

ESSAYS ON REPAYMENT AND MICROFINANCE

by

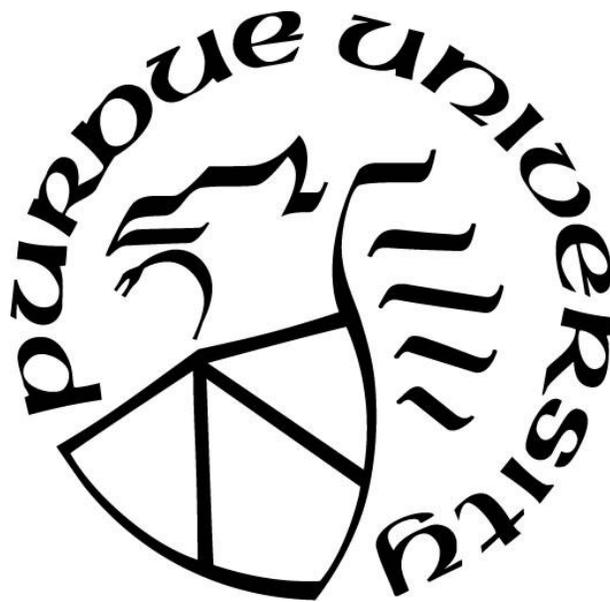
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*Dedicated to my parents, Shawkat Ara Begum and Md. Abdul Latif,
My late mother-in-law, Momtaj Munaf and father-in-law, Md. Abdul Munaf
My wife, Mahmuda Shirin
And my son, Zaheen Shawkat Iqbal*

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ABSTRACT

The first of the two essays in this dissertation uses primary data from Bangladesh to explore the role of microloan repayment frequency (weekly vs. bi-weekly, assigned randomly) on loan repayment performance of microfinance borrowers after controlling for their inherently distinct time preferences. The findings show that the borrowers' individual time preference is an important determinant of their repayment behavior. Specifically, the repayment performance of present-biased borrowers improves significantly when they happen to be assigned to the weekly repayment schedule instead of the bi-weekly schedule. Also, irrespective of time preference, borrowers are found to invest more in new businesses under a more flexible (i.e., bi-weekly) repayment schedule. Overall, our findings suggest that instead of a "one size fits all" approach, by offering loans with a weekly (bi-weekly) repayment schedule matched to the present-biased (time-consistent) borrowers, the MFIs might be able to minimize their transaction costs while ensuring high repayment rates. This would also benefit the borrowers by enabling them to venture into new business investments.

Using primary data from Bangladesh, the second essay seeks to examine two aspects of religiosity that might affect the microfinance borrowers' repayment performance. First, whether individual religiosity influences repayment behavior. Second, whether the impact of religiosity changes with borrowers' age, and level of community religiosity. The results show religiosity to be a significant determinant of a borrower's repayment behavior, as individuals with higher religiosity are found to be better borrowers. Also, the positive impact of religiosity is stronger for older borrowers, and for borrowers who live in comparatively less religious community. These findings indicate that MFIs can take into consideration the degree of individual and community religiosity to decide on the intensity of supervision required for borrowers. Borrowers with higher level of religiosity can possibly go on with minimal level of supervision as they are less likely to default. This reduced supervision would reduce travel costs incurred by MFI staff, making operations more cost-effective. This will also help free up loan officers' and borrowers' time. Thus, MFIs and borrowers can take advantage of this and invest time to other productive activities. The MFIs can also make better use of the freed-up staff to increase coverage.

ESSAY 1. FLEXIBLE REPAYMENT FREQUENCY, TIME PREFERENCE, AND REPAYMENT PERFORMANCE OF MICROFINANCE BORROWERS: EVIDENCE FROM A RCT IN BANGLADESH

1. Introduction

The practice of microlending, whereby poor entrepreneurs with no collateral are given small loans to be paid back over time following structured repayment schedules, has steadily gained popularity over the past 40 years.¹ Typically, microfinance repayment schedule is very frequent; installment amount is equally spread out and small; and the repayment starts almost immediately after loan disbursement. Most lending contracts require weekly repayment; but it is also possible to structure the loan repayments in bi-weekly schedules.² On the face of it, a frequent loan repayment schedule involves substantial costs for both the MFIs and their clientele- direct operational costs for the lenders, and opportunity cost of meeting attendance for the borrowers (Fischer & Ghatak, 2010). In contrast, a less frequent repayment schedule is likely to lower the transaction costs of the MFIs and can, in turn, allow loan officers to reach more potential borrowers. This can help to scale up MFI operations and improve outreach (de Aghion & Morduch, 2004), but potentially at the expense of higher loan defaults.³

However, as Fischer and Ghatak (2010) argue, if borrowers are classically rational, a more or less frequent repayment schedule should have no impact on either loan defaults or loan delinquencies. Yet, there is a prevalent belief among the MFIs that a frequent repayment schedule is crucial for MFIs' high recovery rates, possibly because the typical microcredit borrower is

¹See de Aghion & Morduch, 2010; and Chakravarty & Pylypiv, 2015; for an inclusive discussion of the microfinance literature.

²The installment amount due in each period is calculated by adding the principle and interest due at the end of the term, and then dividing that by the number of installments till the end of the term.

³From the borrowers' perspective, a less frequent repayment schedule implies that they will have to spend less time attending loan related meetings with the lenders' representatives and, more importantly, should have more time between repayment schedules in order to better utilize the borrowed money. This might lower transactions costs but could also increase customer defaults.

present-biased, i.e., she prefers present gains over future rewards.^{4,5} A similar view appears to be shared by researchers as well (see, for example, Jain & Mansuri, 2003; Chowdhury, 2005; Tedeschi, 2006; and Fischer & Ghatak, 2011). However, the empirical, as well as stylized, evidence on the effect of repayment frequency is both limited and mixed. BRAC in Bangladesh, one of the largest MFIs in the world, had to cancel a switch to bi-weekly repayment schedule when an experiment showed more default due to the move (de Aghion & Morduch, 2005). Satin Credit Care, another urban MFI had to experience a drastic fall in its recovery rate. Their loan default rate increased from less than 1% to more than 50% as they tried switching to weekly from daily repayment scheduling. BancoSol, Bolivia had to revise its repayment schedule to more frequent repayment when it faced rising default (Gonzalez-Vega, Navajas, & Schriener, 1995; Wesley, 2004). On the other hand, some experimental and quasi-experimental investigations, (McIntosh, 2008; and Field & Pande, 2008) found no change, or sometimes improvement of repayment performance due to more flexible repayment schedule.

Above all, an important omission in the literature on the role of more versus less frequent repayment, and its effects on loan repayment behavior, appears to be that there has not been an effort to explicitly control for the inherent time preference of the borrowers using well established time preference determination scales. In this paper, we explore the role of microloan repayment frequency (more frequent versus less frequent) on actual loan repayment performance over time on a sample of microfinance borrowers after controlling for their inherently distinct time preferences measured separately.⁶

⁴The pioneer micro-lender Muhammad Yunus (the winner of Nobel Prize in Peace in 2006) captures this reality in his statement: *[I]t is hard to take a huge wad of bills out of one's pocket and pay the lender. There is enormous temptation from one's family to use that money to meet immediate consumption needs...Borrowers find this incremental process easier than having to accumulate money to pay a lump sum because their lives are always under strain, always difficult.* ----- [Muhammad Yunus, *Banker to the Poor*, p. 114.]

⁵According to MIX Market data, the global average repayment rates for microfinance loans are above 90 percent (<http://www.themix.org/about-microfinance/FAQ#ixzz3dCw7Iv4S>). A frequent repayment schedule is believed to be one of the most important factors to keep the default rates down.

⁶While a frequent repayment schedule is considered as a crucial factor to keep the default rate under control, it has the potential to limit the clients' capability to manage short-term shock to household income, and thus could be a source of anxiety and stress for the households (Field et al., 2012). On the other hand, it can be challenging for poor households to accumulate larger savings under a flexible repayment regime since there is a high temptation to consume immediately rather than saving for repayment. For example, one might decide to consume some money immediately, and save some in the future. But when the future comes, and the choice is revisited, she might have trouble controlling the temptation to consume that money and might fail to stick to what she had planned earlier, and thus might fail to save. Time-consistent individuals, on the other hand, do not have this type of problem; and so if they plan now to save in future, they do not give in to the temptation to consume that.

We were granted unprecedented access by the Bangladesh Extension Education Services (BEES), a prominent MFI headquartered in Dhaka but with operations throughout Bangladesh, to 1,168 first-time borrowers of BEES who had been approved by BEES loan officers, and were about to be given actual 1-year microloans at the beginning of a loan cycle. It is to be noted here that, BEES extends loans to female clientele only. Each of the BEES approved borrowers were given a 1-year BDT⁷ 10,000 loan (about \$128 according to the USD/BDT exchange rate prevailing at the time of the experiment). We were, however, allowed by BEES to randomly allocate a given borrower into either a weekly loan repayment schedule (50 payments) or a bi-weekly repayment schedule (25 payments). This was done with the borrowers' prior consent after they were approved for loans. We were also allowed by BEES to have each borrower respond to two surveys in order to determine her time preference (i.e., whether she was present-biased or not) consistent with the survey instrument employed by Bauer et al. (2012)⁸ and collect some demographic and socioeconomic information like age, marital status, income, household size and so on. Other details regarding loan specifics are discussed later in the paper. We then followed the subjects' loan repayment behavior to BEES diligently over the next 12 months. In addition, before actual loan disbursement (with either the weekly or bi-weekly repayment schedule), we used a simple questionnaire to establish her time preference.

BEES borrower groups usually consist of 15 to 40 self-selected people. In our sample, the largest group is of 42 members. Self-selection means that the members of the groups, and not BEES staff, choose who the other members in the groups would be. But the final approval of the groups or any of the members depends on BEES. BEES borrowers have to form groups to be eligible for loans, and they have to attend group meetings. But in effect the loans are individual liability loans in groups. So, unlike group loans with joint liability, in case of the failure of any one member of a group to make timely repayment, no one but the borrower herself would be responsible for that. The group formation is discussed in more details in section 3. Since each borrower was randomly assigned to either the weekly payment schedule (the control group) or the bi-weekly payment schedule (the treatment group) after each had been formally approved for a loan, no client dropped out of her assigned borrower group at this stage. Other than the repayment

⁷BDT or Bangladeshi Taka is the official currency of Bangladesh.

⁸Briefly, we asked all our subjects five YES/NO questions in terms of their current preference or in 1-year from the current period, in order to determine their present and future discount rates. Other details are provided later.

frequency, all other features of the groups were the same. Thus, we are comfortable in the notion that any observed differences in default patterns across clients among the weekly and bi-weekly repayment schedules are attributable mainly to the differences in their repayment schedules.

Our findings based on analysis of data collected for over a year can be summarized as follows. While we see no significant difference in overall borrower performance between those assigned to the weekly repayment schedule and those to the bi-weekly schedule, we do find that their individual time preference is an important determinant of their repayment behavior. Specifically, the repayment performance of present-biased borrowers improves significantly when they happen to be assigned to the weekly repayment schedule instead of the bi-weekly repayment schedule, even after controlling for other determinants of loan repayment behavior. We also find that borrowers, whether present-biased or time-consistent, invest more in new businesses when they are offered a more flexible (i.e., bi-weekly) repayment schedule. Overall, our findings suggest that the MFIs might do better by abandoning a "one size fits all" approach for loan repayment scheduling. Rather, by offering loans with a weekly (bi-weekly) repayment schedule matched to the present-biased (time-consistent) borrowers, the MFIs might be able to minimize their transaction costs while ensuring high repayment rates. This would also benefit the borrowers by enabling them to venture into new business investments.

We are sensitive to the criticisms regarding the power of our conclusions vis-a-vis the sample size. However, we note that our sample size compares favorably with similar field-based studies investigating related questions.⁹ Still in the interest of thoroughness, we examine the impact of the type of repayment scheduling, less frequent bi-weekly or more frequent weekly scheduling, on the repayment performance of borrowers with different degrees of present bias through bootstrapping which takes care of limitations posed by small sample with regard to estimation precision. Bootstrapping is a re-sampling method which involves estimating a model many times using simulated data, and then making inferences based on the estimated results (MacKinnon, 2006). When unsure about the distributional assumptions for residuals, or the sample size is not very large, bootstrapping helps with standard error imprecision and can produce more

⁹Field and Pande investigated the repayment frequency and default in microfinance using a field experiment in India, where their sample size is 1,026. In another framed field experiment to investigate various features of time preference and microlending, Bauer, Chytilova and Morduch (2012) used a sample of 573 people in India. Field, Pande and Papp (2013) find out microfinance modeling and entrepreneurship aspects using a field experiment in India using a sample of 845 people.

reliable confidence intervals and statistical test size. In our analysis, we bootstrap the regression to find the bootstrapped standard errors of our predictors of interest. In this type of basic bootstrapping it is assumed that the sample is taken at random from a population. We then do random sampling (we form samples of size n) with replacement from the original sample of size n ; this is done a number of times, sometimes thousands of times. In the next step, the statistic of interest is calculated and stored from each sample. The SE, estimated as the SD of the simulated sampling distribution, is thus more reliable and accurate. We have used Stata for all analysis and results discussed in this paper. After bootstrapping we find that our main result- i.e. the overall repayment performance of the borrowers is not affected by the type or frequency of repayment schedule; but the repayment performance of present-biased borrowers significantly improves when they are offered weekly repayment schedule instead of bi-weekly schedule, holds true.

We also estimate a regression model with time of last missed repayment of a borrower as the dependent variable, on the strength of her present biasness and other variables. We argue that it would take a stronger present bias to miss a repayment towards the end of the loan cycle, since the reward of regular repayment is not so heavily discounted towards the end given that the reward is not too far at the time. We claim that, if this holds true for our analysis, then that would confirm the robustness of our findings.

The rest of the paper proceeds as follows: section 2 reviews the background literature and develops the testable hypothesis. Section 3 describes the MFI setting and the experimental intervention. Section 4 describes the data, variables and summary statistics. Section 5 describes empirical strategy, and section 6 our findings and check of robustness. Finally, section 7 concludes.

2. Background Literature and Hypotheses Development

In recent years many researchers have been interested in this repayment frequency issue associated with microloans. For example, from a field experiment conducted in Uganda, McIntosh (2008) finds that allowing borrowers to choose between bi-weekly vs. weekly repayment schedule, results in lower level group dropouts and improved repayment rate. But McIntosh notes, this experiment does not measure the direct effect of changing repayment frequency; rather, it tests the effects of letting existing borrowers choose between repayment frequencies. In another field experiment based in India, Field and Pande (2008) randomly assign clients of an MFI to either weekly or monthly repayment schedules. They find no significant change in delinquencies and

default rate. In a follow up study, Field, Pande and Papp (2011) introduce a grace period (i.e., additional time before the first installment is due) in the loan repayment process and find that the default rates increase. They suggest that, when borrowers receive a grace period before the first installment is due, they end up investing the loaned amount in illiquid projects for which the profit level might be higher, but not with quick returns. So those borrowers might not have enough money to pay the installments in the short run.

Despite research findings suggesting no significant difference on loan repayment as a function of repayment frequency, MFI practitioners share the belief that frequent repayment schedules improve the repayment performance of borrowers (Fischer & Ghatak, 2010). Hence, the more costly weekly repayment schedule is used by most of the MFIs. Jain and Mansuri (2003) suggest that frequent repayment is needed in order to develop and maintain fiscal discipline among borrowers. However, when repayment frequency is high, borrowers of a given MFI might have to resort to borrowing from informal moneylenders in order to repay the MFI installments who have better monitoring capacity. Rai and Sjostrom (2004) provide an alternative explanation for frequent repayment. They argue that the frequent meetings, and not the repaying act, are more important. It is in these weekly meetings that lenders (through the loan officers) get information about the borrowers and the state of their projects. This is how frequent repayment schedule might result in better repayment rates.

Experimental evidence relating to behavioral economics shows that individuals' discount rate related to future consumption often varies with the time (Frederick, Loewenstein, & O'Donoghue, 2002). In particular, when choosing between current vs. future trade-offs, people are often more impatient with the former (see Strotz, 1955; and Ainslie, 1992). This short-sighted, present-biased time preference, termed as present bias, is reflected in hyperbolic or quasi-hyperbolic time discount functions (Laibson, 1997). Present-biased preferences thus result in a confusion and tension between future selves and current actions, which then makes people inconsistent. Bauer, Chytilova and Morduch (2012) argue that microcredit innovations may allow clients to foster self-discipline in their financial decision making, as the loans have to be paid back through frequent, timely installments. Using data on women borrowers, they show that present-biased individuals are highly prone to be microcredit clientele.

Fischer and Ghatak (2010) theoretically show that greater present bias is associated with better repayment performance when paid back in more frequent installments. For present-biased

borrowers, the instantaneous gain to non-payment on any large repayment is highly appealing. But when the installments are more frequent and spread out evenly over a period of time, the immediate repayment liability at any time is also smaller and less subject to the temptations of defaulting. This theory also supports the common belief of many microfinance practitioners that more frequent schedules ensures better repayment rate.

