DEPARTMENT OF ECONOMICS WORKING PAPER SERIES

Repayment Performance in Group Lending: Evidence from Jordan

Moh'd Al-Azzam
American University in Dubai

R. Carter Hill
Louisiana State University

Sudipta Sarangi
Louisiana State University

Working Paper 2011-09
http://bus.lsu.edu/McMillin/Working_Papers/pap11_09.pdf

Department of Economics
Louisiana State University
Baton Rouge, LA 70803-6306
http://www.bus.lsu.edu/economics/

Repayment Performance in Group Lending:

Evidence from Jordan[*]

Moh'd Al-Azzam[a]

R. Carter Hill[b]

Sudipta Sarangi[c]

Abstract: Using data from a survey of 160 urban borrowing groups of the *Microfund for Women* in Jordan, we investigate the effect of screening, peer monitoring, group pressure, and social ties on borrowing groups' repayment behavior as an indirect test of different theoretical models. The dependent variable used captures the intensity of default measured by the total number of days of late repayment after each due date, allowing us to use count data models with cluster standard errors. As theory predicts, our empirical analysis suggests that peer monitoring, group pressure, and social ties reduce delinquency. The paper uncovers interesting evidence about the role of social ties and religion. Most notably, in an area where religion contributes to attitudes and beliefs of individuals, we find that religiosity improves repayment performance.

Keywords: group lending, repayment performance, count data.

JEL Classification: D82, G29, O12

[*] We would like to thank Bassem Khanfar, Jumana Theodore, Abdullah Al-Hayajneh, Barihal Al-Abbadi of the *Microfund for Women* for their generous help in facilitating the data collection process. The comments of three anonymous referees and the Editor have vastly improved the paper. We would like also to thank David Brasington, Christian Ahlin, and Ayla Kayhan and seminar participants at American University in Dubai, Louisiana State University, SEA and the NEUDC meetings for their comments.

[a] School of Business Administration, American University in Dubai, Dubai, UAE. Email: *malazzam@aud.edu*

[b] Ourso Family Professor of Econometrics and Thomas J. Singletary Professor of Economics, Department of Economics, Louisiana State University, Baton Rouge LA, 70803. Email: *eohill@lsu.edu*

[c] **Corresponding Author:** Department of Economics, Louisiana State University, Baton Rouge, LA 70803. Email: *sarangi@lsu.edu*

1. Introduction

In the past couple of decades, a growing number of financial institutions have developed alternative lending mechanisms reversing the conventional wisdom that lending to poor households is doomed to failure. Microfinance institutions (MFIs) as these are called provide small loans to poor households for starting productive activities or expanding their current economic activity. While many of these institutions are increasingly offering individual loans, microfinance is typically associated with joint liability based group lending. Among several others, group lending is one strategy employed to boost repayment rates.[1] Group lending consists of lending to a self-selected group of borrowers who are jointly liable for the loan. This mechanism may lead to higher repayment rates by mitigating moral hazard through joint liability and monitoring, solving limited contract enforcement through threats of sanctions and punishing in the case of default, and over-coming adverse selection of borrowers through exploiting information that potential borrowers have about each other.

This paper uses survey data from 160 borrowing groups carried out in cooperation with the Microfund for Women (MFW), a group lending institution in Jordan.[2] The MFW makes group loans based on a simple set of eligibility conditions. Once a group meets these conditions a standard loan is provided whose contractual parameters are independent of any other group characteristics. This paper is an attempt to bridge the gap between theory and empirical work by considering the impact of a number of different measures for the theoretical variables of interest on repayment performance.

Our paper follows the line of investigation pursued in a recent paper by Ahlin and Townsend (2007). It seeks evidence for and against the different theoretical models by using variables that capture the role of screening, monitoring, group pressure, and social ties on group repayment performance. In light of the criticism advanced by Hermes and Lensink (2007) it is worth noting that we consider a number of alternative measures of each of theoretical variables of interest. Moreover, we do not use uni-

[1] These include direct monitoring, regular repayment schedules, and the use of non-refinancing threats (Armendariz de Aghion and Murdoch, (2000), (2007)). For a discussion on individual lending versus group lending see Gine and Karlan (2006) and Lehner (2008).

[2] This one-person survey was developed by the authors and conducted by Moh'd al-Azzam in two representative provinces in Jordan providing us with a unique data set. Detailed survey is available from the authors on request.

dimensional variables, but instead construct each variable using a series of questions. Our paper is the first to capture the interesting impact of religion and communication technology, the use of phone, on repayment rates and offers new insights about the role of education. Unlike most of the literature that uses a binary dependent variable, our econometric methodology uses a dependent variable that captures the intensity of default: the number of days each group has been late at each due date in the current loan cycle.[3] The paper illustrates the usefulness of count data models for this literature and offers a new set of proxies for social ties including kinship ties, friendship ties, ties generated from business interactions, and neighborhood ties.

We find that average group loan size is an insignificant determinant of repayment while outside credit options seem to have some predictive power. Among the monitoring measures, we find that groups with a higher percentage of members having phones improve repayment. Group pressure has the expected sign and cooperation among group members seems to increase the intensity of delinquency. The social ties variable shows a negative and significant impact on the default intensity. Finally, we measure the religiousness of a group by asking whether or not they pray five times a day and find that more religious groups have better repayment rates.

The rest of the paper is organized as follows. Section 2 provides an overview of the relevant theoretical and empirical work on group lending. In Section 3 we provide information about the MFW and its operating procedures. Section 4 describes the data collection process and construction of variables. Empirical results are presented in Section 5. Section 6 contains concluding remarks.

2. Theoretical and Empirical Literature

The theoretical literature on group lending is quite substantial and there are a growing number of empirical papers on this topic as well.[4] Credit rationing and collateral requirements are primarily

[3] Karlan (2007) is one exception.

[4] An exhaustive but somewhat older survey by Ghatak and Guinanne (1999) provides an excellent introduction to the theory and practice of group lending. See Hermes and Lensink (2007) for a recent survey on empirical aspects of this topic, as well as the textbook by Armendariz de Aghion and Morduch (2006).

responsible for the exclusion of poor borrowers from the credit market. As shown in the seminal paper by Stiglitz and Weiss (1981), liberalizing interest rates, or using collateral requirements to loosen credit rationing results in adverse selection and moral hazard problems. Ghatak (1999) and Van Tassel (1999) show how group lending can take advantage of the "inside" information that only borrowers have about each other to draw in relatively safer borrowers and thus mitigate the adverse selection problem. [5] Varian (1990) analyzes how borrowers mutually monitor each others' projects to ensure the success of financed projects while Stiglitz (1990) shows that group lending, via monitoring, alleviates the moral hazard issues involved in lending to those with no collateral. Banerjee, Besley, and Guinnane (1994) show that the burden of the moral hazard problem between borrowers and the lender falls on the monitoring members who are responsible for repaying the defaulting member's loan. They show that at an increasing effort cost, the monitor can impose higher penalties on a defaulting borrower. To avoid these penalties the borrower will choose a safer project equalizing the marginal costs of increased monitoring (higher effort) with its increased benefits (safer project). Another set of theoretical papers focuses on strategic default by group members. Besley and Coate (1995) focus on group lending under limited contract enforcement and the threat of official (seizure of assets) and unofficial penalties (social sanctions). This strand of the literature argues that without the threat of social sanctions group lending may add little if any superiority over individual lending (see also Armendariz de Aghion (1999)).

One of the earliest empirical papers by Wenner (1995) studies group lending as a means of transmitting information on borrower creditworthiness. He finds that groups using a written internal code of regulations for screening and limited access to alternative credit options have a better repayment performance. Around the same time, Sharma and Zeller (1997) find that endogenously formed groups and a high degree of credit rationing improve repayment performance but social ties, measured as the proportion of relative members in the group, have a negative impact on repayment. Zeller (1998) combines features of both Wenner (1995) and Sharma and Zeller (1997) to investigate the effect of

[5] If group members do not have complete information about each other, then group lending may not lead to any improvements in loan repayment rates. This has also been shown in Laffont and N'Guessan (2000).

intragroup risk pooling and social cohesion on repayment rates. His results show that the repayment rate increases with more diversification in the group's joint asset portfolio up to a point. Social cohesion, measured as the number of common characteristics among group members like social class, ethnicity, neighborhood, friendship and kinship, was found to improve the repayment rate.

