant improvement in borrower performance under joint liability loans without mandatory group meetings as compared to individual liability. This is in line with the findings of Carpena et al. (2013) but differ from the no impact found by Giné and Karlan (2014) and Attanasio et al. (2011) based on randomized control trials. All these studies have been criticized on account of differences in loan contracts between individual and joint liability loans. Since, there were no changes to the contract in the case of Akhuwat, we believe that our study has been able to provide evidence in a more comparable setting.

Our study also finds some evidence of the importance of social connections discussed in literature on group liability lending as a possible mechanism through which we can expect improvement in borrower performance. We use the variation in the time people had to form groups to show that borrowers choose on the basis of social ties like knowing people from before and meeting them frequently when they had time to think carefully about the formation of the group. However, we do not find any evidence regarding the importance of other mechanisms like informal insurance networks or cultural similarity. Hence, encouraging borrowers to take time to form groups and choosing members that they interact with frequently may be advantageous to microfinance organizations.

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Figure 1: Average Monthly Missed Payments - Individual vs. Joint Liability Groups
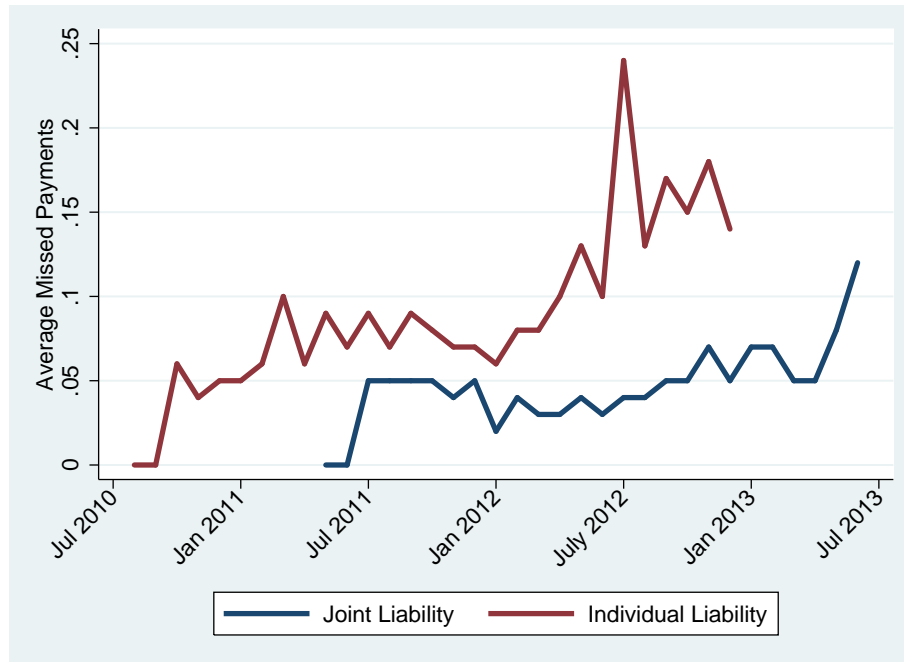


Note: The figure plots the average months missed payments over time for our sample that received both individual and joint liability loans.

Figure 2: Distribution of outstanding Individual and Joint Liability Loans (April 2011 to September 2012)
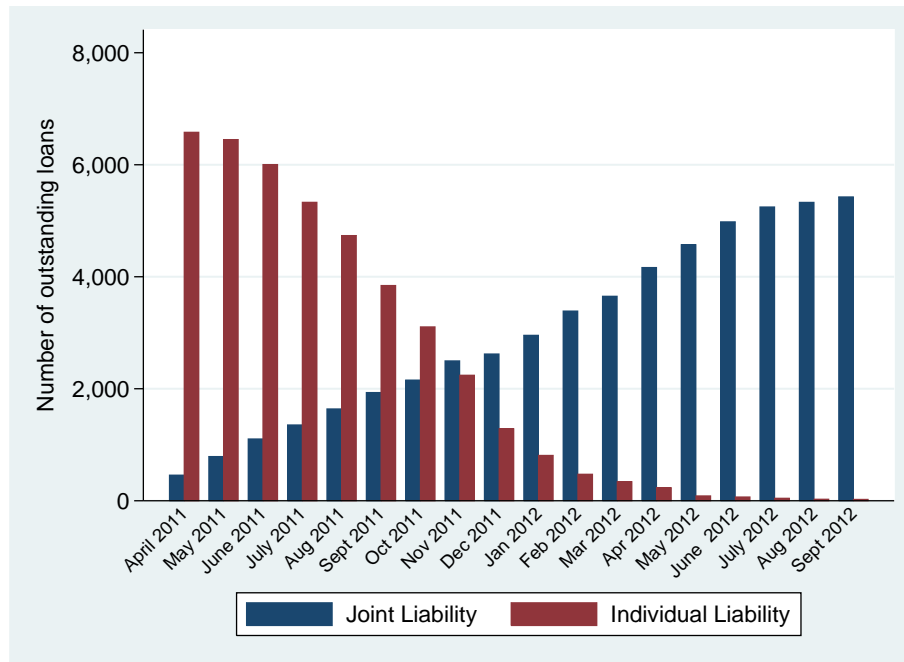