Overall, it can be stated that while there is mixed evidence on how repayment schedule flexibility impacts the repayment performance of borrowers, to our knowledge there is no evidence that explicitly connects the dots between borrower repayment, repayment flexibility and inherent borrower impatience.¹⁰

We hypothesize that:

- weekly repayment schedule, as opposed to bi-weekly schedule, improves the repayment performance of the present-biased borrowers; and
- the repayment performance of time-consistent borrowers is indifferent to the frequency of repayment schedule.

In this paper, we address our research question by exploring repayment behavior of people with heterogeneous time preference, when offered different repayment scheduling. We use the standard incentive compatible choice experiment to directly measure individuals' present and future discounting rates following the literature (e.g., Bauer, Chytilova & Morduch, 2012; Harrison, Lau, & Williams, 2002; Tanaka, Camerer, & Nguyen, 2010; Andersen et al., 2008). These findings allow us to compare the consistency or inconsistency of individual time preference to know whether one is present-biased or not. Combining the time preference and repayment performance data along with some other socio-demographic indicators, we are able to directly explore the relationship between time preference and repayment performance under different repayment schedules.

¹⁰To better understand how borrowers' present bias might influence the repayment performance of the borrowers, let us recall how the installment amount is calculated in microlending. The installment amount due in each period is calculated by adding the principle and interest due at the end of the term, and then dividing that amount by the number of installments until the end of the loan term. Thus, for a relatively less frequent repayment schedule, the amount due in each installment is larger relative to the same loan repaid over a more frequent repayment schedule. Given this, for a present biased borrower, it is more tempting to divert a larger repayment amount for immediate consumption. But when these payments are more frequently scheduled, the immediate repayment burden is smaller and less subject to a consumption temptation. By the same token, for those who are not present biased (i.e., time-consistent), the frequency of repayments should not matter.

Recently another study by Barboni and Agarwal (2017) addresses questions similar to ours in this paper. They argue that allowing borrowers to choose between a flexible and a rigid contract mitigates the adverse selection problem lenders face. However, the borrowers self-selecting themselves into the repayment schedule that best suits their characteristics prevents MFIs from realizing the full potential of flexible contracts. Barboni and Agarwal (2017) then try to find out the impact of introducing repayment flexibility in microfinance contracts on repayment performance and business outcomes of the borrowers. Though our study is also addressing the same questions, our approach and methods make our work stand out. As already mentioned, McIntosh (2008) did a quite similar work in Uganda where borrowers were offered to choose between either regular, more frequent weekly repayment or more flexible bi-weekly repayment schedule as per their preference. The results show lower dropouts, and slightly improved repayment performance. McIntosh states that when borrowers are allowed to choose between options, the impact on repayment occurs as a result of the self-selection process, and not directly due to the repayment flexibility. In our study, borrowers are randomly assigned to repayment groups; therefore, any impact on repayment performance is directly attributable to changing the frequency of repayment schedules.

In microfinance literature, repayment flexibility means lower number of repayments made at less frequent intervals (Field & Pande, 2008 and McIntosh, 2008 use this definition of repayment flexibility). When MFIs introduce more flexible repayment schedules, they reduce the repayment frequency. For example, Grameen Bank in Bangladesh and BancoSol in Bolivia moved from weekly to bi-weekly repayments; and Satin Credit Care, from daily to weekly repayments (Field & Pande, 2009). But Barboni et al. (2017) introduce a three month “no repayment” window in a year, which is a onetime thing, and for the rest of the year the repayment frequency remains the same. Field, Pande and Papp (2011) study the impact of introducing a “grace period” at the beginning of the loan cycle on the repayment performance and investment behavior of microfinance borrowers. A grace period is when a borrower gets some “repayment holiday”, as Barboni et al. (2017) calls it, before the first repayment happens. In a grace period case, a borrower is allowed some extra period before the first installment begins. Field et al. (2011) introduced a two months grace period and randomly assigned borrowers to either regular repayment, or grace period repayment groups. They find that the grace period encourages borrowers to make riskier, more profitable (in the long run) investments. They also talk about differential price charges in the

form of different interest charged for the grace period schedule and regular schedule. But they propose that instead of charging the borrowers, it would be more welfare oriented if govt. subsidized the MFI for charging the similar prices for both the options. So, the work of Barboni et al. (2017), in essence, is similar to the work of Field, Pande and Papp (2011); only difference is that, for the more recent study, the grace period is not introduced at the beginning of the loan cycle, rather the borrowers can choose when to take the “grace period”.

This study incorporates how an individual discounts her future and compares that to her current reward to decide what her action would be. Some prefer to wait; while some prefer to consume right away and save or repay later. We argue that these differences in how one compares different time period consumptions to make decisions should have different responses to situations involving intertemporal decisions. One such case is repayment of loans. For microfinance borrowers this discounting inconsistency plays a crucial role since the resource poor borrowers have difficulty restraining from not consuming away when the installment amount is large and tempting, and the future reward is far away. Combining these two phenomena, in this research, we study how time decisions involving intertemporal outcomes can be incorporated together. Field and Pande (2008), McIntosh (2008), Field, Pande and Papp (2011) all have tried to address similar research questions; but our study stands apart since only this study observes time preference of individuals to explore how they react to frequency changes of repayment schedule. Field and Pande (2008) randomized borrowers to assign groups with different repayment frequency; but since they did not observe individual time preference, they were unable to see how patient borrowers and short-sighted, present-biased borrowers would react when offered different frequency schedules. This added feature of our study lets us explain why some borrowers might find it difficult to repay when more flexible repayment schedule is offered, while others remain nonchalant. McIntosh (2008) addresses a similar question with data from Uganda; but there the borrowers were allowed to self-select themselves to the repayment frequency that they thought suited them most. This feature of the loan contract did not let him study the impact of flexible repayment. Our study can address the question since borrowers are randomly assigned to repayment categories, enabling us to study the impact of repayment frequency on repayment performance. Barboni et al. (2017) and Field, Pande and Papp (2011) address questions related to repayment performance when grace period is introduced. We cannot address this aspect because in essence the grace period was the same for all, every borrower had a constant two weeks window before the first installment started.

For future research, it will be interesting to see how people with different time preferences react when offered with grace periods of different length, or grace period at different stages of their loan cycle. One crucial objective of MFIs is to be more sustainable by lowering costs. Less frequent repayment schedules lower the transaction costs of loan officers and give them extra time to reach out to more clienteles. This is one of the main reasons why MFIs want to try more flexibility in their repayment schedules. However, a onetime postponement of repayments for individual borrowers at their preferred time would not help MFIs reach that goal of lowering costs and reaching more borrowers. In this context, our findings have more policy implications since this would allow MFIs to lower costs and reach out to more borrowers.

3. MFI Setting and Experimental Intervention

We collected our data by partnering with the Bangladesh Extension Education Services (BEES), one of the major MFIs in Bangladesh, founded in 1975 as a non-profit organization. BEES extends loans to all female groups. To be eligible to qualify for a BEES loan, the applicant has to have some kind of a business, or self-employment, or at least she has to have the intension to start a new income-generating activity. During the time of our experiment, BEES loan amounts varied between BDT 8,000 to BDT 50,000 (BDT 78= US\$1). But usually the first-time borrowers would get loans between BDT 8,000 to BDT 12,000 (US\$103-US\$154); successful timely repayment of the loans would help a borrower graduate to larger amount of loans. Typically, BEES loans are collateral free, 1-year loans with repayments in 50 equal weekly installments, and a nominal interest rate of 15%. BEES' loan officers approach self-reported female entrepreneurs in a yet to be explored village and promote their loan product. Once loan officers are satisfied with the number of new clients in the area, they then rely on these existing group members to recruit other members by word of mouth.

Initially, as a new group of four or five members is formed, a loan officer visits the women at one of their homes or businesses to explain loan terms and processes. These women are then given the responsibility to find other group members. BEES groups normally vary in size between 10 to 40 members. As the loan groups are finally formed, the loan officer explains the loan terms and official requirements to all the members in greater details. BEES loan officers heavily depend on the peer screening and verification to grant membership to the applicants. The applicants are required to present some proof of address and valid identification to qualify for a loan.

As applicants qualify for a loan, all the group members have to guarantee each other for final approval to get a loan. Following the loaning system of Grameen bank, BEES also extends individual liability loans with group settings. The borrowers have to attend the weekly group meetings, but there is no joint liability. So, in case of failure in timely repayment of any borrower, only she is responsible; and no other member of the group would be held liable, and no one else's eligibility for future loans would be affected by any of the group member's failure to repay on time. Loan officers act as moderators of the group meetings; and loan disbursements and collections of installments are performed in group meetings. Like most other successful MFIs, BEES enjoys high timely repayment rate; in 2014 only 0.74% of total BEES borrowers did not make full repayment within 6 months of the due date.¹¹

As stated before, the lending procedure followed by BEES is not like group lending with joint liability where if one group member fails to repay on time, the other members are to bail her out by making repayment on her behalf. BEES extends loans to borrower groups; but each member is individually responsible for her loan repayment. Though new, this type of lending procedure is not very uncommon among MFIs in recent years. De Quidt, Fetzer and Ghatak (2013) document that Grameen Bank of Bangladesh and BancoSol of Bolivia, two well-known MFIs, have moved away from joint liability group loans to individual liability loans in a group setting. They find that such shift does not affect repayment rates; and also, that more frequent group meetings promote social capital in individual liability borrowing groups. This increased social capital ultimately leads to improved repayment performance. De Quidt et al. (2013) also explore the factors motivating MFIs to undergo this kind of shift. They argue that in case of an individual liability group lending system, a borrower is not liable for repaying her partner's loan. She qualifies for succeeding loans irrespective of her partners' payment status as long as she herself does not default. But joint liability group loan might encourage strategic default among able group members, since a borrower who could pay only for herself but not for her partner would also be considered as a defaulter. This might discourage her or other members in the group to repay even their own shares. Given this, some good borrowers might feel discouraged to apply for joint liability loans. As a result, individual liability lending might be preferred to joint liability by some borrowers.

In another study Feigenberg, Field and Pande (2013) do an experiment where they randomly assign microfinance borrowers to more frequent and less frequent meeting groups. They

¹¹ See <https://reports.mixmarket.org/mfi/bees>

find that- more frequent meetings help borrowers create social capital; they interact more among themselves outside the meeting times; and they display a higher willingness to share risk with their group peers, even when they do not have to do that. They also argue that, it is likely that frequent meeting-induced gains in social collateral improves informal insurance arrangements and the borrowers highly value these. Consequently, to attract the good borrowers by offering the individual loans and by not risking the high repayment rates by keeping more frequent meetings, the MFIs are offering individual loans in a group setting. This type of loaning system also helps the lenders by shifting the time burden to the borrowers. As opposed to regular individual loans without groups, loan officers have to meet individual borrowers separately. But in case of the individual loans in group settings the loan officers meet the group together, which saves time and transaction costs. This is valuable because it enables the lender to cut interest rates, relaxing the borrowers' repayment incentive constraints, thus increasing repayment and welfare (De Quidt et al., 2013). This justifies why BEES and many other MFIs are practicing this type of individual loans in a group setting.

We worked with BEES to identify areas of Bogra district in Bangladesh where they planned to operate but had not yet done so. They selected two branches, Golabari and Gabtoli, in Bogra district and their surrounding villages that were not under BEES operations yet, containing mostly rural settlements.

3.1. Details of the Loans Made to Actual Borrowers

Between August and December of 2012, BEES in Bogra district of Bangladesh formed 40 loan groups (commonly referred to as *somities* in the local language) designated for inclusion in the study, giving us a study sample of 1,178 first-time borrowers. BEES borrower groups typically consist of 15 to 40 members (Alamgir, 2009), who meet weekly for financial transactions and other products and services offered by the MFI. Among the 40 loan groups we had in our study sample, the smallest group size was 20 and the largest group had 42 members. There were two groups with 20 members, one group had 23, two groups had 25, two groups had 26, one had 27, five had 28, four groups had 29, ten groups had 30, six groups had 31, one group had 32, two groups had 33, two groups had 34, one group had 36, and one group had 42 members. Each client received an individual-liability loan of BDT 10,000 (~US\$128). BEES waits for two weeks after the loan disbursement date for its clientele to start making repayments in fixed, equal installments.

Before receiving the loans, borrowers were informed about the experiment that would involve randomization to assign each borrower to either regular weekly or bi-weekly repayment scheduling. This happened after group formation and loan approval, but prior to loan disbursement. Since all the clients agreed to the randomization to either of the scheduling, none of them withdrew themselves out of the program after being assigned to either weekly or bi-weekly repayment schedule. Out of the 1,178 borrowers, the 588 control group borrowers were assigned regular BEES weekly repayment loan and 590 treatment group borrowers were assigned bi-weekly repayment loan. Irrespective of the repayment frequency, the repayment started two weeks after the loan disbursement for all.

All other features of BEES loan contract were also kept constant for all the group members. The borrowers had to attend weekly group meetings irrespective of their repayment frequency. Loan officers conducted weekly group meetings at a predetermined place, agreed upon by all the group members. The interest rate of 15% was the same for all the borrowers; and the total repayment amount was also the same for all. Clients on the weekly repayment schedule repaid BDT 230 every week for 50 weeks. In contrast, clients on bi-weekly repayment schedule made BDT 460 repayment every two weeks for 25 weeks. But for both groups, the repayment began after two weeks of the loan disbursement. There are no “late fees” for delayed installments; but any late/missed repayment would go to the loan officers’ “bad loan book” and would bar the borrower from automatically qualifying for future loan cycle. The loan officers would take the case to the office; and then the office would evaluate the reasons stated by the borrower for the missed repayment/s to decide whether the borrower would be eligible for future loan, even though she is not a defaulter. So, a client’s willingness to make repayments on the scheduled day was solely driven by the fear of not having access to future loans from this provider.

The information on each borrower’s actual loan repayment performance was obtained directly from BEES in April 2014, sixteen months after the loans were disbursed to all. We chose this time horizon deliberately following Field and Pande (2008), since this time frame covers both “portfolio at risk 30 (par 30)” and “portfolio at risk 90 (par 90)”, the two most common measures of default in microfinance (Rosenberg, 2009) that consider missed installments past 30 days and 90 days respectively¹². For accounting and policy purposes, BEES considers any late payment as

¹² For reference, see the glossary at the website of the Microfinance Information Exchange: www.mixmarket.org/node/30046.

a measure of loan default, as stated by respective branch managers of BEES. So, we also collected data on the repayment performance from the weekly meeting passbooks.

3.2. Determining the Time Preference

Before BEES extended loans to the borrowers, we used the standard incentive compatible choice experiment to directly measure each individuals' present and future discounting rate following the literature (e.g., Bauer, Chytilova & Morduch, 2012; Harrison, Lau, & Williams, 2002; Tanaka, Camerer, & Nguyen, 2010; Andersen et al., 2008). The findings allowed us to compare the consistency or inconsistency of individual time preference to know whether one is present-biased or not. The participants were given a choice to pick between receiving a smaller sum of money earlier in time or larger sum with three months delay. The exact question that they were asked was: "Do you prefer BDT 250 tomorrow or BDT 265 three months later?" All the participating borrowers were presented with five such choices. Each time the following question had a larger future amount, while the initial amount remained the same. For example, the subsequent questions were: "Do you prefer BDT 250 tomorrow or BDT 280 three months later?", and then: "Do you prefer BDT 250 tomorrow or BDT 300 three months later?". In brief, the future amounts were BDT 330 and BDT 375 for the last two questions. Different participants displayed different switching points. The switching point at which a borrower shifts from choosing the smaller, earlier reward to the future, larger reward gives a range of her discount rate. Following Bauer et al. (2012) we use the arithmetic means of these intervals to find out individual discount rates. The same question set then was presented to the respondents, but the time frame changed from current to future for both the choices. This time they were asked: "Do you prefer to receive BDT 250 in one year's time or BDT 265 in one year and three months?" The future or later monetary choice was raised in each subsequent question like before, from BDT 265 to finally BDT 375. From these binary choice questions, we again could approximate the discount rates of the respondents. We measure the current discount rate of an individual from the choice made by her to the option between tomorrow and in three months. We approximate her future discount rate based on her choice made to the options in the future time frame, what she prefers to have in one year or in one year and three months. Once we have the discount rates for the two periods of an individual, we categorize her as either a present-biased, or a future-biased or a time-consistent individual. A person is present-biased if her preferred current discount rate was larger than her

future discount rate. A present-biased person is more impatient with respect to choices affecting consumption now than with respect to choices that will play out in the future. On the other hand, if an individual's future and current discount rates are the same, she is considered to be time-consistent.

For the survey purpose, six trained research assistants were hired, who were provided with necessary training to operate the time preference elicitation game. To ensure that the participants were motivated to make choice decisions according to their true preference, they all had equal probability of getting rewarded according to the choices they made in the elicitation game. At the end of meeting and game, each of the borrowers was asked to pick a ball from a closed container where there were 9 red balls and 1 green ball. If she picked a green ball, she would get paid (with probability 10%); and to know how much she would receive, she was asked to pick another numbered ball from another closed container. The numbers on the balls represented the binary choices in the time preference game, and the borrower would then be paid according to the number she picked. Here also, each binary choice had the probability of 10% to be picked. Since the borrowers knew this, they were expected to make choice according to their true preference. We also collected information on the borrower's socio-economic and demographic characteristics using a unique survey questionnaire.