Wydick (1999) analyzes the effect of peer monitoring, social ties, and group pressure on the provision of intra-group insurance, mitigation of moral hazard within borrowing groups, and group repayment performance. He finds that neither social ties nor group pressure have an effect on repayment rates. On the positive side he finds that peer monitoring plays a key role. Godquin (2004) focuses on the explanatory power of social ties, group homogeneity, social intermediation, dynamic incentives and loan characteristics (loan size and loan duration) on group's repayment performance. She largely finds mixed results for these variables depending on whether she uses a pooled or a split sample.

A recent survey by Hermes and Lensink (2007) discusses the potential weaknesses of many of the earlier empirical studies. First, in most of the studies the link between theory and empirics is rather implicit. To address this concern, Ahlin and Townsend (2007) develop and explicitly test the implications of four of the representative models of joint liability lending. Two of these models: Stiglitz (1990) and Banerjee, Besley, and Guinnane (1994; henceforth BBG) highlight moral hazard problems. Besley and Coate (1995; henceforth BC) examines strategic default and Ghatak (1999) describes how joint liability contracts can partially overcome the adverse selection problem. They find that the joint liability payment amount has a negative effect on repayment rate favoring the Stiglitz and Ghatak models over BBG's. This finding supports the fact that higher joint liability under *ceteris paribus* conditions acts as an additional tax on success, as only the successful borrowers pay it. Education, a measure of productivity, improves repayment performance in all four models. They do not find screening to be a significant determinant of repayment. The authors find that the covariance of output is a significant predictor of good repayment which weakly favors the Stiglitz and Ghatak models. The monitoring variables show mixed results. The higher the percentage of group members living in the same village, the better is their repayment performance while the opposite is true when the group has a higher percentage of relatives. Default

penalties show positive and significant effect on repayment which are in line with the BC model's predictions. Outside credit options are negatively and significantly associated with repayment performance. Finally, Ahlin and Townsend (2007) find that cooperation tends to worsen repayment rates favoring the BBG and BC models over the Stiglitz's story and conclude that social structures that reduce penalties can be harmful for repayment.

Second, studies investigating the role of social ties in mitigating information asymmetries and improving repayment rates may suffer from endogeneity problems. Karlan (2007) takes advantage of the methodology used by the FINCA(Peru), a microfinance institution that through random formation of groups, creates groups with different levels of initial social ties, to circumvent the endogeniety problem. Karlan finds that groups with stronger social ties are more likely to repay their loans and save more, while also being better at monitoring and enforcing repayment. Finally, in many of the earlier papers crude or one-dimensional measures were used to proxy for variables such as social ties. Through the use of microfinance experiments Cassar et al. (2007) are able to disentangle different aspects of social ties and study their effect on group repayment behavior. Not surprisingly, they find that the specific nature of social ties affects repayment performance differently.

We now briefly discuss this paper in relation to the rest of the literature. Following the line of investigation by Ahlin and Townsend (2007), this paper seeks evidence for and against different theoretical models. In light of the criticism advanced by Hermes and Lensink (2007) it offers a number of alternative measures of each of theoretical variables of interest by using a series of questions to construct variables. Another contribution of this paper is its consideration of the borrower's internal belief toward repayment of debt which can be shaped by religion. Islam, like many other religions, permits assuming debt but emphasizes that those contracting debt must have the means and intention to repay. This paper uses repayment data that are very rich, allowing us to analyze the number of days of late repayment. Furthermore, the institutional lending mechanism mitigates any potential problem of endogeneity between the loan size and repayment rates.

3. The Microfund for Women

The concept of sustainable microfinance was introduced in Jordan by the NGO *Save the Children* in 1994, when they launched a Group Guaranteed Lending and Savings Programs. Encouraged by its success, a separate legal entity (the Jordanian Women's Development Society) was established in 1996, which commenced operations and subsequently became the *Microfund for Women* (MFW) in 1999. Support for the sustainable microfinance industry in Jordan including the MFW, is mainly provided by a program called Access to Microfinance and Improved Implementation of Policy Reform (AMIR) which is an innovative economic opportunity project funded by USAID, and implemented in partnership with the Jordanian private sector and government.[6]

The MFW is registered as a non-profit limited liability company with Jordan's Ministry of Industry and Trade since October 1999. Apart from its headquarter in Amman, it has 9 branch offices serving major cities in Northern and Central Jordan. The MFW primarily targets low-income female clients with the vast majority of its clients living in urban areas.[7] The main types of loans offered by the MFW are group and individual loans. For the individual loans, one to three guarantors are required, according to the loan size, without any physical collateral. Group loans which are our focus replace physical collateral with social collateral in the form of joint liability.

Women interested in borrowing must participate in some meetings in order to know the institution and the loan operation. In these meetings groups identify themselves to the MFW. When eligible, group members are called to review the loan contract and elect a group leader and a treasurer. The group leader functions as an intermediary between the group members and the group officers; keeps the accounts of the group with the treasurer and collects the payment installments from the group members for timely loan repayment. Note that being a group leader or treasurer does not provide any financial privileges. It takes one week from the submission of the application to loan disbursement. The

[6] Along with technical assistance from AMIR, these MFIs have achieved operational and financial self sufficiency by charging an interest rate that covers all costs. (Charitonenko and Kristalsky, 2004).

[7] Over the past five years, however, it has been expanding to include more registered businesses and even men, with the limitation that male borrowers cannot exceed 20% of the total client base.

loan amount is given to the group to be shared among them, not necessarily in the same proportion. Repayment by each member is symmetrical to her loan amount. The MFW does not deal with cash as all disbursement and repayments are made through a partner bank. The group leader raises installment from each member and deposits the total group loan in the MFW bank account. Loan officers can access the common database updated daily via electronic data transfer from the bank.

The Group Guaranteed Lending Product offered by the MFW utilizes a group lending methodology – individual borrowers form a group by themselves and apply for a loan that is jointly guaranteed by the group. Eligibility conditions require that borrowers (a) be aged between 18 – 65 years, (b) have no access to formal lending system or are "un-bankable," (c) must have an existing business, (d) are required to know each other, (e) must form a solidarity group of 4-6 members, (f) must respect the loans size caps by cycle[8], (g) must have separate enterprises, (h) must use loan to finance working capital, and (i) within a group members cannot be from the same family, though relatives can be members of the same group (Planet Rating, 2004). Any group that meets these conditions is granted a loan. The loan officer has no discretion in deciding loan parameters such as loan size and interest rate. The initial loan size for all new members is JD200 (JD1 = $ 1.4). This loan size increases with an increment of JD100 per borrower in each subsequent loan cycle. The maximum loan size is JD500 per borrower. The interest rate is fixed at 21% for all members across all groups regardless of loan size. Groups have the choice of making their repayments either in bi-weekly or monthly installments.[9] A description of the group lending program is provided in Table 1.

[Table 1 here]

At the MFW, if one or more group members default, the rest of the group members must fully repay the unpaid part of the defaulter. To discourage delinquency, a late penalty of JD3 per day, payable on the next payment date or at the end of the loan term are imposed. Delinquent cases are referred to court

[8] Although a group as a whole receives the loan, the MFW stipulates the amount that should be allocated to each borrower. Loan cycle refers to the duration of the loan term, in this case 8 months or 28 weeks.
[9] All groups in our sample use the monthly repayment option.

after 21 days.[10] As of March 2004, the MFW had 10720 clients with an outstanding loan portfolio of JD2.5 million. Since its inception, the MFW has been successful in maintaining repayment rates of over 98 percent for its group loans.

4. Data

4.1. The Data Collection Process

The MFW has 9 branch offices serving major cities in Northern and Central Jordan. These branches include Raghadan with an outstanding portfolio (OP) of 22%, Rusaifa with an OP of 18%, Zarqa with an OP of 16%, Wehdat with an OP of 11%, Balqa with an OP of 9%, Irbid with an OP of 8%, Nazal with an OP of 7%, Madapa with an OP of 5%, and Jerash with an OP of 4%.[11] We prepared the research questionnaire in the U.S. during spring 2004 and chose the sample of branches to be included in the study. The branches included are Irbid in north Jordan and Al-Rusaifa in north-central Jordan covering two representative provinces. Two different provinces were chosen for the study because the performance of the joint liability mechanism could vary across geographical regions.[12]

During the months of February-May, 2005 we surveyed 160 randomly selected borrowing groups of the MFW in Jordan; 84 groups were from Irbid and 76 groups were from Al-Rusaifa.[13] The survey lasted approximately 2 months, after which it took an additional 3 weeks to obtain the data from the MFW data base. Data obtained from the MFW data base include loan size, number of continuing, old, and new members in each group, loan application dates, number of installments, amount due in each installment, due dates of repayment, actual repayment amounts, and actual repayment dates for each group.