Note: The figure plots the total number of individual and joint liability loans that were outstanding each month for our sample that received both individual and joint liability loans.

Figure 3: Average Missed Payments - Joint Liability Loans Only
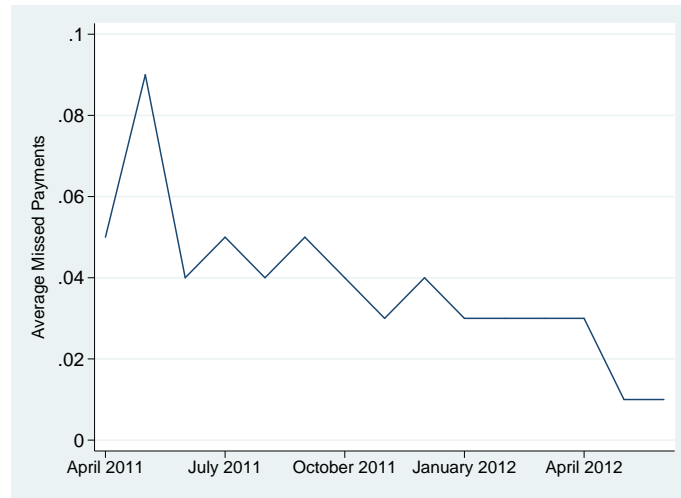


Note: The figure above is a plot of the average missed payments over a complete loan cycle of all loans issued in the same month and year. It is based only on joint liability loans issued to borrowers who received both an individual and joint liability loan.

Figure 4: Average Missed Payment by Month and Year of Loan Issue
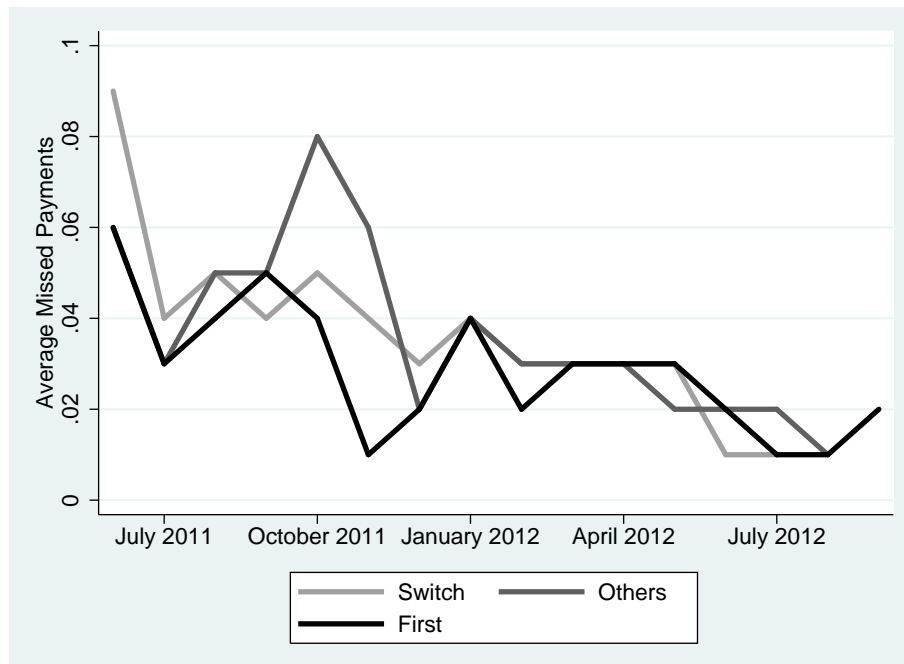


Note: The figure above is a plot of the average missed payments over a complete loan cycle of all loans issued in the same month and year. 'Switch' refers to borrowers issued a joint liability loan who we observe taking out both an individual and joint liability loan. 'First' are first time joint liability borrowers and 'others' refer to the rest of the borrowers who are not first time borrowers but who we also do not observe borrowing under individual liability.