As already been stated, a time-consistent person is someone who does not revise or change her preference based on time. Her current and later selves agree on the order of plans and preferences. To her, if something is preferred in a year, then that is also preferred now. Finally, if her future discount rate is greater than her present discount rate, she is assumed to be future-biased. Future-biased individuals prefer future rewards over current ones; and they are expected, by definition, not to give in to the temptation to consume right away rather than to save for future rewards or consumption. A future-biased borrower would value the future reward of loan repayment more than the current gratification she would get by defaulting and consuming the installment amount in current time. Therefore, we would expect her repayment performance not to be affected by the time or frequency of repayment schedule. For a time-consistent borrower, her choice of repayment decision is also not affected by time in any way. So, for her, too, the time or repayment frequency should not play any role in her decision to repay or default. For the reasons stated above, we expect those with time-consistent preference and those who are future-biased to act similarly with regard to loan repayment behavior in response to either repayment schedule,

since by definition their current actions are not influenced by their time frame. Only present-biased individuals are expected to respond differently to the two distinct repayment schedules. Hence, for simplicity we consider the time-consistent and future-biased borrowers to be in the same group and collectively label them as non-present biased. Present-biased borrowers are further categorized as “weakly present-biased” and “strongly present-biased”. Weakly present-biased preferences are defined as those which just marginally differ in time discounting rates. They are only one binary choice earlier in the future time frame versus the earlier time frame. In our experiment, the exact discount rates for the binary choice questions were 6% (BDT 250 vs. BDT 265), 12% (BDT 250 vs. BDT 280), 20% (BDT 250 vs. BDT 300), 32% (BDT 250 vs. BDT 330), and finally 50% (BDT 250 vs. BDT 375). Every respondent had to make choices from these options both for the current and future time.

Now, in the current time frame, if one chooses to switch from current smaller amount to future larger amount of BDT 300, this yields a current discount rate of 20%; but faced with the same binary choices in one year and three months, when she opts to have the future, larger amount of BDT 265, her future discount rate turns out to be 6%. Since this individual’s current discount rate (20%) > her future discount rate (6%), she is present-biased. If her future discount rate were 12%, still that would be smaller than her current discount rate; so, she still would be a present-biased person. But when her future discount rate is 12%, only one binary choice away from her current discount rate, she is considered to have a weaker present bias and termed as a “weakly present-biased” individual. On the other hand, if her future and current discount rates differ more than just one binary choice, as in 20% current discount rate vs. 6% future discount rate (in between there is 12% discount rate), then she is considered to have a strong present bias and fittingly termed as a “strongly present-biased” individual. In our survey, almost 36% of the borrowers (422 individuals) are present-biased, and the rest are non-present biased. These proportions are similar to those found by Ashraf et al. (2006) in the Philippines, Meier and Sprenger (2010) in the United States and Bauer et al. (2012) in India. Among the 422 present-biased borrowers, 225 borrowers show strongly present-biased time preference, and 197 borrowers show weakly present-biased time preference. In our sample, 19.10% of the borrowers are strongly present-biased, and 16.72% of the borrowers show weakly present-biased time preferences. These figures are also very close to what Bauer et al. (2012) found in their work in India. In their sample, the numbers for strongly and weakly present-biased individuals are 19.9% and 13.2%, respectively.

4. Data, Variables and Summary Statistics

This section describes the data used in this study, defines relevant variables, and finally presents the summary statistics of the variables of interest.

4.1. Data

Our field study was conducted with 1,178 individuals who were actual first-time borrowers from BEES. Data on savings, loans and repayment were collected from BEES; and information about the individual time preference, age, education, marital status, income, assets, household size and whether the borrower made any new business investment during the loan cycle were collected by a team of six field investigators. We tracked each client for almost 16 months from the time they received their loan. The first survey was done shortly after they received the loan and the second survey was done around three months after the loan cycle ended. In the first or baseline survey, information on client characteristics like age, years of education, total number of household members, income, total assets, etc. were collected. In the second or end-line survey, information about whether the borrower made any new business investment during the loan cycle was collected. We conducted standard incentivized choice experiments to elicit the participants' time preferences. In order to get a complete profile on each borrower's week to week loan repayment behavior, we collected administrative data from BEES which included date and amount of each repayment, recorded by the loan officers in client passbooks. Data are available from July 2012 through April 2014, on a complete profile of each borrower's delinquent/default behavior.

4.2 The Variables

Our main dependent variable of interest is the loan delinquency of each borrower. As mentioned earlier, for our research purpose, any missed repayment on a scheduled date is considered as delinquency, following the definition used by BEES.¹³ A delinquent loan becomes a defaulted loan when the chance of recovery is minimal.¹⁴ Specifically, we consider the total

¹³This definition is also applied in the microfinance sector to measure loan delinquency, as according to Rosenberg (1999), a loan is delinquent when a payment is late.

¹⁴Delinquency is important to measure since it indicates an increased risk of loss, and helps to predict portfolio at risk. It is also used to identify eligibility for subsequent loans. According to Rosenberg (1999), there is no definitive way to measure delinquency universally, rather an MFI decides which one to use so that it helps them predict, as accurately as possible, the future potential loss.

number of missed repayments normalized by the total number of payments (50 for weekly borrowers and 25 for bi-weekly borrowers) as our measure of delinquency. This normalization is necessary since the weekly and bi-weekly borrowers had different numbers of opportunities, 50 weeks and 25 weeks respectively, to pay the installments. Thus, our main dependent variable of interest is TOTAL_MISSED_REPAYMENT. To capture the incidence of a borrower missing at least one repayment, we define IF_MISSED_ANY_REPAYMENT taking the value 1 when a borrower missed at least one scheduled repayment, and 0 otherwise. The variable WEEKLY is a dummy variable that takes the value 1 when the borrower has to repay weekly, and 0 if the repayment is bi-weekly. Based on the time preference of the subjects, we have a dummy variable: PRESENT_BIASED. If an individual is present-biased, then this variable takes the value 1, and 0 otherwise. Our data let us find out the degree of present biasness of the present-biased individuals. So, we also have one more dummy variable: STRONG_PRESENT_BIAS; for individuals with strong present biasness, the value of the variable is 1, and 0 otherwise, meaning she is weakly present-biased.

To control for the socioeconomic and demographic characteristics of the borrowers, we include the following variables in our study. Age (AGE) of the respondent is measured in actual years. Many of the previous studies related to MFI also considered age as a demographic variable. For example, Lilay et al. (2015) studied the factors that affect MFI's group loan repayment performance and found age to be a significant factor in MFI repayment decision making. Gutu et al. (2017) also find age to be significantly and negatively related to borrowers' repayment performance. Education (EDUC) is defined as the numbers of years of schooling. Gemere (2017) used education in an empirical study as a factor for analyzing loan default and education. The author expected to have negative relation between education and loan default. Literate borrowers will understand more complex terms and condition of loan and they will comply with that. In another study, Bumbie (2013) expected to have higher literacy rate among individual borrower comparing to group borrowers. Since we also expect education to play a role in the repayment decision, we include this variable. Ownership of assets such as land and livestock is incorporated as a control variable in the study. Many empirical study use asset as an independent variable to understand the nature of borrowers. Borrowers having sufficient asset usually have lower tendency to default (Gemere, 2017; Bumbie, 2013; Kasali et al., 2016). Asset (ASSET) is measured in terms of the market value of assets owned by the respondent's household. In our regressions, we used

the natural logarithm of one plus the market value of household assets in order to deal with the skewness of the household assets and to include households without any tangible assets.

Income (INCOME) is the monthly income of the borrower from her job, and/or business, and/or from any other source. Loan repayment and income should have a positive relationship. Oke et al. (2007) used yearly income for analyzing its impact on loan repayment. Different studies used income as independent variable to determine the factors affecting loan repayment (Gemere, 2017; Kasali et al., 2016). MARRIED is a dummy variable, representing the marital status of a borrower, taking the value of 1 if the borrower is married, and 0 otherwise. Dinh and Kleimeier (2017) argue that marital status should be negatively related to repayment performance; whereas Dunn and Kim (1999) claim marriage to have positive impact on repayment. So, marital status is an important variable to consider. While having a mandatory savings account is a pre-requisite for applying for microcredit in many cases, having a non-mandatory savings account is indeed a choice variable. Accordingly, we introduce the maintenance of a non-mandatory savings account (SAVINGS) as a dummy variable such that SAVINGS equals 1 if the respondent has a non-mandatory savings account with BEES, and 0 otherwise. Additionally, the amount in the non-mandatory savings account is another variable (AMOUNT_SAVING) included in our study. Pasha and Negese (2014), and Bumbie (2013) in their empirical study use savings as a dummy variable to see how it affects repayment. In another study, Gemere (2017) found the coefficient to be negative with loan default. Gutu et al. (2017) study the determinants of loan repayment and find the household size to be significantly and negatively related to loan repayment. We also have HOUSEHOLD_SIZE as a discrete explanatory variable that measures the total number of family members in the household of the individuals.

Since in this study we also want to see if flexibility in repayment schedule affects the investment behavior of borrowers, we have another dummy variable as dependent variable of interest. NEW_BUSINESS_INVESTMENT is the dummy variable such that it takes the value of 1 if the borrower answered “yes” to the survey question “did you make any new investment in any business during the loan cycle?”, and 0 otherwise.

4.3. Summary Statistics

Table 1 presents the summary statistics of the variables used in the study. A randomization balance check, using the first round of survey data, is reported in table 1(A). These reports are only

about the time-invariant client characteristics; and the results report that treatment (bi-weekly repayment) and control (weekly repayment) groups are imbalanced in only one out of eight baseline characteristics, which is the marital status of the borrowers. Other than that, all other variables are balanced across the two groups. The difference in means for marriage in treatment (bi-weekly) and control (weekly) groups is significant at the 5% level of significance. For all other variables, the differences in means are not significant, indicating that our randomization produced a balanced sample. In our study, the average age of the borrowers is 31 years. On average, respondents have spent four years in school. About 84 percent of all the women are married. The average monthly income of each borrower is BDT 4,690 (US\$60). On average, the market value of assets that a respondent possesses is BDT 69,600 (US\$892). Almost 6% of all the borrowers have missed at least one repayment. About 17% of all the borrowers have non-mandatory savings account with BEES. The average amount in the non-mandatory savings account is BDT 253 (US\$3.5). Among all the borrowers, 13% invested in new business during the loan year. Almost 36% of all the borrowers are present-biased; the rest are either time-consistent or future-biased, in other words, non-present biased.

The summary table 1(B) also shows the comparison across those who are present-biased and those who are non-present biased. If we look at the socioeconomic and demographic features, the pool of present-biased borrowers is not much different from that of the time-consistent ones. Socioeconomic and demographic features like age, marital status, income level, and assets are similar for both groups. Only the mean years of education (3.594 years) for the time-consistent borrowers is slightly higher than that of the present-biased borrowers (3.194 years), and the difference is significant at the 1% level. The two groups are different when it comes to the repayment performance. On average, present-biased borrowers' total missed repayment is 0.133, which is 0.022 for the non-present biased borrowers (the difference is significant at the 1% level). The other repayment performance variable "if the borrower missed any repayment" has significantly higher mean value for the present-biased borrower group, 0.126 against 0.02, and the difference is also significant at the 1% level. When we look at the investment behavior of the two groups, the two groups are not different from each other in terms of mean new investment.

Overall, the summary statistics show that there is not much significant difference in socioeconomic and demographic characteristics even between the present-biased and time-consistent borrower groups. This is not surprising since most of the empirical works do not find

any significant association between time preference and socio-demographic features of an individual. But as predicted, the two types of borrower groups display significant difference when it comes to repayment performance indicators.

To have an idea about some of the characteristics of the present-biased individuals in the borrower pool, the table 1(C) would be helpful. Maximum number of present-biased people are in the "no-education" category, followed by "5 years of education" group. There are very few present-biased people with more than 10 years of schooling. The age distribution shows that most of the present-biased people are in the younger age groups. Nearly 200 of all the 422 present-biased people are below 30 years of age. There are a few who are more than 50 years old.

The income distribution sheds light on the fact that 338 out of the 422 present-biased individuals earn less than BDT 6,000 (US\$77) a month. Out of the 422 present-biased individuals, 62 invested in new business creation within the loan year, and 43 borrowed also from other sources besides BEES. In total, 369 of them did not miss any repayment, 50 missed one repayment and 3 individuals missed 2 repayments on the scheduled date.

5. Empirical Strategy

In this section, we present a formal empirical model to examine whether relaxing repayment flexibility has any impact on borrowers' repayment behavior. We further examine whether this flexibility affects repayment behavior of borrowers based on their choice of time preference. Randomization of contract type (weekly or bi-weekly repayment) across borrowers implies that a comparison of average outcomes across clients assigned to either weekly or bi-weekly repayment schedule can be interpreted as a causal association. For our study, we closely follow the empirical model followed by Field and Pande (2008) to measure differences in repayment behavior between experimental arms, and we run the ordinary least square regressions of the form:

$$y_i = \beta_1 W_i + \beta_2 P_i + \beta_3 W_i * P_i + \gamma X_i + \varepsilon_i$$

where y_i is the outcome of interest for client i . In this study, our main interest is to examine the impact of repayment flexibility on repayment performance or delinquency. So, the dependent variable y_i is the total number of missed repayment given total repayment opportunities, for our main analysis. W_i is an indicator variable that equals to 1 if the individual was assigned to weekly

repayment schedule contract. P_i is another indicator variable which equals to 1 if the individual is present-biased. Then the interaction term $W_i * P_i$ is another indicator variable that becomes 1 for an individual who is present-biased and was assigned to the weekly repayment schedule. Finally, we include a vector of client demographic controls X_i consisting of dummy variables for whether the client is married, had non-mandatory savings account, made any new business investment during the loan year. We also control for borrowers' age, years of education, and total number of household members of the borrowers. Since 10 different loan officers were in charge of all the borrowers, the borrowers of a particular loan officer could be correlated in some unknown way inducing correlation within the group error; but any two loan officers' borrower groups do not have correlated errors. The same reasoning applies for borrower groups from different areas- borrowers from a particular area could have some correlation in some way; but borrowers from two different areas might not have any correlation to induce correlated errors among groups. We always cluster standard errors by loan officer to take care of this possibility. Standard errors are also adjusted for clustering at the area level, but the qualitative results remain the same. The central interest of this study is with β_1, β_2 and β_3 , the coefficients on the indicators for weekly repayment schedule, present-biased time preference, and weekly repayment for present-biased borrowers.

6. Results

6.1. Repayment flexibility and delinquency

The results of our estimation model are presented in table 2. Table 2(A) and 2(B) show whether repayment flexibility affects loan delinquency. In table 2(A) the dependent variable is the normalized total missed repayment, calculated as the total missed repayment by a borrower divided by the total number of repayment opportunities; and we use this to capture loan delinquency. Column 1 is without any control variable; column 2 represents results with control variables, and column 3 displays results of bootstrapping regression analysis. It is evident from all three columns that the repayment flexibility itself causes no change in repayment performance of borrowers, since the variable weekly repay is insignificant. This finding is in line with what Field and Pande (2008) found in a field experiment in India: repayment flexibility does not affect loan default in microfinance. We find that in all specifications, only two variables are significant in influencing

the loan performance of borrowers: “present bias” and the interaction variable “present bias and weekly repay”. Both these variables are significant at 1% level of significance. The coefficients of the variable present bias are positive, indicating that everything else remaining constant, present-biased borrowers are more likely to default than the non-present biased borrowers. It is an indicator variable, and the coefficient of 0.0094 means that, if an individual is present-biased, she is 0.94 percentage point more likely to miss a repayment on the scheduled date. This result is not surprising since, by definition, present-biased borrowers value the present gain more heavily, and so it is more difficult for a present-biased individual to restrain from the temptation to consume the money at hand and save that for repayment for future rewards.

Another variable of interest is the interaction variable, present bias and weekly repay. This interaction variable has a negative sign and is statistically very significant (significant at 1% level of significance) in all three specifications. This result has very interesting interpretation: though weekly repayment schedule has no significant impact on repayment performance of borrowers, and though present bias has a worsening impact on the repayment performance of clients, when a present-biased individual is offered a weekly repayment schedule, as opposed to bi-weekly schedule, her likeliness of loan delinquency goes down, as indicated by the negative sign. To find out the exact effect of weekly repayment schedule on present-biased borrowers, we need to find the summation of the coefficients of the variables- weekly repayment and interaction variable present bias and weekly repayment, which yields -0.00946. This implies that when a present-biased borrower is offered a more frequent, weekly repayment schedule, she is 0.95 percentage point less likely to default than when she is offered a bi-weekly loan. This finding is in line with the theoretical prediction by Fischer and Ghatak (2010). They theoretically show that with present-biased borrowers, the optimal contract (in terms of loan size) requires frequent small repayments. We will discuss this in greater detail when we discuss table 2(C).