[10] There were approximately 23 delinquent cases in court proceedings for the periods 2003 and 2004.
[11] www.planetrating.com/ratings/MFW_PlanetRating_240504.pdf
[12] The only other reason for choosing these two branches was that they were the closest to the researcher's place of residence and were within the researcher's financial capabilities in terms of transportation costs, time costs, and other costs. Since the study was self-financed this was an important consideration.
[13] The survey was carried out by Moh'd al-Azzam. This one-person survey instrument is available from the authors on request. Three out of the 163 group leaders approached refused to participate in the survey.

At the time of the survey, there were approximately 510 active borrowing groups in both branches. Interviews took place during the weekdays except on Tuesdays. At the MFW, Tuesdays were allocated only for disbursement of loans to newly formed groups. On average, five group leaders were interviewed each day and each interview took approximately 45 minutes to administer. The survey covered 31% of the active borrowing groups.

Ideally we would have randomly selected a sample of size *N* from the 510 borrowing groups to obtain our data. This was not possible given the constraints under which we had to operate. Our sampling approach did, however, provide a random selection of group leaders. The survey was administered to group leaders as they entered the one designated MWF branch office in the province. Each group leader is required to deliver to the MFW branch the group invoice at least once a month. In cases where more than one group leader appeared simultaneously, an interviewee was randomly selected. Given the way the lending and repayment process is structured, there is minimal need for the group leader to pay multiple visits to the MFW and thus some leaders were not more likely to be interviewed than others.[14] Using this approach $N = 160$ surveys were obtained and we believe that there are no sample selection issues.

4.2 Variable Description

We now describe how the different variables used in the econometric specifications were obtained.

4.2.1 Dependent Variable

For each group, the dependent variable used is the number of days of late repayment after each due date including the due date of the month of the interview. We call this measure *DELINQUENCY*. It measures late repayment in each month in the current loan cycle only. It does not have any information about late repayment in previous loan cycles. This measure has four advantages. First, it is an accurate measure because it is obtained directly from the MFW data base. Second, it provides detailed repayment

[14] Other than for delivering the invoice, the group leader has minimal need to visit the MFW branch even if the group has a repayment problem. A group is charged JD 3 for each day of late repayment. This amount cannot be waived under any circumstances. A group has to solve any repayment problem internally, not with the MFW branch.

observations for each group in each month along the loan cycle. We believe that *DELINQUENCY* offers a good reflection of the true repayment performance of the borrowing groups since repayment is observed multiple times for each group. Late groups are charged JD3 per day and loan officers at the MFW have no authority for any leeway regardless of the past performance of the group. Hence this measure reflects repayment performance and not trust in the borrower. Since it is costly to be late we would expect groups to exert enough efforts to repay on time. Third, we believe that *DELINQUENCY* contains more information than the dichotomous dependent variables usually used in the literature. Fourth, it reflects the performance of the group in the current loan cycle. Hence the dependent variable and the explanatory variables are contemporaneous.

Let us examine the data very closely. *DELINQUENCY* is the number of days of late repayment after each due date passed including the due date of the month of the interview. Table 2 shows the summary statistics of *DELINQUENCY* for each due date. For example, the values for one group (ID 5253) had *DELINQUENCY* = 0, 0, 0, 1, 3, 6, 6, 0. These data mean that the group had no late days of repayment on the first, second or third due dates, but was late 1 day on the fourth due date, 3 days on the fifth due date, and so on. The last row of Table 2 shows the number of groups that are beyond a given number of due dates. There are 160 groups that passed through at least one due date, 136 groups that passed through at least 2 due dates (the difference being the number of groups that have had only one due date, i.e., 160-136 =24 groups), 120 groups that passed through at least 3 due dates and so on. Therefore the sample size is 812. Table 2 shows that the mean value of *DELINQUENCY* increases and reaches a maximum value at month 6 after it which falls. Figure 1 shows frequency of late repayment after each due date.

[Table 2 about here]

[Figure 1 about here]

4.2.2 Independent Variables

In this section we divide the independent variables into five groups: *control variables, screening variables, monitoring variables, group pressure variables, and social ties variables*. Descriptive statistics for the dependent and independent variables are provided in Table 3.

[Table 3 about here]

Control Variables

The control variables mainly include loan characteristics and socioeconomic factors. We use loan size and accessibility to credit for loan characteristics and education, wealth, and religion for the socioeconomic factors.

At the time of the survey, different groups had different starting dates for receiving loans and therefore were at different stages in the loan cycle and repayment. The time span of repayment performance is therefore not identical. Some groups have only one month of repayment history while other groups have eight months. At the time when the interviews were conducted, 48 percent of the groups had repaid their installments on time (mean and median of repayment history during the current loan cycle was 5.07 and 6 months respectively). While defaulting on the entire loan is infrequent, late repayment is common. On average, each group is 3 days late in repaying the loan.

At the MFW repayment installments are due monthly over a period of 8 months. We use dummy variables (*D2-D8*) to measure how far along a group is in its repayment installments in the current loan cycle. Therefore *D2* is a dummy equal 1 if a group has been through at least two due dates, *D3* equal 1 if the group has been through 3 due dates and so on. Note that *D2* takes a value of 1 so long as the group passes through the second due date, regardless of whether the group repays on time or not for that month. We treat the first due date as the base. The last row of Table 2 shows that there are 160 groups that passed through at least one due date, 136 groups that passed through at least two due dates and so on.

Theoretical predictions about the effect of loan size on repayment vary. In Stiglitz (1990) and in the Ahlin and Townsend version of BBG (1994), as loan size increases risky projects become relatively

more attractive increasing the possibility of unwilling delinquency. In the Ahlin and Townsend version of Ghatak (1999), the effect of loan size is non-monotonic. When the loan size is small and the borrower is in need of a larger loan, the expected repayment would be higher. As the loan size becomes larger, and assuming diminishing marginal product of larger loan sizes, repayment worsens. In our study, *AVGLOAN* measures the average (per member) group loan size in hundreds of JD. Given our definition of the dependent variable, the effect of late repayment on subsequent loan size is rather weak. [15] To lessen endogeneity concerns, we test for the exogeneity of *AVGLOAN* and found no empirical evidence to reject that hypothesis.[16] The explanatory variables used are summarized in Table 3.

Both Stiglitz (1991) and BBG (1994) also offer predictions on the effect of outside borrowing options on repayment rates – groups with more outside borrowing options will have access to higher loan size giving group members greater incentive for risky projects. However, outside credit options can also be signals of credit quality, sound economic conditions in the area, etc. The expected sign on outside credit options would therefore be ambiguous. Our measure of outside borrowing options, *CROPTION*, is the percentage of group members who have access to credit from individuals outside the group.[17]

Projects returns and therefore repayment are expected to be positively influenced by the productivity of the group. Predictions generated by Ahlin and Townsend (2007) on the effect of productivity on repayment performance are unanimously positive for all models. We use education as a measure of the group's productivity. Group leaders were asked to classify each group member into one of 6 categories: whether the member can read, has elementary schooling, preliminary schooling, high school, two year college, or four year college. Values from 1 to 6 were assigned to these categories with the

[15] While default results in no future loans, more days of late repayment do not affect future loan sizes,. To get the next loan the current loan must be fully repaid.

[16] *AVGLOAN* can also serve as a proxy for the group age: the number of years since the group took its first loan. If each loan cycle increases the credit value to the borrowing groups, then one would expect the repayment performance to improve at each successive loan cycle. But if groups envision their relationship with the MFI as transitory, then repayment performance worsens in later loan cycles.

[17]To define this variable we use outside credit options from individuals outside the group rather than from commercial banks. This is because bank loans are hard to obtain, a notion that was reiterated by group leaders.

average educational attainment being close to 3 which corresponds to 9 years of actual schooling. In our estimations *AVGEDU* is the group average educational attainment.

While the MFW does not require assets ownership by the borrowing groups, wealth indicators may improve the capacity of the groups to meet repayment requirements on time. Since land is costly in urban areas, we use land ownership to capture the wealth effect on repayment behavior. *LAND*, measured in hundreds of square meters, is the mean land size owned by the group.