Table 1: Summary Statistics - Individual and Joint Liability Loans

| (Average) | Individual | Joint |
|---|---|---|
| Loan cycle | 1.8 | 2.8 |
| Loan amount (Rs.) | 12,691 | 18,637 |
| Loan duration (months) | 11.45 | 14.13 |

Note: Table reports summary statistics for individual and joint liability loan cycles of borrowers who received both an individual and joint liability loan.

Table 2: Average Borrower Performance (%)

| | Overall | Individual | Joint | Individual - joint p- value |
|---|---|---|---|---|
| Missed | 5.96 | 10.21 | 5.91 | 0 |
| Missed & behind | 4.44 | 6.35 | 3.98 | 0 |
| On time | 80.95 | 68.31 | 84.61 | 0 |
| Observations (months) | 219,036 | 22,649 | 23,383 | |

Note: Table reports average performance for the sample of borrowers who received both an individual and joint liability loan.

Table 3: Borrower Performance - Average Missed Payments

| | (1) Overlapping months | (2) Fixed effects | (3) Pooled Sample | (4) Pooled Sample |
|---|---|---|---|---|
| Group dummy | 0.442*** | 0.561*** | 0.579*** | 0.572*** |
| | (0.041) | (0.026) | (0.042) | (0.044) |
| No of previous loans | 1.126*** | | 1.028 | 1.027 |
| | (0.042) | | (0.029) | (0.034) |
| Gender | 1.067 | | 1.144** | 1.153** |
| | (0.095) | | (0.076) | (0.083) |
| Loan Age | | 1.325*** | 1.268*** | 1.267*** |
| | | (0.031) | (0.039) | (0.041) |
| Loan Age Squared | | 0.986*** | 0.990*** | 0.990*** |
| | | (0.002) | (0.003) | (0.003) |
| | | | | |
| Branch dummies | Yes | No | Yes | Yes |
| Monthly dummies | No | No | Yes | Yes |
| Observations | 18,548 | 25,012 | 45,532 | 45,149 |

Note: Table reports odds ratio from estimation of a logit model with dependent variable equal to one if the borrower has missed installment payment in that month, zero otherwise. The sample includes all loans irrespective of whether the loan had matured or not. In Column (1) are estimates using data only for months May 2011 to April 2012. In Column (2) are results using fixed effects model and in Column (3) and (4) are results using the pooled sample with errors clustered by the borrower in Column (3) and by the group in Column (4). Robust standard error in parenthesis. $***p < 0.01, **p < 0.05, *p < 0.1$.

Table 4: Borrower Performance - Sample of Expired Loans Only

| | (1)<br>Overlapping<br>months | (2)<br>Fixed effects | (3)<br>Pooled | (4)<br>Pooled |
|---|---|---|---|---|
| Group dummy | 0.442*** | 0.582*** | 0.594*** | 0.582*** |
| | (0.041) | (0.029) | (0.045) | (0.045) |
| No of previous loans | 1.126*** | | 1.013 | 1.033 |
| | (0.042) | | (0.031) | (0.034) |
| Gender | 1.067 | | 1.127* | 1.132 |
| | (0.095) | | (0.081) | (0.091) |
| Loan Age | | 1.417*** | 1.273*** | 1.376*** |
| | | (0.040) | (0.045) | (0.048) |
| Loan Age Squared | | 0.980*** | 0.990*** | 0.983*** |
| | | (0.002) | (0.003) | (0.003) |
| | | | | |
| Branch dummies | Yes | No | Yes | Yes |
| Monthly dummies | No | No | Yes | Yes |
| Observations | 18,548 | 20,925 | 41,292 | 37,717 |

Note: Table reports odds ratio from estimation of a logit model with dependent variable equal to one if the borrower has missed installment payment in that month, zero otherwise. In Column (1) are estimates using data only for months May 2011 to April 2012. In Column (2) are results using fixed effects model and in Column (3) and (4) are results using the pooled sample with errors clustered by the borrower in Column (3) and by the group in Column (4). Robust standard error in parenthesis.$***p < 0.01, **p < 0.05, *p < 0.1$.