Table 2(B) displays the impact of repayment flexibility on repayment performance of borrowers from another angle. Here we use “if a borrower has missed any repayment” as the dependent variable. Since in practice, BEES considers any missed repayment as bad loan, and the borrower has access to future loan only after the BEES officials have reviewed her case, this variable is another way to capture loan delinquency. To capture this scenario, we use the binary variable as the dependent variable. Since the response variable is a binary variable, we use Probit model to capture the impacts of repayment flexibility and other variables on whether a borrower

missed any repayment. For binary dependent variables that can take only two values: 0 and 1, or in other words, can have probabilities of 0 or 1, using a linear probability model (e.g. an OLS regression model) has a great disadvantage: sometimes the fitted probabilities can be less than 0 or greater than 1 (Wooldridge, 2006). Using a binary response model like the probit regression model helps overcome this limitation. The results of probit regression models are presented in table 2(B). In column 1 of table 2(B), we have probit regression results without the control variables, that show the impact of flexible repayment schedule on loan delinquency. In column 2 and 3 we have the probit and bootstrap regression analysis results. In these two columns we have included all the control variables. The estimates from all the three model specifications tell a consistent story. The signs of all the coefficients are the same for all models across columns. More importantly, same variables are significant irrespective of model specifications.

In probit models, estimated coefficients do not quantify the influence of the explanatory variables on the probability that the dependent variable takes on the value 1. So, to better capture the impact of frequency of repayment schedule and time preference of a borrower on her repayment behavior, in column 4 we have the marginal effects of the coefficients of the probit model. This shows that if the dummy variable present bias changes from 0 to 1, indicating if a borrower is present-biased then her probability of loan default goes up by 18.9%. In the probit model, the variable weekly repayment is marginally significant at 10% level; and the marginal effect shows that for weekly repayment schedules the probability of loan default goes up by 41%. But when we bootstrap the probit model, the variable weekly repayment is no longer significant. To find out what happens to present-biased borrowers when they are offered different loan schedules, we need to evaluate the biasness and loan frequency interaction term. The interaction variable present bias and weekly repayment shows a significant negative coefficient. The marginal effect shows that, when a present-biased borrower is offered a weekly repayment schedule, as opposed to a bi-weekly schedule, her probability of loan default goes down by almost 6%. Even though we use a different dependent variable in table 2(B) than table 2(A) to capture the impact of repayment frequency on loan default in microfinance, the same variables have the same sign, and the same variables are significant across models and even across different measures of loan default. When we do the probit analysis, we come to the same conclusion that present-biased borrowers are more likely to default than those who are not-present biased. But when these borrowers are offered the more frequent weekly repayment scheduling, they display more disciplined, better

repayment performance. But those who are not-present biased, repayment frequency has no significant impact on their repayment behavior.

Together the results from table 2(A) and table 2(B) have a very interesting and important implication: more flexible repayment schedule does not affect repayment performance of the borrowers as long as the borrowers are not present-biased. Only present-biased borrowers show worse repayment performance under more flexible repayment schedule. As stated before, in microfinance, for less frequent repayment schedule the amount due in each installment is larger than that of a more frequent schedule. As a result, a larger amount is more tempting for immediate consumption for a present-biased borrower. When these payments are more frequently scheduled, the immediate repayment burden is smaller and less subject to consumption temptation (Fischer & Ghatak, 2010). But for those who are not present-biased, the frequency of the repayment schedule should not matter since their level of temptation to consume at present remains the same irrespective of the time or payment amount. Our results from table 2(A) and 2(B) present strong support to our study hypotheses that,

a) weekly repayment schedule, as opposed to bi-weekly schedule, improves the repayment performance of the present-biased borrowers; and

b) the repayment performance of non-present biased borrowers is indifferent to the frequency of repayment schedule.

6.2. Repayment Flexibility, Time Preference and Investment in New Business

Field, Pande and Papp (2011) study the effects of a two months grace period on business and loan repayment performance of micro entrepreneurs. They find that postponing repayment by introducing the grace period increases short-run business investments. They argue that grace period allows the borrowers more time before the first repayment, which lets them invest the money to start new business and have profit from that project to make the repayments. In the similar line of argument, we claim that more flexible repayment means more time between any two repayment schedules, which gives borrowers more time and flexibility to invest their money in business that might not have immediate or very regular return. We argue that, if a onetime grace period at the beginning of loan cycles encourages new business investments by microfinance borrowers, as found by Field et al. (2011), then reoccurring extra times in between any two repayment schedules when the repayment is more flexible should encourage new business

investments as well. The extra time between repayment due dates gives borrowers more freedom to invest in new business. To explore the role of repayment flexibility on new business investments by microfinance borrowers, we do a linear regression analysis. The OLS regression results are presented in table 2(C). Column A shows that weekly repayment has a significant, negative impact on new business investment. The more frequent, weekly repayment schedule reduces the likelihood of investment by 11.5 percentage point. The time preference or present biasness has no significant impact on the new investment decision of borrowers. This implies that, irrespective of time preference, a more flexible repayment schedule would encourage investment of all. This could be the reason why weekly repayment schedule reduces new business investment significantly, and the opposite happens in case of more flexible, in this case, bi-weekly repayment schedules. Table 2(C) shows the impact of repayment flexibility on investment in new business within the loan cycle.

There is another variable which is significant and positive: total amount in non-mandatory savings account. This variable is positive and significant at 1% level of significance. This means that, borrowers with more money in the non-mandatory savings account are more likely to invest more in new business, other things remaining the same. By definition, non-present biased borrowers do not have trouble saving, given they have enough to save. But present-biased individuals may have a hard time saving. A present-biased individual might decide to consume some money immediately, and save some in the future. But when the future comes, and the choice is revisited, she might have trouble controlling the temptation to consume that money and might fail to stick to what she had planned before, and thus might fail to save. Time-consistent individuals, on the other hand, do not have this type of problem; so if they plan now to save in future, they do not give in to the temptation to consume that. But this does not necessarily mean that only the non-present biased borrowers save in the non-mandatory savings account. If present-biased individuals anticipate preference reversal when the future comes and they change their decision in favor of consumption (a self-awareness often termed “sophisticated”), they may demand a commitment to “tie their hands” now, locking in the original choice to save (Mullainathan, 2005). This type of sophisticated present-biased borrowers might also save in the non-mandatory savings account to “tie their hands” and have some backup support when some income shock, or some emergency arrives. So those who plan to start a new business or those who already have a business running might want to have as much backup support as possible in the form of savings to handle unforeseen

business shocks. As the clients of MFIs, they know they do not have many options available when some emergency situation arrives. This might drive the positive, significant coefficient of amount in non-mandatory savings account in table 2(C).

6.3. Robustness Checks

6.3.1 Bootstrapping and Robustness

In this section we check for the robustness of our analysis. To ensure robustness of our findings, we examine the impact of switching repayment scheduling from more frequent to less frequent on the repayment performance of borrowers with different present biasness using bootstrapping technique. Bootstrapping is particularly helpful when the sample size is small. To avoid the statistical bias caused by any small sample size, bootstrapping simulates the data a number of times, generating many sub samples from the original sample set. It helps improve estimation precision by asymptotic simulation of small sample. In situations when the distributional assumptions for error terms are not known, or the sample size is not very big to be confident about the precision of statistical findings, bootstrapping generates more reliable standard error and confidence interval. In our analysis we bootstrap both the OLS and probit regression models to find the bootstrapped standard errors of our predictors of interest. In this type of bootstrapping it is assumed that the sample is taken at random from a population. Then some random sampling (samples of size n) with replacement is done from the original sample of size n , this is done a number of times, sometimes thousands of times. Then from each sample the statistic of interest is calculated and stored. This huge collection then helps mitigate the small sample issues, and produce more reliable standard error for more precise estimation. For our purpose, we have the bootstrapping results in the third columns in table 2(A) and 2(B) for the OLS and probit specifications. When we compare the bootstrap results to the OLS and probit results, we can see that the standard errors have changed for all the variables included, but the main results remain the same. The same two variables are significant, have same sign and the coefficients are also the same as they are in column 1, in regular OLS regression. So, even after applying the bootstrap method to our analysis, we find that our main result still holds true- i.e. the overall repayment performance of the borrowers is not affected by the switching of repayment schedule; but the repayment

performance of present-biased borrowers significantly improves when they are offered weekly repayment schedule instead of bi-weekly schedule.

6.3.2 *Strength of Present Biasness and Robustness*

Fischer and Ghatak (2010) theoretically show that greater present bias is associated with better repayment performance when paid back in more frequent installments. For present-biased borrowers, the instantaneous gain to non-payment on any large repayment is highly appealing. But when the installments are more frequent and spread out evenly over a period of time, the immediate repayment liability at any time is also smaller and less subject to the temptations of defaulting. This theory also supports the common belief of many microfinance practitioners that more frequent schedules ensures better repayment rate. Our empirical analysis finds support to that prediction, and concludes that less frequent repayment schedule worsens the repayment performance of present-biased borrowers only, while non-present biased borrowers' repayment performance is not affected by the repayment flexibility. To check for robustness of our empirical analysis, we can examine if the repayment decision and the distance from the future reward also support Fischer and Ghatak's theory. In their work, Fischer and Ghatak (2010) show two things: more frequent repayments make each installment amount smaller and thus subject to less temptation compared to a larger amount; and towards the beginning of any loan contract the future reward is farthest away and, therefore, most heavily time discounted. So, it is easier for someone, even with slightest present biasness, to give in to temptation and consume the installment amount.

Based on the second reasoning, we argue that, as the future reward approaches nearer, it is discounted less and less heavily, making the future reward look more and more tempting. So, it would take greater degree of present biasness to give in to current temptation compared to future reward. We have data on the strength of present biasness of borrowers, and we have data on the repayment behavior of each borrower that allows us to study whether at the beginning or towards the end of the loan cycle, a borrower missed any repayment, if she has missed any. Making use of the information if we find that the timing of missed repayment and the strength of present biasness of a borrower have any relationship, then that would strengthen the robustness of our analysis. To be exact, we try to find if it takes strong present biasness to miss any repayment towards the end of the loan cycle when the future reward is less heavily discounted and looks more tempting

compared to initial time period of a loan cycle, and it would be safe to conclude that present biasness plays a role in loan defaulting in microfinance.

Table 3 shows the regression results of time of last missed repayment of a borrower on the strength of her present biasness. We have already defined strongly present-biased and weakly present-biased individuals in section 3. Column 1 and 2 in table 3 present OLS and bootstrap regression results, and we see that the variable “if the borrower has strong present bias”, which is an indicator variable, is positive and significant. This means that, the borrowers with stronger present bias are more likely to miss scheduled repayment as the repayment dates get closer to the end of the loan cycle. For this analysis we have considered only the borrowers who have missed at least one scheduled repayment; and to minimize the estimation errors caused by smaller sample size, the bootstrapping method is applied. The result that the strength of present biasness influences one to miss repayments supports our main findings that frequency of repayment schedule matters in repayment performance of borrowers with present biasness. Thus, this analysis further confirms the robustness of our main findings.

6.3.3 The Introduction of Joint Liability and the Probable Changes It May Cause

Hernuryadin et al. (2011) examine individual and group time discounting in three distinct societies, hunter-gatherer, agrarian, and industrial societies, as these three societies have the shaping impact on the cultural and socioeconomic development of human history (Massey, 2002). As proxies for these societies they conducted their experiment in fisheries, farming and urban societies, respectively. The main findings of Hernuryadin et al. (2011) suggest that distinct societies have different time discounting rate. In essence, hunter-gatherer type societies tend to be more impatient, or present-biased, since they have to live on day to day basis. Agrarian societies display patience to the highest level. The life style of this type of societies induce patience as people in these societies have to wait long for the outcome of their efforts. Finally, industrial/urban societies possess characteristics of both the urban and agrarian societies, making them lie in between the other two societies in terms of time discounting; they are time-consistent. Another major finding of their work is that, short-sighted, present-biased people are more convincing and influential in deciding group discount rates. These findings are vital for our findings as well to interpret the main findings of our work, at least hypothetically, under different loan contracts or in different demography. In countries, or areas, where the lifestyle of people reflect the characteristics

of the hunter-gatherer societies, we might expect to find more present-biased people. As our findings suggest, present-biased people should be offered more frequent repayment schedule to not let their repayment performance get worse. On the other hand, agriculture-based societies are expected to have more patient, time-invariant people, making them eligible for more infrequent repayment scheduling. We might expect MFIs in these countries or societies to succeed in offering more flexible repayment schedule without having any adverse impact on loan repayment. Industrial societies also should be successful in introducing more flexible repayment options as they have more people who are time-consistent or future-biased. As a result, for them, repayment frequency should not play a role when it comes to the decision between consuming now and default, or save now for future repayment, and qualify for future reward of larger loans.

BEES extends loans to groups with individual liability contract. It is worth a try to see, at least theoretically, if our research findings can be applied to elicit repayment performance of groups with joint liability when people are offered repayment options with different frequency. In another experiment done in the University of Central Arkansas, Charlton et al. (2011) conclude that, individuals display more patience and are more willing to wait for shared outcomes in group settings than individual outcomes. They argue that, in a known group context, individuals consider both their own future rewards and the present rewards to other group members. These combined rewards present a larger future reward for a borrower, making her choose the more patient path. Combining this finding to our research findings, we can conclude that even though present-biased individuals are more vulnerable to more flexible repayment schedule, but when they form groups with joint liability, they know their actions will have adverse impacts on their peers as well. As stated by Charlton et al. (2011), in group settings, these types of borrowers will be less present-biased in decisions made in groups. Consequently, we should expect a present-biased borrower to have better repayment performance under flexible repayment schedule when they are in groups with joint liability as opposed to their performance in groups with individual liability loan contracts.

7. Conclusion

An important element of our research that needs to be emphasized is that the loans given to our subjects were actual 1-year microloans that a microfinance organization normally makes to its approved clientele in actual practice. We were given the unique opportunity to follow these clients week in and week out for the next 52 weeks (and more) while collecting the appropriate

information about their loan repayment behavior over this entire period in addition to gathering other relevant demographic and time preference information. Our approach differs from a majority of field level experiments where a simplified “game” of some sort is usually played over a relatively short period (usually a day or so) that has some resemblance with the actual practice being studied. For obvious reasons, our approach is significantly more labor and time intensive; but is also likely to generate realistic data with which to study our specific research question. The findings of this research have immense policy implications that would benefit not only the practitioners, but also the borrowers as well.

Instead of going with a one-size-fits-all approach, MFIs can collect data on individual time preference during initial screening of potential borrowers along with other information they already collect. Based on the time preference, an individual borrower who is present-biased (non-present biased) can be offered a more (less) frequent repayment option. For example, a present-biased borrower may be offered a weekly repayment option, while a non-present biased borrower may be offered a bi-weekly, or even more spread out, infrequent repayment option. Adjusting the repayment model in this way based on individual time preference is expected to have no negative impact on the repayment performance of the borrowers. Since our findings as well as those from other relevant studies show that a large portion of borrowers are time-consistent or non-present biased, MFIs can offer less frequently repayment options (e.g. bi-weekly, or even less frequent) to this large group of borrowers. This will allow MFIs to reduce operational costs (associated with frequent visits) and thereby make their operations more cost-effective. Reduced visits by MFI staff due to offering less frequent payment options to a large group of borrowers, would free up their time spent in travel and loan collection. This freed-up time can then be used to serve more people, thereby leading to increased coverage. Future research can incorporate repayment flexibility, time preference of borrowers, and grace period with different length and intervention timing to see how MFIs can be more cost effective and self-sustainable.