Cultural factors like religion can also affect the repayment performance of groups. Since all group members in the sample are Muslims, we measure the intensity of religious practice across groups by considering the percentage of group members who pray five times a day. We call this variable *RELIGION* and believe that it has a significant effect on repayment.[18] In Islam, work ethic is defined by the Quran itself. As explained by Esposito (1980), work is considered as the ideology of practice and the practice of ideology, a religion of action, and "the par axis of the believers." Ibrahim Al-Tahawi (1974) explains that the Quran considers productive and beneficial work as a manifestation of faith and belief. All capable people are exhorted to work to earn their living; they are not permitted to become liability on their families through idleness. A person who is honest and works hard is most highly praised by God. In addition to this, Islam calls for prompt and full repayment of debt, once it is incurred. The Prophet Muhammad said "the best among you are those best in paying off debt" and "whoever contracts a debt intending to repay it, Allah will repay it on his behalf, and whoever contracts a debt intending to waste it, Allah will bring him to ruin." Such Islamic ideas create internal monitoring incentives for group members to be productive and put repayment obligations on borrowers which lead to better repayment. Therefore the expected impact of *RELIGION* on delinquency is negative.

[18] In Islam borrowing at non-zero interest rate "riba" is prohibited. One then may ask about the validity of the variable *RELIGION*. Why would a borrower have religious motives to meet repayment obligations when the deal of a non-zero-interest loan itself violates religious beliefs? The answer to this lies in two points. First, many Islamic scholars would argue that borrowing at some interest is allowed if the borrower is to meet un-avoidable necessities. A micro credit loan used to alleviate a person from poverty can fall under this category. Second, when the general manager of the MFW, Bassem Khanfar was asked about the effect of interest on the microfinance expansion in Jordan, he said that the MFW itself does not explicitly use the concept of interest or "riba" in dealing with its borrowers. Since the MFW is considered to be a non-for-profit institution, the concept of interest is introduced as a "cost of borrowing" or as "administrative fees" instead.

Finally, to capture differences in the repayment behavior of borrowing groups across the two branches surveyed, we include a dummy for groups belonging to the Al-Rusaifa branch and call this variable *BRANCH*.

Screening Variables

We include two measures of screening. Our first measure called *SCREEN*, is a dichotomous variable that equals one if the group has ever rejected a person who wanted to join. Additionally, we use a dummy variable, *KNOWTYPE* that takes a value of one if members have quality and sales information about each other's profession.

The variables *SCREEN* and *KNOWTYPE* are meant to measure the ability of group members to exclude members from joining the group. These variables contain information about group members at the moment the group is being formed. On average, we expect groups that accept every potential borrower (low probability of screening) to have worse repayment relative to groups that reject borrowers (higher probability of screening). Recall that according to MFW rules, members should have an existing business. *KNOWTYPE* contains information on whether group members know the quality and sales of each other business at the moment the group is being formed.

Monitoring Variables

Monitoring can mitigate moral hazard problems and the degree of monitoring is itself a function of its cost. We use different proxies to measure cost of monitoring. The first proxy used is *DISTANCE* which is a dummy variable equal one, if the average distance among group members is more than a kilometer.

Our second proxy, *RELATIVE,* is the fraction of group members that are related to at least one other group member.[19] A higher percentage of relatives among group members may facilitate monitoring due to the lower cost of obtaining information among relatives, but can also hinder the ability to impose penalties (see for instance BBG (1994) who relate monitoring to imposing penalties). Therefore, while it

[19] If a group has four members A, B, C and D, and if A is related to B, then *RELATIVE* takes the value of 0.5. If A is related to B and A is related to C then *RELATIVE* is 0.75 and so on.

might be easier for a group member to monitor her relative in the group, it might be difficult to impose penalties on her as well.

Our final proxy of monitoring costs is the percentage of group members who have phone services. The hypothesis here is that the higher the percentage of members with phones, the easier and less costly the flow of information and therefore monitoring. The variable *PHONE* measures the percentage of members in a group that have access to either land or cell phone services.[20]

Group Pressure Variables

Peer pressure against defaulting members is believed to substantially help in reducing moral hazard problems in a borrowing group (Besley and Coate (1995) and Wydick (1999)). In this study group pressure (*PRESSURE)* is measured through four yes/no questions asked to group leaders whether: (i) group members are willing to put pressure on a group member who is late in repaying, (ii) group members feel morally obligated to repay the group loan, (iii) group members repay to stay on good terms with each other, and (iv) the group has an internal code to punish a defaulting group member. *PRESSURE* is thus an index equal to the number of yes responses to these questions.

As shown by Ahlin and Townsend (2007), although most research considers cooperation amongst group members important, the effect of cooperation on repayment rates is model specific. In the empirical analysis, we use a measure similar to the structure used by Ahlin and Townsend (2007). Our measure of cooperation utilizes 6 yes/no questions asked of group leaders whether there was cooperation: (i) in choosing the place of business, (ii) in referring customers to other group members, (iii) in helping with free labor, (iv) in helping with money, (v) in purchasing inputs, and (vi) in selling output during the current lending cycle. The index is the number of yes responses to these six questions. The same set of questions was asked twice – both for unrelated and related group members. *COOP* is the weighted average of cooperation among all group members, both related and unrelated.[21] The questions that were

[20] Note that *PHONE* can proxy for business quality, productivity, wealth, etc.

[21] In the original model, we had two measures of cooperation: one measures cooperation among related group members and the other measures cooperation among unrelated members. This creates a problem because

used to construct the *COOP* variable were chosen to measure the extent of cooperation in business related matters.[22] When a group member has a business hardship in one period and faces difficulty in repayment, group members, given their understanding of the true reason for such repayment difficulty, may find it inappropriate to insist on repayment. Cooperation therefore may dilute pressure and lead to worse repayment.

Social Ties Variables

A number of papers have shown that the success of group lending depends on its ability to harness social ties among borrowers (see for instance Floro and Yotopolous (1991), Karlan (2007), Cassar et al. (2007)). Our measure *SOCIALTIES* utilizes 5 yes/no questions put to group leaders whether: (i) she can get any help from other group members when needed, (ii) she can count on other group members to take care of her child if she needs to be away for awhile, (iii) she seeks help from other group members to make a decision, (iv) she seeks mediation from others to solve a dispute with other group members, and (v) she prefers buying and selling from group members rather than from other individuals. *SOCIALTIES* thus is an index equal to the number of yes responses to these five questions. Note that while variables such as *DISTANCE*, *RELATIVE* and *COOP* were used under the monitoring and group pressure categories, they can also be thought of as measures of different aspects of social ties.

---

cooperation among related group members would be highly correlated with *RELATIVE*. Therefore we measure *COOP* as (*RELATIVE* × the index of cooperation among related members) + ((1−*RELATIVE*) × the index of cooperation among unrelated members)).

[22] One referee noticed that some of the questions seem to be only valid if group members have the same business. This specifically holds for the two questions related to cooperation to purchase inputs and sell outputs (and perhaps also for the question related to choosing the place of business). In our sample, 65.9% of the group members are involved in trade, 21.7% in handicraft, 5.8% in production and manufacturing, 4% in services, and 2.6% in agriculture and live stock. On average almost 66% of group members do have similar business, trade. Most of the raw material used by borrowers can be easily found in nearby markets. The question related to cooperation to purchase inputs refers to the possibility that members, for example, go to the market together to buy inputs. Many leaders interviewed said some members go to the market together for shopping and buying different types of inputs, not necessarily for the same business. Sometimes members share cabs to do so if they are a bit far from the marketplace. The same argument goes for selling output. As to the first question related to choosing the place of business, while we believe that a member would recommend a better place of business for his peer with same business, other members can still suggest places.

5. Econometric Methods and Results

The empirical analysis estimates the effects of a number of independent variables on group repayment performance measured by *DELINQUENCY*, which is a count data variable. Our main hypotheses pertain to the impact of variables highlighted by theory like the effect of screening, monitoring, group pressure, and social ties on group repayment performance.