Table 5: Borrower Performance - On Time in Making Payments

| | (1) Overlapping months | (2) Fixed effects | (3) Pooled | (4) Pooled |
|---|---|---|---|---|
| Group dummy | 5.491*** | 5.035*** | 3.227*** | 3.250*** |
| | (0.499) | (0.164) | (0.237) | (0.246) |
| No of previous loans | 0.892*** | | 0.912*** | 0.914*** |
| | (0.032) | | (0.026) | (0.027) |
| Gender | 0.638*** | | 0.706*** | 0.700*** |
| | (0.056) | | (0.051) | (0.057) |
| Loan Age | | 0.622*** | 0.739*** | 0.738*** |
| | | (0.010) | (0.009) | (0.011) |
| Loan Age Squared | | 1.017*** | 1.009*** | 1.009*** |
| | | (0.001) | (0.001) | (0.001) |
| | | | | |
| Branch dummies | Yes | No | Yes | Yes |
| Monthly dummies | No | No | Yes | Yes |
| Observations | 18,548 | 20,925 | 41,292 | 37,717 |

Note: Table reports odds ratio from estimation of a logit model with dependent variable equal to one if the borrower has missed installment payment in that month, zero otherwise. In Column (1) are estimates using data only for months May 2011 to April 2012. In Column (2) are results using fixed effects model and in Column (3) and (4) are results using the pooled sample with errors clustered by the borrower in Column (3) and by the group in Column (4). Robust standard error in parenthesis. $***p < 0.01, **p < 0.05, *p < 0.1$.

Table 6: Borrower Performance over two Joint Liability Loan Cycles

|                          | (1)     | (2)     | (3)      |
|--------------------------|---------|---------|----------|
| Second Joint Loan (=1)   | 0.648   | 0.652   | 0.810    |
|                          | (0.182) | (0.177) | (0.228)  |
| Gender                   |         |         | 1.468    |
|                          |         |         | (0.489)  |
| Loan age                 |         |         | 1.376**  |
|                          |         |         | (0.183)  |
| Loan age squared         |         |         | 0.977*   |
|                          |         |         | (0.0133) |
| Number of previous loans |         |         | 0.820    |
|                          |         |         | (0.104)  |
|                          |         |         |          |
| Branch dummies           | No      | Yes     | Yes      |
| Individual FEs           | No      | No      | Yes      |
| Observations             | 1,962   | 1,835   | 1,835    |

Note: Table reports odds ratio from estimation of a logit model with dependent variable equal to one if the borrower has missed installment payment in that month, zero otherwise. The sample is restricted to two consecutive complete joint liability loan cycles of borrowers. Robust standard errors clustered by the borrower in parenthesis. $***p < 0.01, **p < 0.05, *p < 0.1$.

Table 7: Comparison of Individual and Loan Characteristics of Female Borrowers

|  | Full Sample | Survey Sample | Mean difference p -value |
|---|---|---|---|
| Age | 42.9 | 41.61 | 0.011** |
| Personal Loan (=1) | 8.37% | 8.47% | 0.954 |
| All female group (=1) | 50.66% | 53.03% | 0.414 |
| Loan Amount | Rs.18,164.02 | Rs.18,139.53 | 0.923 |
| No. of previous loans | 2.58 | 2.51 | 0.234 |
| Monthly donation | Rs. 57.78 | Rs. 57.64 | 0.951 |
| On time in paying instalments | 94.88% | 95.24% | 0.773 |
|  |  |  |  |
| Observations | 756 | 215 |  |

Note: The table reports summary statistics for the full sample of female borrowers who received both an individual and joint liability loan and for the sub-sample of them who were surveyed. The variable age has missing values so it is based on 705 observations for the full sample and 207 for the survey sample.