Table 1(A): Summary Statistics and Randomization Check

VARIABLES	All Subjects (n=1178)		Weekly Repayment (n=588)		Bi-weekly Repayment (n=590)		Difference: Treatment (Bi- weekly)- Control(Weekly)
	Mean (SD)	Max Min	Mean (SD)	Max Min	Mean (SD)	Max Min	
Age	31.116 (11.365)	65 18	31.366 (11.543)	65 18	30.786 (10.843)	65 18	-.569 (.652)
Education	3.581 (3.684)	16 0	3.577 (3.741)	16 0	3.586 (3.629)	15 0	.01 (.215)
Married	.845 (.362)	1 0	.866 (.341)	1 0	.824 (.381)	1 0	-.042** (.021)
Income	4686.375 (1756.204)	15500 2000	4694.303 (1816.057)	15500 2000	4678.475 (1695.959)	15500 2000	-15.828 (102.376)
Asset	69486.71 (79885.08)	350000 0	67691.67 (78868.56)	340000 0	71275.68 (80912.72)	350000 0	3584.011 (4655.849)
Total number of household members	4.995 (1.397)	9 2	4.993 (1.378)	8 2	4.997 (1.418)	9 2	.003 (.081)
Proportion of present bias	.358 (.48)		.359 (.48)		.358 (.48)		-.001 (.028)

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Table 1(B): Summary Statistics

VARIABLES	All Subjects (n=1178)		Weekly Repayment (n=588)		Bi-weekly Repayment (n=590)		Present Bias (n=422)		Non-present Bias (n=756)	
	Mean (SD)	Max Min	Mean (SD)	Max Min	Mean (SD)	Max Min	Mean (SD)	Max Min	Mean (SD)	Max Min
Age	31.116 (11.365)	65 18	31.366 (11.543)	65 18	30.786 (10.843)	65 18	30.654 (11.757)	65 18	31.374 (11.14)	65 18
Education	3.581 (3.684)	16 0	3.577 (3.741)	16 0	3.586 (3.629)	15 0	3.301 (3.378)	16 0	3.738 (3.786)	15 0
Married	.845 (.362)	1 0	.866 (.341)	1 0	.824 (.381)	1 0	.841 (.366)	1 0	.847 (.361)	1 0
Income	4686.375 (1756.204)	15500 2000	4694.303 (1816.057)	15500 2000	4678.475 (1695.959)	15500 2000	4760.9 (1750.314)	15500 2000	4644.775 (1759.266)	15500 2000
Asset	69486.71 (79885.08)	350000 0	67691.67 (78868.56)	340000 0	71275.68 (80912.72)	350000 0	73752.01 (83776.05)	430000 0	67105.82 (77583.14)	350000 0
Total missed repayment	.062 (.258)	2 0	.03 (.187)	1 0	.095 (.310)	2 0	.133 (.360)	2 0	.022 (.165)	2 0
If borrower has missed any repayment	.058 (.233)	1 0	.026 (.158)	1 0	.09 (.286)	1 0	.126 (.332)	1 0	.02 (.14)	1 0
New business investment	.126 (.332)	1 0	.065 (.246)	1 0	.186 (.39)	1 0	.147 (.354)	1 0	.115 (.323)	1 0
Total number of household members	4.995 (1.397)	9 2	4.993 (1.378)	8 2	4.997 (1.418)	9 2	4.938 (1.346)	8 2	5.026 (1.425)	9 2
Proportion of present bias	.358 (.48)		.359 (.48)		.358 (.48)					

Table 1(C): Summary Statistics for Some Features of the Present-biased Borrowers

Years of education for present-biased people																	
Years of education	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Number of present-biased people	176	1	27	25	20	96	11	15	24	3	14	1	5	2	0	1	1
Age distribution of present-biased people																	
Age group	18-22	23-27	28-32	33-37	38-42	43-47	48-52	53-57	58-65								
Number of present-biased people	117	89	64	38	47	21	23	11	12								
Income distribution for present-biased people																	
Income	2000-4000		4000-6000		6000-8000		8000-10000		10000-12000		16000						
Number of present-biased people	186		152		26		14		1		1						
Present bias and household size																	
Household size	2		3		4		5		6		7		8				
Number of present-biased people	11		40		122		112		80		42		15				
Present bias and some other indicator variables																	
Number of religious people	Number of people making new investment			Number of people with loans from other sources besides BEES													
237	62			43													
Present bias and total missed repayment																	
Number of total missed repayment	0			1			2										
Number of people	369			50			3										

Table 2(A): Repayment Schedule and Loan Delinquency

OLS and Bootstrap regression results for repayment schedule flexibility and loan delinquency. The dependent variable is the normalized total missed repayment. The normalized total missed repayment is calculated as the total missed repayment by a borrower divided by the total number of repayment opportunities she had. Column 1 is without any control variable, and column 2 represents results with control variables. Column 3 is the regression results after bootstrapping is applied. In all the models, standard errors are clustered by loan officers.

VARIABLES	(1) OLS (No control variable)	(2) OLS (With control variables)	(3) Bootstrap
Present bias	0.00944*** (0.000739)	0.00939*** (0.00128)	0.00939*** (0.00129)
Weekly repay	0.000267 (0.000626)	0.000239 (0.000356)	0.000239 (0.000353)
Present bias and weekly repay	-0.00975*** (0.00105)	-0.00969*** (0.00129)	-0.00969*** (0.00130)
Age		-9.11e-06 (2.22e-05)	-9.11e-06 (2.21e-05)
Years of education		-3.62e-05 (7.05e-05)	-3.62e-05 (7.00e-05)
If the borrower is married		0.000261 (0.000899)	0.000261 (0.000880)
Total number of household members		0.000210 (0.000132)	0.000210 (0.000132)
Log of total asset of the borrower's household		2.65e-05 (0.000117)	2.65e-05 (0.000116)
Log of income		3.42e-08 (1.60e-07)	3.42e-08 (1.58e-07)
If the borrower has non-mandatory saving account		-0.000777 (0.00132)	-0.000777 (0.00127)
Amount in non-mandatory saving account		8.92e-07 (7.55e-07)	8.92e-07 (7.44e-07)
If the borrower made any new business investment		-0.000248 (0.000915)	-0.000248 (0.000900)
Constant	0.000422 (0.000442)	-0.000721 (0.00146)	-0.000721 (0.00146)
Observations	1,178	1,178	1,178
R-squared	0.148	0.152	0.152

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Table 2(B): Probit and Bootstrap Regression Results for Repayment Schedule Flexibility and Loan Delinquency

The dependent variable- “whether the borrower missed any repayment” is a binary choice variable. The first column displays the probit regression results without any other explanatory variables. The second column shows probit regression results with all other variables included in the regression. The third column displays probit regression results when bootstrapping is introduced to the regression analysis. We always cluster standard errors by loan officers.

VARIABLES	(1) Probit (No control variable)	(2) Probit (With control variables)	(3) Bootstrap	(4) Marginal effects of the probit model
Present bias	1.575*** (0.199)	1.583*** (0.211)	1.583*** (0.375)	.189*** (.034)
Weekly repay	0.413** (0.202)	0.414* (0.218)	0.414 (0.378)	.029* (.045)
Present bias and weekly repay	-1.757*** (0.221)	-1.766*** (0.233)	-1.766*** (0.391)	-.059*** (.006)
Age		-0.000405 (0.00686)	-0.000405 (0.00693)	-0.00002 (.0005)
Years of education		-0.00947 (0.0203)	-0.00947 (0.0205)	-0.0006 (.001)
If the borrower is married		0.182 (0.265)	0.182 (0.272)	.011 (.014)
Total number of household members		0.0609 (0.0383)	0.0609 (0.0374)	.004 (.003)
Log of total asset of borrower's household		0.0241 (0.0273)	0.0241 (0.0282)	.002 (.002)
Log of income		3.72e-05 (5.00e-05)	3.72e-05 (5.25e-05)	.000 (.000)
If borrower has non-mandatory saving account		-0.214 (0.266)	-0.214 (0.264)	-.013 (.014)
Amount in non-mandatory saving account		0.000147 (9.56e-05)	0.000147 (0.000104)	.000 (.000)
If the borrower made any new business investment		-0.0166 (0.135)	-0.0166 (0.141)	-.001 (.009)
Constant	-2.306*** (0.158)	-2.994*** (0.457)	-2.994*** (0.572)	
Observations	1,178	1,178	1,178	

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2(C): Flexible Repayment Schedule, Present Biasness, and New Business Investment

The dependent variable is if a borrower has made any new investment after receiving the loan within the loan cycle. The results are from robust OLS estimation.

VARIABLES	(1) (OLS)
Weekly repay	-0.115*** (0.0165)
Present bias	0.0431 (0.0294)
Present bias and weekly repayment	-0.0202 (0.0243)
Age in years	0.000132 (0.000522)
Years of education	0.00510* (0.00243)
If the borrower is married	0.0253 (0.0167)
Total number of members in the borrower's household	0.00263 (0.00972)
Log of total asset	-0.00332 (0.00473)
Log of income	0.00862 (0.0191)
If the borrower has non-mandatory saving account	0.0300 (0.0395)
Total amount in non-mandatory saving account	0.000113*** (3.32e-05)
Constant	0.0193 (0.140)
Observations	1,178
R-squared	0.114

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3: Strength of Present Biasness and Timing of Missed Repayment

The dependent variable is the time of the last missed repayment of a borrower. Here we have considered only those borrowers who have missed at least one scheduled repayment on the due date.

VARIABLES	(1) OLS	(2) Bootstrap
If the borrower has strong present bias	5.593** (2.569)	5.593* (2.855)
If the repayment schedule is weekly	2.412 (2.994)	2.412 (3.764)
Age of the borrower	0.108 (0.103)	0.108 (0.102)
Years of education	0.0365 (0.333)	0.0365 (0.439)
If the borrower is married	-0.766 (3.644)	-0.766 (4.319)
Total monthly income	-0.000398 (0.000591)	-0.000398 (0.000563)
Number of total household members	0.257 (0.877)	0.257 (0.921)
Log of total assets	0.0624 (0.510)	0.0624 (0.523)
If the borrower has non-mandatory saving acct	2.634 (4.808)	2.634 (7.014)
Total amount in non-mandatory saving acct	-0.000533 (0.00189)	-0.000533 (0.00413)
If the borrower is religious	1.294 (2.501)	1.294 (2.355)
If the borrower made any new business investment	5.901 (3.785)	5.901 (3.762)
Constant	14.97* (8.372)	14.97* (8.416)
Observations	68	68
R-squared	0.181	0.181

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

ESSAY 2. RELIGIOSITY AND LOAN REPAYMENT IN MICROFINANCE: EVIDENCE FROM BANGLADESH

1. Introduction

Microcredit is the provision of small loans that do not require collateral and are offered particularly to resource-poor entrepreneurs in developing countries who often lack easy access to formal sources of credit. As of 2010, 3,652 microfinance institutions (MFIs) served more than 200 million borrowers across the world (Maes & Reed, 2012).¹⁵ Microfinance institutions vary in terms of size, outreach, target clientele, profit orientation, product design, and maturity¹⁶. But self-sustainability is a major challenge faced by MFIs across the world (Bernanke, 2007). To ensure financial self-sustainability, they must focus on improving loan efficiencies, mainly through reducing default rates.¹⁷ Accordingly, substantial efforts have been exerted to enhance the understanding of the factors that might influence loan repayment rates in microcredit¹⁸. Therein lies the motivation to explore religion as another possible determinant of MFI loan repayment rates.

Becchetti and Conzo (2011) state that the act of repaying a loan, under asymmetric information, signals the trustworthiness of a borrower. On a related note, religious people have been found to be more trustworthy (Guiso, Sapienza, & Zingales, 2003). Thus, there are theoretical reasons for believing that the loan repayment decisions of borrowers might be influenced by their religiosity. This begs the question: Does religiosity affect loan repayment? In support, Georgarakos and Furth (2012) find that defaults and delinquencies among European households on loans and bills are more common in regions with a lower fraction of religious people. However, the challenge of disentangling the role of religiosity from the other motives of loan repayment remains. In the context of a conventional loan, a borrower can repay a loan in a timely manner

¹⁵Some of the prominent microcredit programs/institutions are Spandana (India), MBK Ventura (Indonesia), Grameen Bank (Bangladesh), Association for Social Advancement (ASA, Bangladesh), BRAC (Bangladesh), Bureau Bangladesh (Bangladesh), Bancosol (Bolivia), and Bank Rakyat Indonesia.

¹⁶For an overview of this market, see de Aghion and Morduch (2010).

¹⁷Richard Rosenberg (2009) explains why MFIs, even with very high repayment rates, might be unsustainable; and so always should try to improve their collection rates. The following link explains this in more details: www.cgap.org/blog/95-good-collection-rate

¹⁸Ahlin & Townsend (2007); Wydick (1999); Zeller (1998); Cassar, Crowley, & Wydick (2007); and Sharma & Zeller (1997) are few examples.

simply to avoid adverse consequences such as the seizure of collateral or destruction of credit histories. Therefore, it would be ideal to examine the role of religiosity in a loan market where borrowers are not afraid of losing collateral or jeopardizing credit records upon defaulting on a loan obligation. This forms the motivation to address the abovementioned research question in the context of microcredit.

Previous researchers in this field have largely attributed the success of microcredit to the joint liability feature and how this induces incentive to make timely repayment (de Aghion & Morduch, 2010). Empirical evidence on this has, however, been mixed, with various researchers finding that group loans do not always outperform individual loans. Ghatak and Guinnane (1999) states that social intermediation and social capital are the driving force of the joint liability mechanism. Mondal and Tune (1993) find that, in support to the findings by Ghatak and Guinnane (1999), joint liability program does not work in areas where there is cultural differences and lack of social capital. It is thus obvious that social and cultural features can play a crucial role in group loan repayment performance. Furthermore, without the formal laws and institutions behind conventional loans in microcredit, personal efforts to repay individual loans will be equally, if not more, sensitive to cultural and social values such as trustworthiness. As Guiso et al. (2006) define culture as the accustomed values and beliefs that all indigenous, social and religious groups pass on from generation to generations without any significant change to it, it becomes quite obvious that religion and its teachings are a major component of culture. Therefore, this study contributes to this literature by investigating whether religiosity affects loan repayment decisions in microcredit.

In particular, this paper seeks to examine two aspects of religiosity that might affect the repayment performance of borrowers. First, whether individual religiosity, among other factors, influences the repayment behavior of MFI borrowers. Due to the collateral-free nature of microcredit, the role that religiosity plays in loan repayment can be disentangled from other motives of loan repayment in conventional micro loans. Using a sample of 1,849 borrowers from Bangladesh Extension Education Services (BEES), a large Bangladeshi MFI, this study investigates their repayment record and factors affecting their repayment performance, with main focus on the religiosity of the borrowers. Second, this paper investigates whether the impact of

religiosity changes under different scenarios, like with the age of the subject, and with different levels of community religiosity where the clients live. Understanding the links between religiosity and repayment behavior of microfinance borrowers might be of interest to the policymakers and practitioners to achieve higher repayment rate and self-sustainability. We can logically deduce that if there is diversity among the individuals displaying different religiosity, practitioners and policymakers should delineate their target clientele and put forth efforts accordingly, resulting in lower costs and increased efficiency. Therefore, it is crucial to explore whether religiosity affects individual repayment behavior. This paper contributes to the scant knowledge base on this particular area by empirically exploring the role religiosity might play to influence borrowers' repayment behavior. The findings can also be expected to help microfinance practitioners and policymakers in designing appropriate lending mechanism.

To investigate our research questions, we used data from BEES, Bangladesh, on 1,849 borrowers from different branch areas in Bogra district, one of the major areas where BEES operates. This study uses the repayment record of the borrowers, along with information on their socio-demographic characteristics, religious affiliation and the degree of religiosity, collected through survey. Out of the 1,849 borrowers, 106 borrowers missed at least one repayment on the scheduled day. We then use econometric tools to explore whether religiosity influences borrowers' repayment behavior. The results show religiosity to be a significant determinant of a borrower's repayment behavior. Individuals with higher religiosity are found to be better borrowers when it comes to repayment performance. Our results also exhibit that the positive impact of religiosity is stronger for older borrowers, and for borrowers who live in comparatively less religious community. A potential problem with our empirical model, however, is that our main explanatory variable "religiosity" can be endogenous. For example, formal religious education could be very much related to the religiosity of an individual, and this could as well affect the repayment behavior of borrowers. Findings of Nawai et al. (2012) suggest that borrowers with formal religious education display better repayment behavior. In our sample we do not have information about the formal education of the borrowers, which might influence both their religiosity and repayment performance. It is well documented in microfinance literature that social tie is a crucial factor influencing the repayment behavior of borrowers. De Quidt et al. (2016) show that strong social

capital or social tie is necessary to sustain mutual insurance for repayment in microfinance for both group and individual loans. Feigenberg et al. (2013) find that social capital, created by frequent group meetings among individual liability borrowing groups, plays an important role in improving repayment rates. On the other hand, the essence of extrinsic religiosity is that people practice or maintain religious activities or gatherings to achieve social goals (Whitley & Kite, 2016). So, the presence or strength of social tie could drive the dependent variable of our study; and it could also drive the religiosity of an individual, the main independent variable in our study. This could create the simultaneity problem in our regression analysis. Both of these problems can cause endogeneity in our analysis. In order to address the potential endogeneity problem, we use the instrumental variable technique. We use the “religiosity of the household head” and the “community prayer” as two instrumental variables for “individual religiosity”. Existing evidence suggest that the religiosity of parents or household heads are important determinants of an individual’s religiosity. Childhood participation in religious activities may also help one accumulate religious capital and transmit the effects of religiosity (Iannaccone, 1990). Using an intergenerational data set, Myers (1996) found that parents’ or household heads’ religiosity positively influences an individual’s religiosity, and this influence is independent of aging. But there is no reason to believe that the household head’s religiosity would influence a borrower’s repayment behavior. Also, sometimes people do attend religious gatherings, like church attendance or saying prayers together, for extrinsic religiosity (Batson, 1993). This is done to meet some social goal rather than for afterlife salvation. This, in turn, will reflect in high RCI-10 score to represent someone as highly religious person. So, our use of household head’s religiosity and community prayer as two instrumental variables for an individual’s religiosity is well justified. The results of probit analysis after using the instrumental variables to tackle endogeneity confirm the impact of individual religiosity on the repayment performance of borrowers. The use of instrumental variables makes our findings—that the religiosity of a borrower positively affects her repayment performance, and it is stronger in areas with lower level of religiosity and for older people, more credible.

The rest of the paper proceeds as follows: section 2 reviews the background literature and develops the testable hypothesis. Section 3 describes the MFI setting, the data, variables and summary statistics. Section 4 describes empirical strategy; section 5 contains our findings, and

robustness check of the findings. Finally, section 6 concludes by summarizing the study findings and providing some policy recommendations.

2. Literature Review and Hypotheses Development

2.1 Economics of Religion

In recent times economists have started investigating the relation between people's preferences and beliefs, and relating them to various measures of economic outcomes. Iannaccone (1998) is believed to be one of the first to develop a formal theoretical model to predict the determinants of religious affiliation. Since then, researchers have exerted substantial efforts to analyze the economics of religion. Their work can be broadly categorized into two groups.¹⁹ The first focuses on the determinants of religious beliefs. The second group analyses the economic impact of religiosity. This proposed study belongs to the latter group.