Due to the count data nature of the dependent variable, we consider models such as the Poisson, the negative binomial I (NB1), the negative binomial II (NB2), and their zero inflated versions, zero inflated Poisson (ZIP) and zero inflated negative binomial (ZINB). [23] See Greene (2008, pp. 907-913 and 922-925) for discussion of estimation and testing issues. Here we use the NB2 model. Briefly, the standard Poisson model did not fit the data well. In a Poisson distribution the mean and variance are equal. When the variance is greater than the mean (which is most of the time) the distribution is said to display overdispersion. The standard Poisson suffers from overdispersion and under-predicts the number with zero days of late repayments. The negative binomial II model relaxes the equidispersion assumption, specifying the conditional variance to be a quadratic function of the mean, rather a conditional variance proportional to the mean as in the NB I model. Cameron and Trivedi (2005, pp. 676-677) note that the NB2 model is useful in applied work because it has the flexibility to fit the data well in many circumstances. In our application, the NB2 model predicts the number of days of late repayments very well. The zero-inflated negative binomial relies on more parameters, and fits the data almost as well as the NB2 specification. These two competing models are not nested. However Vuong (1989) proposed a test statistic for nonnested models that can be used to compare the two models. Interestingly this test statistic is directional, and if sufficiently large, or small, favors one model over the other. Using Clarke's

[23] The variable we analyze is, as we have noted, a count of the number of days of late repayment after each due date. We have chosen to analyze the data with estimators and models that are designed for such count data, thereby using the full information contained in the data, rather than use a binary choice model to analyze the either/or variable, whether a group made a late repayment or not. The probit coefficient estimates do have signs that are largely similar to the count data model results we present. What the binary choice model approach cannot do is to account for the intensity of the delinquency, as we have done. We obtain many fewer statistically significant coefficients using probit with cluster corrected standard errors, than we do with our count data models also using cluster corrected standard errors. This outcome supports, but is not the sole basis for, our use of count data models.

(2007, p.349) degrees of freedom corrected version of the test, our data significantly favors the negative binomial II model over the zero-inflated negative binomial model.

We treat each due date as an event and estimate across all due dates, clustering by group. To account for within-cluster correlations, we use cluster robust standard errors. The empirical results are shown in Tables 4a and 4b. In Table 4a the column labeled "Full" includes all control variables, as well as the groups of variables relating to screening (*SCREEN* and *KNOWTYPE*), monitoring (*DISTANCE*, *RELATIVE* and *PHONE*), group pressure (*PRESSURE* and *COOP*), social ties (*SOCIALTIES*), as well as the control variables (*AVGLOAN*, *CROPTION*, *AVGEDUC*, *RELIGION*, *LAND*, *BRANCH*) and due date dummy variables (*D2-D8*). In Table 4a the column labeled (1) includes only the screening variables plus controls, (2) includes monitoring variables plus controls, (3) includes group pressure variables plus controls and (4) includes social ties plus control variables.

In Table 4b we present the "Full" model results again in the first column for easy reference, and then in column (5) the model includes screening and monitoring variables, plus group pressure and controls, column (6) includes screening plus monitoring variables, social ties and controls, column (7) includes screening plus group pressure variables, social ties and controls, and column (8) includes monitoring plus group pressure variables, social ties and controls. In Tables 4a and 4b we show alternative specifications, including and omitting groups of variables. The model in column (8) of Table 4b minimizes the AIC and BIC criteria, and is thus "best" under these measures. This outcome is also suggested by the robust Wald tests of results of the omitted variables (relative to the "Full" model) in each model. The *p*-values of these joint tests indicate that the only insignificant group of variables is the screening group.

Given the AIC and BIC criteria and the robust Wald tests, our emphasis will therefore be on model (8) of Table 4b. Results on the dummy variables show that groups in their second due dates have more days of late repayment compared to their first due dates. Groups in their third due dates have more days of late repayment compared to their first due date and so on. In general, the difference in days of late repayment, compared to the first due date, increases up to the sixth due date after which the difference

falls. This suggests that repayment performance gets worse before it improves toward the end of the lending cycle. Treating problems like need for liquidity in the initial stages could be one explanation for the increase in late days of repayment at the beginning. Towards the end of the cycle, however, groups are expected to improve their repayment performance to be eligible for another loan cycle.

The empirical evidence on the effect of loan size on repayment is mixed in the literature. Our results show that the sign on *AVGLOAN* is negative but statistically insignificant.[24] We use the average loan size (*AVGLOAN*) rather than the total loan size because of the lending rules of MFW described in Section 3, with the initial loan size being JD200 for new members, increasing by JD100 per loan cycle to a maximum of JD500. The lending mechanism and the group formation process at the MFW lessen, but possibly do not eliminate endogeneity concerns regarding the loan size,[25] and reduce its relevance. [26]

The sign on *CROPTION* is positive and statistically significant as predicted by models of Stiglitz (1991) and BBG (1994). This may indicate that groups with more outside credit options have higher levels of fulfilled credit demand reducing concerns about future borrowing privileges from the MFW. Groups with more alternative credit sources may value the MFW's services less and have a more casual attitude towards timely repayment (Wenner (1995).[27]

[24] Group age, a proxy for *AVGLOAN*, therefore has no significant impact on repayment. A more direct measure of group age, the number of years since a group took its first loan, also yields similar results.

[25] It is important to mention that endogeneity concerns cannot be entirely dismissed. For example, lenders usually increase loan size over time to groups with good performance. Therefore, from the borrower's point of view, there might be some probabilistic decision-making regarding future loans which may not be entirely random with respect to repayment. Other arguments also exist. Lenders usually increase loan size over time to those groups with good past performance. Any group member can exit at the end of the loan cycle and new members can join at the beginning of the next loan cycle. However given the lending rules of MFW, groups with higher new members will have lower group loan size even if they have good repayment performance.

[26]To check this result we estimated the model with total loan size but using only groups of size four. In the sample there are 116 such groups. After controlling for the group size in this manner, we also obtain similar results, the loan size and its square effects are statistically insignificant. We thank an anonymous referee for this suggestion. We test the endogeneity of *AVGLOAN* using the strategy proposed by Wooldridge (2002, pp. 663-665). The reduced form for *AVGLOAN* is estimated using the additional and very strong instrument, the number of new group members (t-value = -7.6). The reduced form residuals are added to model (8) in Table 4b, the preferred specification, and tested for significance. The p-value for this endogeneity test is 0.35, leading us to fail to reject the exogeneity of *AVGLOAN* in this model..

[27] More credit options may allow borrowers to take on more short-term risk with their loans. This may lead to more days of late repayment in the short-term; not necessarily bad if borrowers ultimately repay.

In our estimation, the coefficient on *AVGEDU*, group average educational attainment, is positive but statistically insignificant. However, the result on *AVGEDU* is sensitive to the omission of *CROPTION*. When *CROPTION* is dropped from the model, the coefficient on *AVGEDU* is positive and becomes statistically significant at the 5% level. That is, groups with higher levels of education have more days of late repayment relative to those with lower levels of education. The empirical literature on the effect of education on repayment has found mixed results. Ahlin and Townsend (2007) find that more productive groups, measured by their education, have better repayment performance. On the other hand, Zeller (1998) using literacy as a measure of human capital found that the coefficient on literacy is not statistically different from zero. Others, like Godquin (2004) found education to have no impact on repayment. Our results add an additional dimension to this issue as explained below.

An explanation for our results may lie in the fact that highly educated groups have less unfulfilled demand for credit, or are less credit rationed. We have two pieces of evidence to support this claim. First, the simple correlation coefficient between *AVGEDU* and *CROPTION* is 0.19. That is, more educated groups are associated with more outside credit options. More educated groups may have better social networking that provides them with more outside credit sources. Second, in the survey we asked the group leaders about their desired loan sizes. We also have the group leaders' actual loan sizes from the MFW's data base. These data allows us to measure the degree of credit rationing of the group leaders by taking the difference between the desired loan sizes and the actual ones expressed as a percent of the desired loan sizes. Let us call this variable *CRATION*. Assuming that the group leader and her partners are identically credit rationed, we found a negative correlation between education and credit rationing of -0.11. That is, highly educated groups are associated with lower degree of credit rationing. An explanation for this may lie in the fact that more educated groups might be from a pool of relatively less needy groups and therefore their need for credit is relatively less than less educated groups.

Our hypothesis is that more educated groups who have lower unfulfilled demand for credit and are less concerned about larger loans in the future may exert less effort to improve their repayment performance. To indirectly test this hypothesis, we run the main models omitting *CROPTION*. The

variable *AVGEDU* becomes statistically significant at 5% level in most of the models. When including *CROPTION*, the variable *AVGEDU* maintains its positive sign but loses its significance at the 10% level as shown in Tables 4a and 4b. When including *CRATION* along with *CROPTION*, the variable *AVGEDU* loses its significance level considerably. We did not include the variable *CRATION* for several reasons. It refers specifically to the group leader and not to group members, it is highly correlated with *CROPTION* (+0.8) and it is statistically insignificant. The results of the model do not change with the inclusion the credit ration variable.[28]

The cultural factor, *RELIGION*, holds a negative sign and is statistically significant. More religious groups tend to have fewer days of late repayment. To the best of our knowledge, this paper is the first to shed light on this interesting determinant of repayment behavior. This is a key finding of our paper and the discussion in Section 4.2.2 on Control Variables provides more information on the effects of this variable. The influence of religion on work ethics, productivity and prompt repayment of debt seem to be the driving forces of religiosity-repayment results.