Table 8: Month wise Distribution of Loans in the Full and Survey Sample

| Year | Month | Full sample | | Survey Sample | |
|------|-------|------|------|------|------|
| | | No. | % | No. | % |
| 2011 | March | 19 | 1.12 | 8 | 1.23 |
| 2011 | April | 34 | 2.01 | 15 | 2.31 |
| 2011 | May | 59 | 3.49 | 12 | 1.85 |
| 2011 | June | 36 | 2.13 | 10 | 1.54 |
| 2011 | July | 137 | 8.11 | 45 | 6.93 |
| 2011 | August | 140 | 8.28 | 61 | 9.40 |
| 2011 | September | 139 | 8.22 | 49 | 7.55 |
| 2011 | October | 9 | 0.53 | 1 | 0.15 |
| 2011 | November | 284 | 16.80 | 106 | 16.33 |
| 2011 | December | 262 | 15.50 | 104 | 16.02 |
| 2012 | January | 247 | 14.62 | 101 | 15.56 |
| 2012 | February | 138 | 8.17 | 61 | 9.40 |
| 2012 | March | 83 | 4.91 | 32 | 4.93 |
| 2012 | April | 49 | 2.90 | 18 | 2.77 |
| 2012 | May | 33 | 1.95 | 16 | 2.47 |
| 2012 | June | 21 | 1.24 | 10 | 1.54 |

Note: The table reports the month wise disbursement of joint liability loans for the full sample of borrowers who received both an individual and joint liability loan and for the sub-sample surveyed.

Table 9: Group Characteristics - by Gender

|  | Overall sample | Male | Female | Mean difference p-value |
|---|---|---|---|---|
| Knew before |  | 87 | 87 | 0.819 |
| Business partners | 13 | 11 | 17 | 0.028 |
| Would have borrowed | 28 | 26 | 33 | 0.072 |
| Same caste | 16 | 14 | 21 | 0.007 |
| **How they know group member** |  |  |  |  |
| Neighbours | 71 | 71 | 72 | 0.603 |
| Relatives | 8 | 7 | 10 | 0.086 |
| Friends | 6 | 7 | 4 | 0.109 |
| **Frequency of meeting** |  |  |  |  |
| Weekly | 73 | 73 | 72 | 0.709 |
| Sometimes | 9 | 9 | 9 | 0.889 |
|  |  |  |  |  |
| Observations | 755 | 540 | 215 |  |

Note: The table reports group characteristics for the full sample as well by gender for borrowers who were surveyed.

Table 10: Characteristics used in PCA and the Factor Weightings

| | |
|---|---|
| Knew from before | 0.5803 |
| Had done business together before | 0.2481 |
| Would have borrowed | 0.2924 |
| Same caste | 0.1341 |
| Neighbour | 0.4716 |
| Meet weekly | 0.5252 |

Note: The table reports the weighting assigned to each factor by PCA.

Table 11: Group Characteristics Index and Borrower Performance

|  | (1) Missed Payments | (2) Missed Payments | (3) PCA Index |
|---|---|---|---|
| Number of months | -0.02** | | 0.049** |
|  | (0.001) | | (0.021) |
| PCA index | | -0.039* | |
|  | | (0.023) | |
|  | | | |
| Observations | 8,797 | 8,797 | 8,797 |

Note: All regression include controls for gender, proportion of years borrower has lived in the area, number of previous loans, loan age and loan age squared. Robust standard errors clustered by the borrower in parenthesis. $***p < 0.01, **p < 0.05, *p < 0.1$.

Table 12: Group Characteristics and Borrower Performance

|       | Knew before | Met weekly | Same Caste | Borrowed | Neighbour |
|-------|-------------|------------|------------|----------|-----------|
| 100%  | 0.016***    | 0.014**    | 0.002      | 0.006    | 0.017**   |
|       | (0.006)     | (0.049)    | (0.595)    | (0.344)  | (0.027)   |
| 50%   | 0.010**     | 0.012*     | 0.004      | 0.004    | 0.009     |
|       | (0.038)     | (0.061)    | (0.482)    | (0.587)  | (0.173)   |
| 20%   | 0.009**     | 0.011*     | 0.001      | 0.003    | 0.011     |
|       | (0.039)     | (0.082)    | (0.93)     | (0.69)   | (0.102)   |

Note: Group characteristic dummy is the dependent variable. All characteristics refer to the pre-group formation situation. Knew before is a measure for if the borrower knew group member from before the group was formed and borrowed refers to if the borrower would have borrowed from the group member in time of need. All include controls for gender, number of previous loans, loan age and loan age squared. Robust standard errors clustered by the borrower in parenthesis.$***p < 0.01, **p < 0.05, *p < 0.1$.

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