2.2 The Impact of Religiosity on Economic Attitudes and Economic Outcomes

The economic impact of religion has basically three strands of research. The first involves drawing linkages from religiosity to economic attitudes and fundamental institutions which can potentially affect economic outcomes. Guiso et al. (2003) use church going frequency to measure individual religiosity and find that religiosity is positively linked to being more trusting of others, abiding the law, and believing more in the fairness of the market; but they are also less tolerant of immigrants and people of other races. Furthermore, they exhibit a less progressive attitude towards women. Some other studies find that, in the current day United States, people displaying higher level of religiosity are more likely to believe in more conservative political positions (Guth, Kellstedt, Smidt, & Green, 2006). Another study based on individual level data from the USA reports that religiosity may have opposing effects on the promotion of social welfare provision (Malka, Soto, Cohen, & Miller, 2011). In another study, Putnam (1993) studies the development across Italy and concludes that the strong Catholic tradition promotes stronger bonding with the

¹⁹ For an overview of this literature, see Iannaccone, 1998; and Guiso et al., 2006.

church than with fellow citizens, which leads to lack of trust toward others. Some other researchers conclude that some values and predispositions characterizing religiosity are responsible for having positive bias towards conservative social outcomes and policies (Alford, Funk, & Hibbing, 2005; Jost, Nosek, & Gosling, 2008). Landes (1998) also posits that in the 16th and 17th centuries, Spain's economic development was adversely affected by the intolerance diffused by the Catholic Church.

The second strand of literature focuses on the direct link between religiosity and economic outcome. Using data from the Penn World Table and the World Development Indicators of the World Bank, Barro and McCleary (2003) show that macroeconomic development is positively correlated with religious beliefs; but at the same time, holding beliefs constant, more frequent church going depresses economic growth. Chiswick (1983) also finds that religiosity affects the average wage levels by examining Jews and non-Jews in USA.

The third strand of literature is newer and attempts to tie the two other strands together while incorporating the multistep approach of Guiso et al. (2006). They first show how religiosity affects economic attitudes, and subsequently how those attitudes affect economic outcomes. Then they follow up by testing religiosity directly on economic outcome to validate their proposed channel. Two notable studies in this stream are that of Hilary and Hui (2009), and Kumar, Page and Spalt (2011). Hilary and Hui (2009) first showcase through a discussion of literature and a simple experiment that religiosity influences risk preferences of individuals. Their findings further suggest that this risk preference is linked to investment attitudes of individuals and organizations. Using county-level religiosity data, Hilary and Hui find that firms located in more religious areas exhibit lower degrees of risk exposure. Using the same methodology, Kumar, Page and Spalt (2011) first argue that gambling is more heavily discouraged in the Protestant scriptures compared to that of the Catholics. As a result, gambling—an indicator of attitude towards risks—is viewed more favorably in Catholic majority counties. Accordingly, the authors conclude that in those counties, investors are more likely to hold riskier assets, like stocks displaying lottery like features.

2.3 Religiosity and Microfinance

Going through the literature on connections between religiosity and microfinance, one can easily notice that the conceptual, faith related aspects get more focus in studying role of faith in

development, the importance given to conceptual aspects such as the role of faith in development, feasibility of faith-based organizations (FBOs), or different aspects of religion and micro-entrepreneurship. But almost all the studies focus on the religious affiliation or religious aspect of the institution or organization. Both Mersland et al. (2013), and Ashta and De Selva (2011) report that not only this, but also much of the related research to date have focused on Islamic MFIs rather than on broader empirical dimensions. They often look at the business model innovations inspired by the Islamic views toward charity, business and partnership (see for example, Kaleem & Ahmed, 2010 or Rahim, 2010). Using data from Indonesia, Seibel (2008) shows that outreach and growth of Islamic microfinance has been rather poor. Al-Azzam, Hill and Sarangi (2012) investigated the effect of group-attributes on repayment of group-based microcredit. Using data from a microcredit program in Jordan, they find that while religiosity is not initially linked with the occurrence of late repayment, more religious groups tend to repay faster once a late repayment occurs. Covering only the followers of Islam, they use percentage of borrowers in a group who say their prayers five times a day as a measure of religiosity for the group, and use this to find the impact of religiosity on group repayment performance. The authors note that Islam strongly encourages all to earn their living by her own work; does not permit people to idle away and become responsibility and burden of their families; and calls for quick and full repayment of debt. Therefore, once debt is incurred, these religious guidelines and motivations are most likely the push factors of religiosity-repayment results.

As for research beyond Islamic MFIs, Mask and Borger (2008) propose savings-led microfinance as a more viable model for churches in disadvantaged and backward areas. Studying loan default performance of religious versus non-religious MFIs, Iyer (2011) did not find any significant difference. Mersland et al. (2013) explore the differences between Christian and secular microfinance institutions to investigate their social and financial performance only to find that there exists significant differences between these two. For instance, they find that secular MFIs reached relatively more female clients; but their average loan size was no different than their counterparts. They state that, since Christianity encourages helping the poor, the average loan size for Christian MFIs should be lower as this would indicate poorer borrower clientele. On the other hand, they believe that even though empowerment of women might be against the Christian

doctrine, poverty alleviation and the reputation of women as better credit risks might lead Christian MFIs to have more female borrowers. But the study results failed to support their hypotheses. Mersland et al. (2013) also argue that the classic Christian virtues of forgiveness and helping others are not compatible with financial sustainability. In addition, Christian MFIs might not be willing to enforce more compelling and binding loan recovery methods which go against their religious standpoint. Together these will make a Christian MFI have worse repayment rate than their secular counterparts. But contrary to hypothesis, there was no significant difference in enforcing loan repayment between Christian and secular MFIs. The authors, however, do not explain why some of the results they predicted were not in line with their predictions. But they do stress on the need to analyze the recipients' features to have a better understanding of the results.

Allen (2006) provides support for faith-based microfinance institutions in better serving the very poor people. Using data on female micro-entrepreneurs from Zambia, Van Engelenhoven (2006) finds that religion positively affects micro-entrepreneurship. Hollis and Sweetman (2004) explore the impact on the Irish loan funds as a result of the Great Irish Famine of the 1840s. The funds, like MFIs, offered short term loans on weekly repayment basis with low interest rates, throughout Ireland. A significant portion of the funds were managed by religious ministers. The results show that these funds in particular were about 15%-20% less likely to survive in time of crisis. They argue that more social orientation and less professionalism of the ministers might be a major reason behind this.

Dutta and Magableh (2006) analyze how various socio-economic determinants, including religiosity, influence different aspects of microfinancing in Jordan. They find that the borrowing process of the micro-entrepreneurs was influenced by religious beliefs. The authors breakdown the borrowing process in four stages where a potential applicant decides whether to apply for loan, then for how much to apply; on the other hand, the MFI decides whether to approve the loan, and then how much to approve of. Their main results suggest that religious barriers and beliefs are the main deterrents of applying for and getting approved for microfinance loans.

It is clear from the discussion and extant literature that religion is a vital element of aggregate, economic activities. We can see from the above discussion that existing literature has established the importance of religion at the aggregate economic level. However, it is still unclear whether

individual religiosity, not religious affiliation, plays any role in individual repayment behavior. This gap in literature, given that religion is one of the shaping factors of many economically relevant behavior (Iannaccone, 1988), motivates us to explore the role individual religiosity plays in influencing individual repayment behavior. Some more recent studies also find religion or religiosity to be shaping the economic attitude of humans. For example, Arrunada (2010) and Guiso et al. (2003) did some cross-country study and found that religious affiliation and religiosity induce differences in economic attitudes, which in turn leads to differences across countries in economic growth. In contrast, our study is concerned with intra-country heterogeneity in the repayment decision of microfinance borrowers induced by difference in individual religiosity. Most microfinance literature look at religion and religiosity from the MFIs' perspective. To contribute to the knowledge base on whether the borrowers' individual religiosity affects their repayment decision-making, in this paper we investigate whether religious individuals have different takes on economic decisions, and whether their repayment decisions is different compared to less-religious individuals. We also investigate whether the impact of religiosity, if any, on repayment decision changes under different socio-demographic settings like age and community religiosity.

2.4 Factors Affecting Repayment of Microcredit

Previous researchers have largely attributed the success of microcredit to the joint liability feature. Indeed, most of the economic literature on microfinance focuses on the incentives induced by such group loans (de Aghion & Morduch, 2000). Previous researchers have theoretically shown that joint liability induces peer screening during group formation, and thus can help mitigate adverse selection problem; it also can minimize moral hazard problems by inducing peer monitoring in the loan utilization stage. Together these two mechanisms lead to low levels of default²⁰. There is, however, mixed evidence regarding how joint liability impacts loan repayment. For example, based on a study on 147 microcredit programs, de Aghion and Morduch (2010, ch.5) show that MFIs that extend only individual liability loans have similar repayment rates as only

²⁰ See, for example, Stiglitz, 1990; Varian, 1990; Ghatak, 1999 and 2000; Ghatak & Guinnane, 1999; de Aghion, 1999; and Van Tassel, 1999.

joint liability loan lenders. This is further supported in the Randomized Controlled Trial experiment by Gine and Karlan (2007). It showed that after removing the joint liability clause from the loan contract, the borrowers of the Green Bank of Caraga in the Philippines showed no difference in their repayment performance. In contrast, using a propensity score matching (PSM) technique, Gomez and Sanator (2003) show that group borrowers are less likely to default than individual borrowers with similar characteristics. Ghatak and Guinnane (1999), however, explain that at the root of the joint liability mechanism lies social intermediation that utilizes within-group social capital and the private information about the groups. For instance, Besley and Coate (1995) claim that the risk of being socially sanctioned plays the pivotal role to give group lending little or no edge over individual loans. Additionally, Cassar, Crowley and Wydick (2007) find that trust among group members positively influences group repayment performance. This highlights that social and cultural characteristics can play a significant role in terms of the effectiveness of group loan repayments.

Previous studies have also identified factors other than the contractual features of microcredit or institution specific features, which can affect repayment performance. For example, based on evidence from Bangladesh, Sharma and Zeller (1997) show that borrowers' gender is an important factor in the context of credit risk. Additionally, Ahlin, Lin and Maio (2011) show that the success of MFIs, in terms of lowering default rates, depends on the macroeconomic and institutional features of the home country. Using evidence from 373 MFIs across the world, they show that in countries with high per capita income growth and high private credit to national income ratio, MFIs face low repayment problems. From a study conducted in Malaysia, Nawai and Shariff (2012) find- gender, formal religious education, distance between MFI and borrowers' business/work, monthly sales/income, and loan amount- to be important determinants of borrowers' repayment performance. In another study, Bhatt and Tang (2002) find that in the USA, education, distance between lender and borrower, and the fear of being denied future loans due to non-repayment act as positive influences on the repayment performance of microcredit borrowers; whereas borrowers' gender is found to be not significant for the purpose.

Shariff (2010) states that four types of factors affect microfinance repayment performance: borrower factors, firm factors, loan factors and lender factors. Since in this study we cover the

borrowers of a particular MFI, of a particular area, the loan factor and lender factor remain the same for all. Hence, our analysis will allow us to study the individual and firm factors in repayment performance of borrowers. Income, farm size, borrowers' age, years of education, savings behavior, household size (Angaine & Waari, 2014), access to other lenders (Al-Azzam et al., 2012; Stiglitz, 1990, Banerjee et al., 1994), marital status (Bauer, Chytilova, & Morduch, 2010), land or asset value, religiosity of the borrowers (Al-Azzam et al., 2012), income and economic shocks (Tedeschi, 2006) are the individual and firm related factors that might affect the repayment performance of microfinance borrowers.

2.5 The Impact of Religiosity on Loan Repayment

Economists have tried numerous theories to explain what determines loan repayment decisions of a rational borrower. In an early influential paper, Jaffee and Russell (1976) categorized borrowers as (a) either “lucky” or “unlucky”, and (b) either “honest” or “dishonest”. A “lucky” borrower is one whose investment project yields adequate returns to service a debt in a timely manner; whereas an “honest” borrower does not default on loan obligations when she is able to repay. This implies that in addition to the ability to repay, the loan repayment decision of a borrower is driven by the willingness to do so, which in turn, depends on the borrower's trustworthiness.²¹ Furthermore, Becchetti and Conzo (2011) add that the act of repaying a loan, under asymmetric information, signals the trustworthiness of a borrower. The findings of Georgarakos and Furth (2012) support this view as they show defaults and delinquencies among the European households to be more common in areas with low proportions of religious people. However, the challenge of disentangling the role of religiosity from the other motives of loan repayment remains. Repayment of a loan does not immediately imply trustworthiness. A borrower can repay a loan in a timely manner simply to avoid adverse consequences such as the seizure of collateral or destruction of credit histories. Microcredit provides an environment where such formal institutions are minimized. Its collateral-free nature allows borrowers' personal characteristics, such as trustworthiness and religiosity, to play a bigger role in their loan repayment

²¹ This explains why banks invest to develop meaningful relationships with clients to collect information about the character of the borrowers (Boot, 2000).

decisions. Karlan (2005) provides support for this proposition. In particular, using the General Social Survey (GSS) questions on trust, Karlan (2005) estimated the level of trustworthiness among the microcredit recipients of a Peruvian MFI and investigated their repayment performances over the next three years using an experimental game. Arrears have been found to be less common among the trustworthy borrowers.

From a religious preaching point of view, almost all religions preach disciplined, responsible behaviour when it comes to loan repayment. For example, in Islam (almost 93% of the borrowers in our study practice Islam as their religion), repayment of any debt in a timely fashion is highly encouraged. As reported by Khan and Phillips (2010), the Prophet Muhammad (SAW) said, “The best among you are those best in paying off debt”. In another hadith it is stated that “procrastination (delay) in repaying debts by a wealthy person is injustice” (reported in Khan & Phillips, 2010), where a wealthy person is defined as one who has the ability to repay the debt. Ashta and Hannam (2014) states that in Chapter VIII, article 47 of the Manusmriti, which is one of the ancient legal texts or *Dharmasastras* (religious law book) of Hinduism, it is stated that, “When a creditor sues (before the king) for the recovery of money from a debtor, let him make the debtor pay the sum which the creditor proves (to be due)”. On the same note, article 50 the Manusmriti states that, “A creditor who himself recovers his property from his debtor, must not be blamed by the king for retaking what is his own” reported in Ashta & Hannam, 2014). Together these two statements make it very clear that the rulings are in favor of the creditor, and loan default is highly discouraged. Hess (2012) mentions two of Christian scriptures to highlight how debt and late repayment are viewed in Christianity. He mentions, “The wicked borrows but does not pay back, but the righteous is generous and gives” (Psalms 37:21); and “Pay to all what is owed to them: taxes to whom taxes are owed, revenue to whom revenue is owed, respect to whom respect is owed. Owe no one anything, except to love each other, for the one who loves another has fulfilled the law” (Romans 13:7, 8). He then argues that these norms should be reflected on the individuals’ actions who are from highly religious areas. Consequently, they should have better repayment history and low levels of credit card debt. These findings motivate us to think that, since by definition more religious individuals abide by religious preaching, and practice the life style as suggested by their

respective religion, they are expected to reflect the religious laws and preaching in their lives and display better repayment behavior.

As discussed above, one of the most researched areas of microcredit loan repayment lies in the joint liability mechanism which is susceptible to cultural and social influences. Following the argument that microcredit removes majority of the formal laws and institutions behind conventional loans, individual loan repayment rates will be equally, if not more susceptible, to cultural and social constructs, such as religiosity. It can be said that religion and its teachings are a major component of culture (Guiso et al., 2006), which leads this study to examine the research question in the context of microfinance. Based on the findings that (a) religiosity and trustworthiness are positively associated with each other (Guiso et al., 2003), and (b) trustworthiness and repayment performances are positively related (Karlan, 2005; Cassar et al., 2007); and that almost all the religions encourage timely repayment of any debt, this study forms the following hypothesis.

H1: Microfinance borrowers practicing higher degree of religiosity display better repayment performance.

In *H1* we hypothesize that more religious borrowers will show better repayment performance. In other words, those believing in and practicing religious activities more than others are hypothesized to be better borrowers. But there is one aspect of religiosity to which there is no clear-cut answer: how and to what extent religiosity is related to age (Hunsberger, 1985). Hunsbeger (1985) states that there are three theories concerning religious activities and age. The traditional theory states that religious activities initially decline with age; then after 30, it keeps rising. The stability theory suggests that there is almost no relation between religiosity and age. On the other hand, the disengagement theory suggests that there is a continuous decline in religious activities with age. Hunsbeger (1985) finds at least some evidence to support each of these theories.

The research on the economics of religion by Azzi and Ehrenberg (1975) help us understand why some people prefer to spend more time in religious activities, which might help us understand the age-religiosity correlation. Within this thought provoking model, rational individuals are lifetime and afterlife utility maximizers. They rationally try to allocate their time and goods among religious and secular commodities so as to maximize utility. For secular consumption, individuals

and households have to invest their time and money in purchasing worldly products and services. On the other hand, anticipated afterlife rewards depend upon the lifelong religious activities of the households, for which they have to spend their time and money in religious activities. Combining their theoretical framework and budget constraint, assuming that the future expected marginal utility of religious activity is not decreasing in age, Azzi and Ehrenberg (1975) conclude that religious actions might escalate with age.