It is likely that the measure of religiosity, measured for each group member, is highly correlated with religiosity of the husband or parents, which is unmeasured. If the patriarchal structure of the household or parents is positively associated with religiosity of the husband or the parents, then it could be the husband's or parents' control that drives the religiosity-repayment result. It has been long debated

[28] We also tried alternative measures of education and they yield qualitatively similar results. One such measure is a dummy variable that attempts to separate groups who are well educated (two-year college and higher) from groups with less education since education beyond high school level in Jordan is not free. Using this measure we find that education worsens repayment. While the inclusion of outside credit and credit rationing measures weaken the effect of this dummy variable, it does not loose predictive power. One explanation for this may lie in the mechanism of the labor market in Jordan. The number of jobseekers applying to the *Civil Service Bureau* was 168,133 in 2003. The labor force in Jordan was 1.2 million in the same year. The public sector in Jordan constitutes the largest employer (39%) and is considered more attractive than other sectors because it offers many benefits such as secure employment, favorable working hours, attractive retirement, social security benefits and, for many, high social status. Education has significant impact on job opportunities in the public sector. Among employed Jordanians, over two-thirds of female workers have a high education qualification (37% have bachelor's degree or higher and 31% a two-year college degree). In the data sample, 11% of the groups have an average education attainment of two-year college and higher. While the public sector is very attractive for job seekers, it cannot supply sufficient jobs to meet the growing demand. The vast majority of the job seekers in the public sector register in a waiting list kept by the *Civil Service Bureau*. Waiting times vary considerably. Quite possibly a borrower with higher education may take advantage of the MFW group loans until a job becomes available. Therefore groups with higher levels of education may envision their relationship with the MFW as transitory. If borrowers perceive their relationship with the MFW as temporary then we expect *DELINQUENCY* to increase for groups with higher education.

that Muslim family laws and Middle Eastern traditions served to reinforce patriarchal gender relations. However, patriarchy differs from one country to another in the Middle East. Sharabi (1988) characterize Jordan as neopatriarchal society, which means it is neither modern nor fully patriarchal, but bears characteristics of both. Nevertheless, since the possibility of patriarchy cannot be totally excluded, the fact that husband's or parents' control may drive the religiosity-repayment result cannot be ruled out.[29]

The sign on *LAND* is negative as expected but statistically insignificant. A similar result was obtained by Zeller (1998). Land ownership as a measure of wealth seems to be unimportant factor in determining repayment behavior.

To control for differences in repayment behavior among groups belonging to different regions we use a dummy equal to one if the group belongs to Al-Rusiafa's branch and zero if the group belongs to Irbid's branch. *BRANCH* is negative and statistically significant. Group members belonging to Al-Rusaifa's branch have better repayment performance relative to their counterparts in Irbid's branch. *BRANCH* may signal different factors one of which is differences in socioeconomic conditions between the two regions in the study.

The robust Wald *p*-values at the bottom of Tables 4a and 4b indicate that the only insignificant group of variables is the screening group. *SCREEN* and *KNOWTYPE* are statistically insignificant across all specifications. Additional proxies for screening were also used in the model. These include whether there are people who would like to join the group but could not, whether the group leader was aware of the quality and sales of other members' businesses before group formation, whether the group members are aware of each other's debt and saving with banks other than the MFW, each other's debt with other individuals, each other's assets before group formation. The signs on all these proxies were invariably negative as expected but none was statistically significant and therefore were omitted from the model. This agrees with most of the literature since evidence on the positive effect of screening on repayment was only documented in Wenner (1995) and Zeller (1996).

[29] We would like to thank an anonymous referee for drawing our attention to this point.

The sign on *DISTANCE* is positive as expected and statistically significant.[30] Groups with an average distance of one kilometer or more tend to have more days of late repayment. This result was also found by Wydick (1999), Karlan (2007) and Ahlin and Townsend (2007) who used different versions of the variable *DISTANCE*.

Ahlin and Townsend (2007) and Sharma and Zeller (1996) used measures similar to *RELATIVE*. In these papers, the percentage of relatives on a group worsens repayment performance. Both papers argue that it is difficult to impose penalties on relatives which weaken the repayment enforcement process. The sign on the coefficient of *RELATIVE* in this paper suggests that groups with more relatives reduce the number of days of late repayment. The impact, however, is statistically insignificant.

The sign on the coefficient of *PHONE* is also negative and statistically significant. The flow of information necessary for monitoring becomes smoother with access to phone services which in turn improves repayment performance. *PHONE* can be also thought of as a measure of technology that enhances productivity. Group members equipped with phones can have better access to market information at a lower cost which brings efficiency gains in their businesses as well as in coordinating their own loan repayment. This variable is of particular interest because it has many implications for the MFI. First, groups provided with this technology tend to have better repayment. Second, it offers a means of lowering communication cost. For example, the loan officer can choose to call clients rather than relying on other communication channels such as having to physically meet with them. Third, it can be used to attract new clients and thus increasing outreach at a lower cost.

The group pressure measures have the expected signs and have significant explanatory power on the number of days of late repayment. This indicates the importance of group pressure in alleviating moral hazard. Similar results were found by Ahlin and Townsend (2007), Wydick (1999) and Karlan (2007). The results show that a greater degree of *PRESSURE* among group members reduces the number of days of late repayment. The sign on *COOP* is positive indicating that a greater degree of cooperation

[30] We also used the average distance among group members as an alternative to *DISTANCE*. The sign on this measure turns out to be negative but statistically insignificant.

among group members increases the number of days of late repayment. Cooperation among group members seems to dilute the willingness to exercise pressure on delinquent members which encourages late repayment. Ahlin and Townsend (2007) found that cooperation among non-relatives had negative impact on repayment. Our results show that cooperation, in general, worsens repayment.[31]

As expected, our measure of social ties, *SOCIALTIES,* shows a negative and strong impact on delinquency. Our results on the effect of *SOCIALTIES* on repayment are in line with Zeller (1998), Karlan (2007) and Cassar et al. (2007). Information contained in socially tied groups and group members' sensitivity to their social network both lessen the consequences of adverse selection and moral hazard problems which improve repayment performance.

In this paper, potential measures of social ties include *SOCIALTIES, COOP,* and *DISTANCE*. We view our results as one attempt to disentangle the impact of different aspects of social ties on repayment behavior. Social ties that are manifest in friendship (*SOCIALTIES*) appear to improve repayment through lowering the cost of obtaining information among socially tied borrowers (monitoring) and through the propensity of group members to maintain and protect existing relationships. Social ties that are manifest through cooperation facilitate the mission of group members to have some understanding of the actual state of each other businesses, which worsens repayment. Presumably, if a group member experiences a negative shock, and her group members are aware of this information, implicitly measured in *COOP*, we would expect her group members to be more understanding and lenient in terms of exercising pressure and imposing penalties. Social ties that are manifest in neighborhood, *DISTANCE,* seem to improve repayment behavior. Thus as already mentioned in the previous section, the extent of social ties and the manner in which they are used support different views on the impact of social ties in group lending.

Finally note that signs and significance levels of the variables discussed above are fairly similar across all specifications.[32] One exception to this is the variable *COOP* in column (3) of Table 4a where

[31] We also used cooperation among relatives and cooperation among non-relatives as alternatives for *COOP* and obtained similar results. Cooperation among group members, relatives or not, has negative impact on repayment.

[32] A study carried out by *Planet Finance* (2007) "National Impact and Market Study of Microfinance in Jordan" shows that seasonal economic activity in terms of sales peaks from June to September and it slows down in winter

the coefficient drops in size and significance. This indicates the importance of including the groups of variables that proxy for monitoring and social ties.

6. Conclusion

We use an original dataset to supplement the existing literature on repaymenmt rates under group lending in a number of ways. We corroborate existing findings, but also provide insight on the importance of religious beliefs while being the first look at the impact of technology, in terms of access to a telephone. The data include surveys of 160 loan group leaders and loan data collected from the *Microfund for Women*, a micro lending institution in Jordan. In contrast to existing empirical literature that provides evidence about different theoretical models of group lending using single measures of the variables of the theoretical variables of interest, the current paper offers a number of alternative measures of each such variable. Multiple survey questions are used to construct variables to capture the role of screening, monitoring, group pressure, and social ties on group repayment performance. Similarly, we use a more descriptive dependent variable, the number of days a payment is late, as opposed to the convention of using a binary variable of whether a payment was late or on time. This allows for a better understanding of the role of each explanatory variable in late payments and suggests the use of count data models in this literature.