In another study, Fiori et al. (2006) state that while health problems might cause formal religious participation to decline with age, informal participation usually increases as an individual ages. They argue that with age individuals are better able to appreciate both external control (such as God) and a sense of internality. In other words, older religious people appreciate religion and act more responsibly by taking responsibilities and blames on themselves (internal control). On the other hand, younger religious people exhibit lesser internal control and more external control, and act less responsibly thinking that its always God's will for something to happen or not happen (external control). So even though the younger, religious people are committed to religion and faith, they often depend on luck.

Combining all these findings, we argue that religiosity will have different impacts on people of different ages. Compared to young religious borrowers, older religious borrowers would exhibit more adherence to religious beliefs and act accordingly, which in turn will reflect in their better repayment behavior. To older people religion and their inner feeling of religiousness may be of great importance as they are closer to their own morbidity and mortality (McCue, 1995). So, older, religious people would not risk committing a sin by willingly avoiding a repayment on time and be held responsible in afterlife. In contrast, younger people would exhibit more external control and might blame a failed repayment on fate since they have more time to make it up for afterlife. So, we have reasons to deduce that if an older individual, here an older female, devotes more time in religious activities and beliefs, she does that because she values the future afterlife return of that more than what her younger counterparts, who exhibit less internal control, do. In other words, the same degree of religiosity for younger and older individuals shows different degrees of commitment, belief and satisfaction from religious activities for those two groups.

Based on survey data collected in 1991, 1998 and 2008 from 30 countries, the University of Chicago's National Opinion Research Centre suggests that oldest individuals are most likely to have strong belief in God, possibly due to increasing anticipation of mortality. So, from the A-E theory and the findings, we can assume that when older women practice and participate in more religious activities, they value the afterlife rewards more and fear God more than their younger counterparts who have external control and believe have more time to make up for their misdeeds. This, together with the A-E explanation, lead us to draw the conclusion that, religiosity is expected to have a stronger impact on older people's religiosity influenced behavior. Based on this reasoning the following hypothesis is formulated:

H2: Religiosity has a stronger positive impact on loan repayment performance of older women than of their younger counterparts.

Extant research theoretically explains how religious affiliation or religiosity might contribute to social conformity; but still this does not provide social scientists with full confidence to claim whether religiosity actually inhibits deviant behavior (Tittle & Welch, 1983). Most researchers believe religiosity to be of great importance to influence how people act; but the results sometimes are not obvious (see Tittle & Welch, 1983 for a discussion on different and opposing findings on the influence of religiosity on human actions). They also argue that since religiosity strengthens individual moral commitments, it can be expected to restrain atypical behavior to the highest extent where there are very low levels of external, behavioral guidance for individuals. Their findings also support their view that the religiosity influenced conformity is proportionately related to the aggregate religiosity of individuals in a given context. In other words, they find that greater aggregate religiosity is inversely proportional to the restraining effects of individual religiosity. Tittle and Welch (1983) argue that religion is not the only conformity generating phenomena; there are some social environments that promote and induce similar conforming human attitudes and responses. Consequently, religiosity is expected to have distinct conformity generating effect only where the larger environment lacks the aberration discouraging, deviance curtailing mechanisms. Since in any loan repayment, the willingness of the borrower is equally important as her ability to do so, religiosity is believed to affect loan repayment behavior of a borrower by either affecting her willingness or both to do so. Following the arguments of Tittle and Welch (1983), we have

reasons to believe that the willingness driven by the religiosity of microloan borrowers to repay is also context dependent. In the areas where the aggregate religiosity is not very high, the religious people practice religion from a stronger belief in their respective religions and try to uphold the status of religion by conforming to the rules and expectations. So, they have stronger willingness to not deviate, which in the context of loan repayment, might make them strongly willing to repay loans timely and not deviate. Subsequently, the following hypothesis is formed.

H3: Individual religiosity will have a stronger positive impact on the repayment performance of microloan borrowers in areas where the aggregate religiosity of the area is low.

It is, however, worth underscoring that this thesis is not the first to discuss the impact of religiosity on repayment of microcredit. Al-Azzam et al. (2012) investigate the effect of group-features²² on repayment performance of group-based microcredit. Using data from a microcredit program in Jordan, they find that while religiosity is not initially linked with the occurrence of late repayment, more religious groups tend to repay faster once a late repayment occurs.

Our study focuses on the individual religiosity of the borrowers, and aims to find out whether that impacts their repayment performance. Al-Azzam et al. (2012) consider group religiosity, which is measured by the percentage of the group members saying their prayers five times a day, to assess its impact on the group repayment performance. There are several limitations to their study, which this study proposes to overcome. Firstly, Al-Azzam et al. (2012) investigated repayment performance of only the Muslim borrowers, and so are unable to generalize their findings over different religious denominations. Although all the major religions encourage timely repayment of loans, they differ substantially in terms of ramifications of defaulting or flexibility towards debt forgiveness. For example, Blum and Dudley (2001) argue that Protestantism's rejection of the Catholic's sacrament of penance causes an increase in the individual penalty for defaulting. Furthermore, Christianity and Judaism biblical writings call for the celebration of a Jubilee Year every 50 years, where amidst other things, debts are to be forgiven. Currently only the Catholic Churches celebrated this event. The last celebration occurred in 2000 where the Pope called for the forgiveness of international debt. Due to such inherent heterogeneity between

²² Such as peer screening during group formation, peer monitoring during project operation, peer pressure, and social capital.

religious texts and teachings, the magnitude of the impact of religiosity on loan repayment might vary with the religious denomination. This study does not restrict to any particular religion, thereby providing results with a higher degree of generalizability in determining if religion, in general, affects loan repayment. Secondly, their measure of religiousness using a binary choice variable is problematic. In Al-Azzam et al. (2012), only those who pray five times a day are categorized as religious. Those who pray even four times a day are considered as “non-religious”; and more surprisingly, are treated equally to those who are completely atheists. In contrast, our study uses Religious Commitment Inventory-10 (RCI-10), a much broader, more inclusive scale to get an unbiased score of individual religiosity, irrespective of her religious affiliations. The RCI-10 index was developed in counselling psychology by Worthington et al. (2003); they then checked for its estimated internal consistency, 3-week and 5-month test-retest reliability, construct validity and discriminant validity. As RCI-10 was found to have all these features to make it a good measure of religiosity, they proposed this religiosity index as a more inclusive measure.

To summarize, the three hypotheses that this study tests are:

H1: Microfinance borrowers practicing higher degree of religiosity display better repayment performance.

H2: Individual religiosity has a stronger positive impact on loan repayment performance for older women than their younger counterparts.

H3: Religiosity will have a stronger positive impact on the repayment performance of microloan borrowers in areas where the aggregate religiosity of the area is low.

3. BEES Setting, and the Data

We collected our data by partnering with the Bangladesh Extension Education Services (BEES), one of the major MFIs in Bangladesh, founded in 1975 as a non-profit organization. BEES extends loans to all female groups. To be eligible to qualify for a BEES loan, the applicant has to have some kind of a business, or self-employment, or at least she has to have the intension to start a new income-generating activity. During the time of our experiment, BEES loan amounts varied between BDT 8,000 to BDT 50,000 (BDT 78= US\$1). But usually the first-time borrowers would get between BDT 8,000 and 12,000 (US\$103-US\$154); successful timely repayment of the loans

would help a borrower graduate to larger amount of loans. Typically, BEES loans are collateral free, 1-year loans with repayments in 50 equal weekly installments. BEES charges a nominal interest rate of 15%. BEES' loan officers approach self-reported female entrepreneurs in a yet to be explored village and promote their loan product. Once loan officers are satisfied with the number of new clients in the area, they then rely on these existing group members to recruit other members by word of mouth.

Initially as a new group of four or five members is formed, a loan officer visits the women at one of their homes or businesses to explain loan terms and processes. These women are then given the responsibility to find other group members. BEES groups normally vary in size between fifteen to forty members. As the loan groups are finally formed, the loan officer explains the loan terms and official requirements to all the members in greater details. BEES loan officers heavily depend on the peer screening and verification to grant membership to the applicants. The applicants are required to submit a copy of some form of proof of address and authentic identification to qualify for a loan.

As applicants qualify for a loan, all the group members have to guarantee each other for final approval to get a loan. Following the loaning system of Grameen bank, BEES also extends individual liability loans with group settings. The borrowers have to attend the weekly group meetings, but there is no joint liability. So, in case of failure in timely repayment of any borrower, only she is responsible; and no other member of the group would be held liable, and no one else's eligibility for future loans would be affected by any of the group members failure to repay on time. Loan officers act as moderators of the group meetings, loan disbursements and collections of installments are performed in group meetings. Like most other successful MFIs, BEES enjoys high timely repayment rate; in 2014 only 0.74% of total BEES borrowers did not make full repayment within 6 months of the due date²³

As stated before, the lending procedure followed by BEES is not like group lending with joint liability where if one group member fails to repay on time, the other members are to bail her out by making repayment on her behalf. BEES extends loans to borrower groups; but each member is individually responsible for her loan repayment. Though new, this type of lending procedure is

²³ See <https://reports.mixmarket.org/mfi/bees>

not very uncommon among MFIs in recent years. De Quidt, Fetzer, & Ghatak (2013) documents that Grameen Bank and BancoSol, two of the pioneering MFIs, have started lending under individual liability contract in group settings in place of joint liability. They find that such shift does not affect loan recovery rates. They claim that more frequent group meetings increase social capital, which helps individuals in individual liability borrowing groups display better repayment behavior. De Quidt et al. (2013) also explore the factors motivating MFIs to undergo this kind of shift. They argue that in case of an individual liability group lending system, a borrower is not liable for repaying her partner's loan. She qualifies for succeeding loans irrespective of her partners' payment status as long as she herself does not default. But joint liability group loan might encourage strategic default among able group members, since a borrower who could pay only for herself but not for her partner would also be considered as a defaulter. This might discourage her or other members in the group to repay even their own shares. Due to this, some good borrowers might feel discouraged to apply for joint liability loans. As a result, individual lending might be preferred to joint liability by some borrowers.

In another study, Feigenberg, Field and Pande (2013) do an experiment where by randomly assigning microfinance borrowers to more frequent and less frequent meeting groups, they find that- more frequent meetings help borrowers create social capital; they interact more among themselves outside the meeting times; display an increased disposition to share risk with their group members, even when they do not have to do that. They argue that, borrowers value the informal insurance induced by group meeting based interactions among the group members and the social capital thus generated. So, to attract the good borrowers by offering the individual loans and by not risking the high repayment rates by keeping more frequent meetings, the MFIs are offering individual loans in a group setting. This type of loaning system also helps the lenders by shifting the time burden to the borrowers. As opposed to regular individual loans without groups, loan officers have to meet individual borrowers separately. But in case of the individual loans in group settings the loan officers meet the group together, which saves time and transaction costs. This is important since the lower cost enables the lender cut interest rates, makes the borrower better able to repay by relaxing her installment constraint, which results in improved repayment

performance and welfare (De Quidt et al., 2013). This justifies why BEES and many other MFIs are practicing this type of individual loans in a group setting.

For evaluation purposes, BEES branch managers consider any missed repayment as a measure of loan delinquency. If a borrower misses even a single installment on the due date, she goes to the “bad loan” book; and to qualify for future, larger loan amount, she has to justify her late or missed repayment, and then this is up to the loan officers and managers to decide whether she would qualify for the next loan cycle. But those in the group remaining in good standing are automatic choice for larger, future loan amounts. Late repayments are not very common though. In 2014, only 0.74% of total BEES borrowers did not make full repayment within 6 months of the due date²⁴.

3.1 The Data

We worked with BEES to identify areas of Bogra district in Bangladesh where they were planning to operate, after surveying the areas, but had not yet done so. BEES selected two branches, Golabari and Gabtoli, in Bogra district and their surrounding villages that were not under their operations yet, containing mostly rural settlements. For this study, we have borrowers from eighteen different villages of Bogra. Bogra is a large district with 2,695 villages and 3,013,056 total population (Population and Housing Census-2001, Bangladesh Bureau of Statistics, BBS.). We collected repayment records of 1,849 first-time borrowers of BEES that they forwarded loans to during the year 2012 and 2013.

BEES lets its borrowers form groups, known as *somities* in the local language, of size between 15 to 40 members (Alamgir, 2009). The members meet weekly for financial transactions and other products and services offered by BEES. For this study purpose, we had 62 loan groups, the smallest group size was 20 and the largest group had 47 members. There was one group with 20 members, one group had 23, two groups had 25, two groups had 26, four groups had 27, nine groups had 28, seven groups had 29, fourteen groups had 30, five groups had 31, ten groups had 32, two groups had 33, two groups had 34, one group had 36, and one group had 42, and the largest

²⁴ For reference, see <https://reports.mixmarket.org/mfi/bees>

group had 47 members. All these sixty-two borrower groups let us study a total of 1,849 borrowers for our research purpose. Each client received an individual-liability loan of BDT 10,000 (~US\$128). BEES waits for two weeks after the loan disbursement date for its clientele to start making repayments in fixed, equal installments.

We collected information on the borrower's socio-economic and demographic characteristics using a unique survey questionnaire. The survey questionnaire included Religious Commitment Inventory-10 (RCI-10) questions that helped us measure the degree of religiosity of the borrowers, their household heads and the community. This scale is equally capable of capturing religiosity of individuals from different religious denominations. Aten, O'Grady and Worthington (2013) strongly recommend RCI-10 as a strong screening measure of religiosity. To measure the community religiosity, data was collected by a team of six field investigators. In each survey village, a central point was selected by the surveyors (the following were typically used as centers: school/college, mosque, and bridge/culvert). Starting from this center, surveyors walked in a random direction, knocked on every fifth house and invited the household head or his/her spouse to participate in the survey. Thirty respondents were interviewed from each village. Thus, a total of 540 respondents were interviewed and their RCI-10 scores were measured to capture the community religiosity.

The information on loan repayment performance of each borrower was collected from BEES in April 2014, sixteen months after the loans were disbursed to all. We chose this time horizon deliberately. In Bangladesh (as well as in most other countries), microloans are collected over a period of one year. A loan is considered as delinquent if it is not repaid in full (principal plus interest) within 15 months of the loan disbursement²⁵. We also collected data from the weekly log book of each borrower, which enables us to track the repayment behavior of each borrower on weekly basis.

²⁵ For reference, see the website of the Microfinance Information Exchange: www.mixmarket.org/node/30046

3.2 Variable Description

Here we describe how the different variables used in the econometric specifications for our research question were obtained. Our main dependent variable of interest is the loan delinquency of each borrower. Delinquency occurs when a loan payment is not made on the scheduled date.²⁶ A delinquent loan becomes a defaulted loan when the chance of recovery is minimal.²⁷ BEES considers any late or missed repayment on a scheduled date as an act of delinquency by that borrower. We, too, follow the same definition of loan delinquency by a borrower. Specifically, we consider whether the borrower missed any repayment on the due date to capture loan delinquency. The dependent variable of our interest is a measure of loan delinquency, “whether a borrower has missed any repayment on the due date”, which is a dummy variable. To control for the socioeconomic and demographic characteristics of the borrowers, we include the following variables in our study as explanatory variables. Cultural factors like religion can also affect the repayment performance of a borrower, as explained in the earlier section. As the measure of religiosity, we measure the intensity of religious practice and commitment of a borrower, irrespective of her religious denomination, using RCI-10 scale. This variable can range from 0, indicating no religious commitment and practice, to 50, indicating very high level of religious practice and commitment of an individual; and we call this variable RELIGIOSITY.

Age (AGE) of the respondent is measured in actual years. Many of the previous studies related to MFI also considered age as a demographic variable. For example, Lilay et al. (2015) studied the factors that affect MFI’s group loan repayment performance and found age to be a significant factor in MFI repayment decision making. Gutu et al. (2017) also find age to be significantly and negatively related to borrowers’ repayment performance. Education (EDU) is defined as the numbers of years of schooling. Gemere (2017) used education in an empirical study as a factor for analyzing loan default and education. The author expected to have negative relation between education and loan default. Literate borrowers will understand more complex terms and

²⁶This definition is also applied in the microfinance sector to measure loan delinquency, as according to Rosenberg (1999), a loan is delinquent when a payment is late.

²⁷Delinquency is measured because it indicates an increased risk of loss, warnings of operational problems, and may help to predict how much of the portfolio will eventually be lost because it never gets repaid. According to Rosenberg (1999), there is no definitive way to measure delinquency universally, rather an MFI decides which one to use so that it helps them predict, as accurately as possible, the future potential loss.

condition of loan and they will comply with that. In another study, Bumbie (2013) expected to have higher literacy rate among individual borrowers compared to group borrowers. We also expect education to play a role in the repayment decision; and so we include this variable. Ownership of assets such as land and livestock is incorporated as a control variable in the study. Many empirical study use asset as an independent variable to understand the nature of borrowers. Borrowers having sufficient asset usually have less tendency to default (Gemere, 2017; Bumbie, 2013; Kasali et al., 2016). Asset (ASSET) is measured in terms of the market value of assets owned by the respondent's household. In our regressions, we used the natural logarithm of one plus the market value of household assets in order to deal with the skewness of the household assets and to include households without any tangible assets. Income (INCOME) is the monthly income of the borrower from her job, and/or business, and/or from any other source. Loan repayment and income should have a positive relationship. Oke et al. (2007) used yearly income for analyzing its impact on loan repayment. Different studies used income as independent variable to determine the factors affecting loan repayment (Gemere, 2017; Kasali et al., 2016). MARRIED is a dummy variable, representing the marital status of a borrower, taking the value of 1 if the borrower is married, and 0 otherwise. Dinh and Kleimeier (2007) argue that marital status should be negatively related to repayment performance; whereas Dunn and Kim (1999) claim marriage to have positive impact on repayment. So, marital status is an important variable to consider.