A number of our findings coincide with existing literature: screening variables have no significant impact on loan repayment, higher levels of cooperation result in higher delinquency, and higher group pressure results in fewer late payments. While this is important, we are also able to examine the

---

months. The study also shows that the demand for credit is higher when economic activity is high, in particular during the summer months, with high peak in June. This suggests that there might be some seasonality effects in various types of loans that may alter the results. We carry out robustness checks of the main specifications (Tables 4a and 4b) by including dummies that represent the origination of the month of the group loans. We create eight dummies namely; *AUG*, *SEP*, *OCT*, *NOV*, *DEC*, *JAN*, *FEB*, and *MAR*. For example *AUG* is a dummy equal one if the group received the loan in August; SEP is a dummy equal to one of the group received the loan in September and so on. AUG is kept as the base. The rationale for the inclusion of the *SEP-MAR* controls is to see if type of loan is correlated with some of the other independent variables in ways that cancels out their effects; traders loans are in the summer and traders have cell phones and traders are less delinquent, etc. We find that the results are robust to the inclusion of the dummies *SEP-MAR* intended to capture seasonality.

importance of factors like religiosity and communication technology and their effect on repayment rates. Individuals who are more religious (as measured by those who pray 5 times daily) are less likely to make late payments. This can be explained through the teachings of Islam, which provides a strong internal motivation for repayment that has been ignored in earlier studies (as already mentioned Ibrahim Al-Tahawi (1974) provides a detailed discussion of this). Similarly, we are the first to consider the effect of having access to a telephone, which decreases late payments. Since communication technology increases group accountability, this finding is not surprising. This research suggests some potential means to improve repayment, i.e., lenders should focus on encouraging group pressure, monitoring, and aspects of social ties that increase repayment rates.

References

1. Adams, D., D. Graham, and J.D. von Pischke. 1984. *Undermining Rural Development with Cheap Credit.* Boulder, CO: *Westview Press*.
2. Ahlin, C. and R. Townsend. 2007. "Using Repayment Data to Test across Models of Joint Liability," *Economic Journal*, 117, F11-F51.
3. Al-Tahawi, I. 1974. *Al-Iqtisad Al-Islami*. Majma' Al-Buhuth al-Islamiyah.
4. Armendariz de Aghion, B. 1999. "On the Design of Credit Agreement With Peer Monitoring," *Journal of Development Economics*, 60, 79-104.
5. Armendariz de Aghion, B. and J. Morduch. 2000. "Microfinance Beyond Group Lending," *Economics of Transition*, 8, 401-420.
6. Armendariz de Aghion, B. and J. Morduch. 2007. "The Economics of Microfinance," *The MIT Press*.

7. Banerjee, A., T. Besley, and T. Guinnane. 1994. “Thy Neighbor’s Keeper: The Design of a Credit Cooperative with Theory and a Test,” *Quarterly Journal of Economics*, 46, 1-18.
8. Besley, T. and S. Coate. 1995. “Group Lending, Repayment Incentives, and Social Collateral,” *Journal of Development Economics*., 46, 235-264.
9. Cameron, A. and P. Trivedi. 2005. *Microeconometrics: Theory and Methods*. Cambridge: Cambridge University Press.
10. Cassar, A., Crowley L. and Wydick, B. 2007. “The Effect of Social Capital on Group Loan Repayment: Evidence from Field Experiments,” *The Economic Journal*, 117, F85-F106.
11. Charitoneko, S. and T. Kristaslky. 2004. “Commercialization of Microfinance in Jordan: Progress and Prospects,” *AMIR Program Funded by USAID*.
12. Clarke, K.A. 2007. “A Simple Distribution-Free Test for Nonnested Model Selection,” *Policy Analysis*, 15, 347-363.
13. Esposito, J. 1980. *Islam and Development: Religion and Sociopolitical Change*. Syracuse, N.Y: Syracuse University Press.
14. Floro, S. and P. Yotopolous. 1991. *Informal Credit Markets and the New Institutional Economics: The Case of Philippine Agriculture*. Boulder, *Westview Press*.
15. Ghatak, M. 1999. “Group Lending, Local Information and Peer Selection,” *Journal of Development Economics*, 60, 27-50.
16. Ghatak, M. and T. Guinnane. 1999. “The Economics of Lending with Joint Liability: Theory and Practice,” *Journal of Development Economics*, 60, 195-228.
17. Gine, X and D Karlan. 2006. “Group versus Individual Liability: A Field Experiment in The Philipines,” *Policy Research Working Paper Series 4008*, The World Bank.
18. Godquin, M. 2004. “Microfinance Repayment Performance in Bangladesh: How to Improve the Allocation of Loans by MFIs,” *World Development*, 32, 1909 – 1926.
19. Greene, W.H. 2008. *Econometric Analysis, Sixth Edition*, Prentice-Hall.

20. Hermes, N. and R. Lensink. 2007. The Empirics of Microfinance: What do We Know? *Economic Journal*, 117, F1-F10.
21. Karlan, D.S. 2007. "Social Connections and Group Banking," *The Economic Journal*, 117, F52 – F84.
22. Laffont, J.J. and T. N'Guessan. 2000. "Group Lending with Adverse Selection," *European Economic Review*, 44, 773-784.
23. Lehner, M. 2008. "Group versus Individual Lending in Microfinance," *Discussion Papers in Economics 2008-24*, University of Munich.
24. Planet Finance (2007). National Impact and Market Study of Microfinance in Jordan. http://planetfinancegroup.org.
25. Planet Rating (2004). Microfund for Women, Jordan. http://www.planetrating.com.
26. Sharabi, H. 1988. *Neopatriarchy: A Theory of Distorted Change in Arab Society*. New York: Oxford University Press.
27. Sharma, M. and M. Zeller. 1997. "Repayment Performance in Group-Based Credit Programs in Bangladesh: An Empirical Analysis," *World Development*, 25, 1731-1742.
28. Stiglitz, J. 1990. "Peer Monitoring and Credit Market," *Word Bank Economic Review*. 4, 351-66.
29. Stiglitz, J. and A. Weiss. 1981. "Credit Rationing in Markets with Imperfect Information," *American Economic Review*, 71, 393-419.
30. Van Tassel, E. 1999. "Group Lending Under Asymmetric Information," *Journal of Development Economics*, 60, 3-25.
31. Varian, H. 1990. "Monitoring Agents with Other Agents," *Journal of Institutional and Theoretical Economics*, 146, 153-74.
32. Vuong, Q. 1989. "Likelihood Ratio Tests for Model Selection and Non-Nested Hypotheses," *Econometrica*, 57, 251-261.
33. Wenner, M. 1995. "A Means to Improve Information Transfer and Loan Repayment Performance," *Journal of Development Studies*, 32, 263-281.

34. Wooldridge, J. M. 2002. *Econometric Analysis of Cross Section and Panel Data*. Cambridge, MA: The MIT Press.

35. Wydick, B. 1999. "Can Social Cohesion be Harnessed to Repair Market Failure? Evidence from Group Lending in Guatemala," *The Economic Journal*, 109, 463-475.

36. Zeller, M. 1998. "Determinants of Repayment Performance in Credit Groups: The Role of Program Design, Intragroup Risk Pooling, and Social Cohesion," *Economic Development and Cultural Change*, 46, 599-620.

Table 1: Description of Group Loans at the MFW

Loan Type	**Group Loans**
Creation Date	1996
Client Type	Urban
Collateral Requirements	Group guarantee
Repayment Schedule	Bi-weekly, monthly
Nominal annualized interest rate (first loan)	21% flat
Additional Fees (in JD)	5
Loan Size Range (in JD100)	2.00-5.00
Average Loan Size (in JD100)	3.703
Loan Term Range	28 weeks, 8 months

Table 2: Summary Statistics for *DELINQUENCY* by due date

	Due1	**Due2**	**Due3**	**Due4**	**Due5**	**Due6**	**Due7**	**Due8**
Mean	0.163	0.360	0.633	0.710	0.833	1.023	0.754	0.757
Std.Dev	0.603	0.706	1.824	1.957	1.816	2.129	1.921	2.362
Minimum	0	0	0	0	0	0	0	0
Maximum	6	5	14	17	10	13	8	10
Count	160	136	120	107	96	87	69	37

Table 3: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
DELINQUENCY	812	.5862069	1.626297	0	17
SCREEN	812	.5738916	.4948147	0	1
KNOWTYPE	812	.9507389	.216546	0	1
DISTANCE	812	.1083744	.3110443	0	1
RELATIVE	812	.2156897	.2856168	0	1
PHONE	812	.6447537	.2964044	0	1
PRESSURE	812	3.258621	.7244962	1	4
COOP	812	3.263424	1.273143	0	6
SOCIALTIES	812	3.938424	1.083972	0	5
AVGLOAN	812	3.805397	.908782	2	5
CROPTION	812	.2700739	.364525	0	1
AVGEDUC	812	2.95447	.7891132	.4	4.5
RELIGION	812	.8592734	.225614	0	1
LAND	812	3.999261	10.10856	0	70
BRANCH	812	.5504926	.4977506	0	1

Table 4a: Negative Binomial Regression Cluster Robust Standard Errors

	Full	(1)	(2)	(3)	(4)
SCREEN	-0.103	-0.306			
	(0.211)	(0.234)			
KNOWTYPE	0.153	0.00537			
	(0.473)	(0.563)			
DISTANCE	0.633**		0.783**		
	(0.278)		(0.308)		
RELATIVE	-0.548		-0.527		
	(0.433)		(0.484)		
PHONE	-0.851**		-0.833*		
	(0.421)		(0.443)		
PRESSURE	-0.277*			-0.569***	
	(0.151)			(0.153)	
COOP	0.221**			0.0477	
	(0.0961)			(0.0927)	
SOCIALTIES	-0.382***				-0.361***
	(0.116)				(0.111)
AVGLOAN	-0.176	-0.250*	-0.149	-0.218*	-0.163
	(0.131)	(0.135)	(0.144)	(0.129)	(0.134)
CROPTION	0.773**	0.749**	0.738**	0.700*	0.766**
	(0.388)	(0.356)	(0.355)	(0.392)	(0.359)
AVGEDUC	0.296	0.203	0.237	0.167	0.197
	(0.185)	(0.154)	(0.162)	(0.164)	(0.152)
RELIGION	-1.191***	-1.277***	-1.576***	-1.325***	-1.140**
	(0.343)	(0.461)	(0.409)	(0.405)	(0.478)
LAND	-0.00357	-0.00352	0.00572	-0.00700	0.000103
	(0.0114)	(0.0105)	(0.0123)	(0.0115)	(0.0102)
BRANCH	-0.771**	-0.765**	-0.799***	-0.936***	-0.527
	(0.317)	(0.301)	(0.276)	(0.290)	(0.322)
D2	0.759**	0.856***	0.844***	0.820***	0.787***
	(0.298)	(0.299)	(0.296)	(0.301)	(0.299)
D3	1.164***	1.324***	1.328***	1.327***	1.167***
	(0.284)	(0.303)	(0.343)	(0.333)	(0.270)
D4	1.414***	1.498***	1.387***	1.525***	1.446***
	(0.421)	(0.386)	(0.374)	(0.412)	(0.414)
D5	1.369***	1.494***	1.379***	1.432***	1.431***
	(0.355)	(0.347)	(0.336)	(0.347)	(0.355)
D6	1.707***	1.899***	1.711***	1.744***	1.868***
	(0.367)	(0.377)	(0.345)	(0.375)	(0.399)
D7	1.209***	1.521***	1.306***	1.238***	1.412***
	(0.393)	(0.429)	(0.381)	(0.394)	(0.438)
D8	0.718	1.049**	0.948**	0.684	0.995**
	(0.453)	(0.442)	(0.464)	(0.451)	(0.444)
_CONS	1.188	-0.143	0.0220	1.533*	0.538
	(0.844)	(0.903)	(0.868)	(0.860)	(0.704)
lnalpha	0.747***	1.092***	0.970***	0.974***	0.973***
	(0.246)	(0.184)	(0.213)	(0.209)	(0.216)
N	812	812	812	812	812
AIC	1419.6	1470.4	1452.2	1446.4	1446.8
BIC	1527.7	1550.3	1536.8	1526.3	1522.0
Robust Wald p-value		0.0000	0.0005	0.0000	0.0002

Standard errors in parentheses
Two-tail test p-values: * p<0.10, ** p<0.05, *** p<0.01
lnalpha = ln(α) where α is parameter in the NB II conditional variance
Estimations were carried out using STATA 11.1.

Table 4b: Negative Binomial Regression with Cluster Robust Standard Errors

	Full	(5)	(6)	(7)	(8)
SCREEN	-0.103	-0.369	-0.186	-0.126	
	(0.211)	(0.241)	(0.224)	(0.235)	
KNOWTYPE	0.153	-0.201	0.802	-0.0472	
	(0.473)	(0.523)	(0.495)	(0.516)	
DISTANCE	0.633**	0.531*	0.810**		0.610**
	(0.278)	(0.277)	(0.330)		(0.270)
RELATIVE	-0.548	-0.638	-0.499		-0.521
	(0.433)	(0.447)	(0.435)		(0.450)
PHONE	-0.851**	-0.627	-0.770*		-0.896**
	(0.421)	(0.407)	(0.446)		(0.442)
PRESSURE	-0.277*	-0.477***		-0.438***	-0.279*
	(0.151)	(0.148)		(0.164)	(0.147)
COOP	0.221**	0.101		0.164	0.237**
	(0.0961)	(0.0934)		(0.100)	(0.0925)
SOCIALTIES	-0.382***		-0.365***	-0.334***	-0.393***
	(0.116)		(0.112)	(0.114)	(0.117)
AVGLOAN	-0.176	-0.186	-0.124	-0.213	-0.170
	(0.131)	(0.137)	(0.130)	(0.129)	(0.132)
CROPTION	0.773**	0.725*	0.711*	0.750*	0.790**
	(0.388)	(0.389)	(0.368)	(0.392)	(0.382)
AVGEDUC	0.296	0.283	0.279	0.202	0.293
	(0.185)	(0.178)	(0.179)	(0.165)	(0.184)
RELIGION	-1.191***	-1.433***	-1.230***	-0.979**	-1.213***
	(0.343)	(0.344)	(0.366)	(0.387)	(0.352)
LAND	-0.00357	-0.00393	0.00701	-0.00979	-0.00409
	(0.0114)	(0.0130)	(0.0115)	(0.0107)	(0.0113)
BRANCH	-0.771**	-1.011***	-0.634*	-0.776***	-0.755**
	(0.317)	(0.297)	(0.324)	(0.298)	(0.323)
D2	0.759**	0.805***	0.762**	0.773***	0.762**
	(0.298)	(0.299)	(0.303)	(0.299)	(0.299)
D3	1.164***	1.287***	1.174***	1.177***	1.163***
	(0.284)	(0.333)	(0.285)	(0.276)	(0.283)
D4	1.414***	1.450***	1.370***	1.523***	1.412***
	(0.421)	(0.409)	(0.416)	(0.443)	(0.418)
D5	1.369***	1.376***	1.342***	1.433***	1.371***
	(0.355)	(0.349)	(0.360)	(0.359)	(0.355)
D6	1.707***	1.678***	1.721***	1.815***	1.705***
	(0.367)	(0.358)	(0.373)	(0.392)	(0.365)
D7	1.209***	1.216***	1.275***	1.284***	1.201***
	(0.393)	(0.389)	(0.406)	(0.411)	(0.389)
D8	0.718	0.692	0.867*	0.725	0.720
	(0.453)	(0.452)	(0.450)	(0.443)	(0.455)
_CONS	1.188	1.566*	0.113	1.597*	1.295*
	(0.844)	(0.944)	(0.824)	(0.855)	(0.747)
lnalpha	0.747***	0.859***	0.807***	0.880***	0.752***
	(0.246)	(0.237)	(0.243)	(0.229)	(0.242)
N	812	812	812	812	812
AIC	1419.6	1436.9	1430.7	1432.5	1416.0
BIC	1527.7	1540.3	1529.4	1526.5	1514.7
Robust Wald p-value		0.0010	0.0048	0.0024	0.8622

Standard errors in parentheses
Two-tail test p-values: * p<0.10, ** p<0.05, *** p<0.01
lnalpha = ln(α) where α is parameter in the NB II conditional variance
Estimations were carried out using STATA 11.1.

Figure 1. Frequency of Late Repayment after Each Due Date