While having a mandatory savings account is a pre-requisite for applying for microcredit in many cases, having a non-mandatory savings account is indeed a choice variable. Accordingly, we introduce the maintenance of a non-mandatory savings account (SAVINGS) as a dummy variable such that SAVINGS equals 1 if the respondent has a non-mandatory savings account with BEES, and 0 otherwise. Additionally, the amount in the non-mandatory savings account is another variable (AMOUNT_SAVING) included in our study. Pasha and Negese (2014), and Bumbie (2013) in their empirical study use savings as a dummy variable to see how it affects repayment. In another study, Gemere (2017) found the coefficient to be negative with loan default. Gutu et al. (2017) study the determinants of loan repayment and find the household size to be significantly and negatively related to loan repayment. We also have HOUSEHOLD_SIZE as a discrete explanatory variable that measures the total number of family members in the household of the

individuals. HOUSEHOLD_HEAD_RELIGIOSITY is a binary variable that captures if the household heads of the borrowers say their prayers five times a day. Following Al-Azzam et al. (2012), we define a person (here, the household head) as religious if s/he says her/his prayers five times a day and the variable takes the value 1; and it becomes 0 otherwise.

3.3 Summary Statistics

Table 1(A) presents descriptions of the variables used in this study and their summary statistics. In our study, the average age of the borrowers is 32 years. The oldest borrower is 65 years old, and the youngest is 18 years. To be eligible for a loan from BEES, one has to be at least 18 years old. On average, respondents have spent four years in school. Since primary and secondary schooling for females is free in Bangladesh for last 15 years, the younger borrowers are expected to have more years of schooling than the older borrowers. About 84 percent of all the borrowers are married. The average monthly income of each borrower is BDT 4,650 (US\$60). On average, the market value of assets that a respondent or her household possesses is BDT 69,600 (US\$892). Almost 6% of all the borrowers have missed at least one repayment. The maximum number of missed repayment on the due date by a borrower is 3. The average total missed repayment is .071. About 17% of all the borrowers have non-mandatory savings account with the MFI, and about 13% invested in new business during the loan year. In total, 16 loan officers were in charge of the 1,849 borrowers from 62 loan centers. These loan officers were also in charge of other borrowers who are not a part of our study. 106 borrowers missed at least one repayment on the scheduled date. We also have data on how much more or less religious one is compared to the community she lives in. The maximum difference between individual and community religiosity is 19, which implies that this individual displays 19 RCI-10 score more religious than the average community. The minimum difference of -16 displays how much less religious this individual is compared to the average community religiosity. Positive differences imply that the individual is more religious than the average community; negative numbers imply the average community displays more religiosity than the individual; 0 implies no difference at all. In case of the household heads, we do not have data for them to capture the RCI-10 scores to measure their religiosity. But we have the number of prayers the household heads say to capture if they are religious or not,

based on the definition used by Al-Azzam et al. (2012). We find that 60 of the household heads say their prayers five times a day.

4. Empirical Model

We first investigate to which degree religiosity is associated with differences in repayment performance of a borrower. We estimate the following multivariate model:

$$y_i = \alpha + \beta R_i + \gamma X_i + \varepsilon_i$$

Where y_i is loan delinquency for borrower i . X_i is the vector of client demographic controls, consisting of clients' age, years of education, total household members, income, value of assets, marital status and if she has non-mandatory savings account. R_i is the religiosity variable measured by RCI-10 questionnaire, and can take on discrete values between 18 and 44 in our study, since these are the lowest and highest value of religiosity in the current research. α is the intercept and ε is the error term. The main dependent variable of our interest is a measure of loan delinquency, "whether a borrower has missed any repayment on the due date", which is a dummy variable. Since the dependent variable of our interest is a binary variable, we estimate a probit model. We always cluster standard errors per *somiti* (borrowing group) of the borrower to account for unobserved area or group effects: residuals may be correlated among the borrowers from the same community or group features, even though they might be uncorrelated among borrowers from different localities. We also clustered standard errors per loan officer using the same line of argument. But in all cases the results remain the same. Our main interest lies in the religiosity coefficient β , which tells us about the relationship between religiosity and repayment performance; but the coefficients on the other control variables (γ) are also of interest and will be discussed.

5. Results

5.1 Individual Religiosity and Loan Delinquency

We first want to verify if individual religiosity affects loan repayment performance of microfinance borrowers. Table 2(A) outlines the results of the probit estimation where delinquency

is the dependent variable, and religiosity and other control variables are independent variables. In column 1 we have the estimation results without any control variable, and in column 2 we have the estimation results with control variables. Table 2 results show that religiosity is negatively and significantly associated with loan delinquency. The religiosity coefficient is 0.046, which is negative and significant at 1%. This implies that, holding all other things constant, a more religious person is less likely to delinquent on a microloan. To have some numerical understanding, we calculate the marginal effect of religiosity on loan delinquency at mean; and we find the value of this marginal effect at the mean to be -0.005. Since our dependent variable “whether the borrower missed any repayment” is a categorical one with only two possible values (0 or 1), this marginal effect at the mean tells us that, if we had two otherwise-average individuals, a one point rise in the religiosity measuring score of RCI-10 would make the individual 0.5 percentage point less likely to delinquent on the microloan. This result is not trivial. Holding all other variables constant, for an average person with the average value of all other explanatory variables, this marginal effect implies that, compared to a person with 0 RCI-10 score, meaning completely no religious practice and commitment, an individual with the average religiosity (RCI-10 score of 30) in our study has almost 15 percentage point less probability to default on her loan. This finding is in line with what we hypothesize in H1. A highly religious person would be motivated by her religious teaching and belief to work hard and be honest. Together these two are important for loan repayment, since they are important for project success and willingness to repay a loan. So, we fail to reject the first null hypothesis and conclude that religiosity is significantly and negatively related to loan delinquency. No other variable in this regression specification is significant to explain loan delinquency of microfinance borrowers.

As already mentioned, a potential problem with our empirical model is that our main explanatory variable “religiosity” can be endogenous. For example, formal religious education could be very much related to the religiosity of an individual, and this could as well affect the repayment behavior of borrowers. This might create, through missing variable problem, endogeneity issue in our model. Nawai et al. (2012) find that borrowers who have formal religious education are more responsible to repay their loan. In our sample we do not have information about the formal education of the borrowers, which might influence both the religiosity and repayment

performance of the borrowers. It is also well documented in microfinance literature that social tie plays a very important role in the repayment behavior of borrowers. De Quidt et al. (2016) show that strong social capital or social tie is necessary to sustain mutual insurance for repayment in microfinance, both for group and individual loans. Feigenberg et al. (2013) find that social capital created by an increase in the meeting frequency of individual liability borrowing groups leads to a subsequent improvement in repayment rates. On the other hand, the essence of extrinsic religiosity is that people practice or maintain religious activities or gatherings to achieve social goals. As Whitley and Kite (2010) put it, “The church is most important as a place to formulate good social relationships”. So, the presence or strength of social tie could drive the dependent variable of our study, and it could also drive the religiosity of an individual, the main independent variable in our study. This could create the simultaneity problem in this regression analysis. Both of these missing variable and/or simultaneity problems can cause endogeneity. In order to address the potential endogeneity problem, we use the instrumental variable (IV) technique.

To implement (IV) estimation, the endogenous variable needs to be replaced with an IV. This IV and the endogenous variable have to be correlated; the IV and error term of the estimation model have to be uncorrelated; and it cannot be one of the explanatory variables in the original model (Wooldridge, 2006). The last requirement necessitates that the instrumental variable should not affect the dependent variable directly; rather it should affect indirectly only through the endogenous variable. We use the “religiosity of the household head” as an instrumental variable for “religiosity” variable that captures individual religiosity. The extant evidence suggests that the religiosity of parents or household heads is an important determinant of an individual’s religiosity. Childhood participation in religious activities may also help one accumulate religious capital and transmit the effects of religiosity (Iannaccone, 1998). Myers (1996) used an intergenerational data set to analyze whether parents’ or household heads’ religiosity has any influence on the religiosity of an individual. The results show that the religiosity of parents or household heads positively influences an individual’s religiosity, and this influence is independent of aging. Also, sometimes people attend religious gatherings, like church attendance or saying prayers together, for extrinsic religiosity (Batson, 1993). This is done to meet some social goal rather than for afterlife salvation. This, in turn, will reflect in high RCI-10 score to represent someone as highly religious person.

But there is no reason to believe that the household head's religiosity or the community prayer level would influence a borrower's repayment behavior. So, our use of household head's religiosity and community prayer as two instrument variables for an individual's religiosity is well justified.

To be precise, we capture the HOUSEHOLD_HEAD_RELIGIOSITY by using the same RCI-10 score that we use for the measurement of individual religiosity. The religiosity of household heads positively affects the religiosity of the household members. We measure, on average, how many times a community says its prayers per day to capture "community prayers" variable. So, we do expect the covariance between the IVs and the endogenous variable to be positive, or non-zero. This satisfies the first requirement of the IV criterion that the IV and endogenous variable should have non-zero, significant covariance; and there is no reason for us to believe that household head's religiosity, or the community prayer would influence the repayment performance of an individual. Thus the requirement of IV regression that the IV is not related to the error term in the original model is also met. To test whether there is some endogeneity in our model, and whether our instrumental variables are good instruments, we conduct the Hausman test of endogeneity.

Since there is a suspicion that individual religiosity (religiosity) suffers from omitted variable bias or simultaneity, we choose household head's religiosity and community prayer as instrumental variables. These two IVs are likely not to affect the repayment of a borrower but are good predictors of one's religiosity, which includes both intrinsic (inner belief and private) and extrinsic (to achieve some social advantage, and publicly visible) religious orientation. This is why they may potentially be good instrumental variables. To test this assumption that household religiosity and community prayer are strong instruments, we need to run a reduced form regression. In this regression model we run religiosity on the instruments and exogenous variables. The results of this regression are presented in table 2(B). The F-test shows that in fact household head's religiosity and community prayer both are statistically significant determinants of the religiosity of an individual.

Once we know that our IVs are good instruments, we use Stata to run instrumental variable regression analysis, the Durbin-Wu-Hausman regression analysis. The results are presented in table 2(C). To test the hypothesis that all the slope coefficients are jointly zero, we look at the

Wald statistic and p-value for the test which show that together all these variables are significant at the 1% level of significance. Wald test of the exogeneity of the instrumented variables result shows that the p-value is .000; therefore, we reject the null hypothesis that there is no endogeneity. The main coefficient of interest in this specification is religiosity; and like the original or base model specification, still it has the significant, negative coefficient. So, after taking care of the probable endogeneity issue of our model, our result still holds that higher degree of individual religiosity has a negative impact on loan delinquency of microfinance borrowers. So, it is safe to conclude that more religious individuals are better microfinance borrowers.

5.2 Age, Religiosity and Loan Delinquency

To investigate if the role of religiosity in influencing repayment behavior of microfinance borrowers changes with age, we present probit regression results in table 3. In column 1 we have probit regression results, and in column 2 we have the marginal effects. Standard errors are again clustered at the group level. In this model specification, we introduce a new interaction variable: AGE_RELIGIOSITY, which is generated by multiplying the age of a borrower by her individual religiosity score (RCI-10 score). We then run a probit regression with the delinquency variable as the dependent one, and other control variables, and the age and religiosity interaction variable as the explanatory variables. We initially included age, religiosity and their interaction in the same regression model. But this creates severe multicollinearity problem since age and religiosity both are highly correlated with the interaction variable, with correlation coefficients of 0.83 and 0.54, respectively. So, we exclude the variables age and individual religiosity from the regression and keep the age-religiosity interaction variable to see if the impact of religiosity on the repayment performance of borrowers varies with their age. This way we have no multicollinearity in our regression analysis anymore.

As shown in table 3, the interaction variable “age-religiosity” has a negative sign, and is significant at the 10% level of significance. This significance level is not very high, but we can marginally consider this as significant. This means that, all other things remaining the same, older people practicing higher degree of religiosity are less likely to default on any repayment. To be more specific, all other things remaining constant, for any given degree of religiosity, as the

borrower gets older her repayment performance compared to another otherwise identical but younger borrower gets better. Since in this specification we do not have either age or religiosity variables included, we cannot comment on the magnitude or marginal change of the coefficients of the variables. But we certainly can comment on the direction of the change of the repayment performance due to change in the variables. As Fiori et al. (2006) summarize, compared to older adults, younger individuals are less able to integrate their belief in God, the external source of control (God) with any sense of internal control. In other words, older religious people appreciate religion and act more responsibly by taking responsibilities and blames on themselves (internal control). On the other hand, younger religious people exhibit less of internal control and more of external control, and act less responsibly thinking that it's always God's will for something to happen or not happen (external control). So even though the younger, religious people are committed to religion and faith, they often depend on luck. Combining all these findings, the result that we have for age-religiosity is not surprising. Compared to young religious borrowers, older religious borrowers would exhibit more adherences to religious beliefs, would avoid sin and act accordingly, which in turn will reflect in their better repayment behavior.

5.3 Community Religiosity, Individual Religiosity and Loan Delinquency

We now want to identify if individual religiosity of a borrower has different impact on loan repayment behavior when the surrounding religiosity of her community changes. To investigate this question, we run a probit regression model, as our dependent variable “if the borrower missed any repayment on time”, is a binary variable. The explanatory variables are the same control variables as before. To capture the extent to which an individual religiosity deviates from her average surrounding religiosity, we introduce `DEVIATION_RELIGIOSITY`. We measure the deviation of individual religiosity from the mean community religiosity as measured previously by subtracting community religiosity from individual religiosity. Any positive value of this variable indicates that the individual's degree of religiosity is above average in her community; while a negative value of the variable implies that the individual's degree of religiosity is below the average community religiosity. A zero difference indicates that the individual's religiosity coincides with the mean community religiosity.

In table 4 we display the regression results. Because of very high collinearity between individual religiosity and the deviation religiosity variable (the correlation coefficient is 0.91) we do not include “religiosity” and “deviation religiosity” in the same model specification. The probit regression coefficient on the deviation variable is -0.044, which implies that, all other things remaining constant, the more religious one is compared to the community she lives in, the better repayment behavior she displays, or her likelihood of loan delinquency declines. To see why this happens, let us recall Tittle and Welch (1983)’s argument from section 2. They argue that since religiosity strengthens individual moral commitments, it can be expected to restrain atypical behavior to the highest extent where there are very low levels of external, behavioral guidance for individuals. Their findings also support their view that the religiosity influenced conformity is proportionately related to the aggregate religiosity of individuals in a given context. To be specific, they find that the greater the aggregate religiosity, the less the inhibiting effects of individual religiosity. So, from our data and analysis we also reach the similar conclusion: individual religiosity has more inhibiting effect where the aggregate religiosity is low, and vice versa.

5.4 Robustness Check

In this section we present results from robustness check. Section 5.4.1 presents the subsample analysis using only the Muslim borrowers, who comprise almost 93% of our total borrower pool. In section 5.4.2 we report results using different categorizations to capture the religiosity of borrowers.

5.4.1 Different Measures of Religiosity and Repayment

In our study we use RCI-10 to measure the degree of religiosity, since we believe that this captures the religious beliefs and commitments of individuals in a better way than just capturing the measure of church going (for Christians) or number of prayers (for Muslims) as used by Al-Azzam et al. (2012). To test for the robustness of our research findings, we use the number of prayers per day, as used by Al-Azzam et al. (2012) to measure the degree of individual religiosity and use that as the explanatory variable to find the impact of religiosity on loan repayment. The

maximum value that this measure can take is 5, since a Muslim is required to say her prayers five times a day; and the lowest value this can take is 0, indicating no religious commitment at all. We use this definition and run the probit regression. The results are presented in table 5(A). The first column represents the results for our first regression model specification; only this time we are using a different measure of religiosity. The results show that like our base model, only the religiosity variable is negative and significant at 1% level of significance. So, the Muslims who say more prayers per day are less likely to default on their loans. In column 2 we have regression results for repayment performance and age-religiosity interaction variable. Here, too, we see that the results of our original regression using the RCI-10 score to measure religiosity are reflected. We do not change the dependent or independent variables, and just use a different measure to capture religiosity of Muslims; but the results remain unchanged. The interaction variable age-religiosity is significant at 1% level of significance, and has a negative coefficient. Like our original finding, this also means that, other things remaining constant, a certain degree of religiosity has a stronger, positive influence on the loan repayment performance of microfinance borrowers, even when we are considering the Muslim borrowers only and measuring their religiosity by the number of times they say their prayers. The third column represents regression results of the repayment performance on deviation of individual religiosity from the average community level religiosity, and other control variables. In this specification as well, we find our original regression results to hold. The deviation of individual religiosity from the average community religiosity has a negative, significant coefficient (significant at 1% level). So, the more times one says her prayers compared to the community, the less likely she is to default on her repayment. Therefore, it is safe to conclude that our findings are robust to the measurement of religiosity. In turn, this confirms the robustness of our findings.

5.4.2 Total Missed Repayment and Religiosity in Repayment Performance

So far, we have used “if borrower missed any repayment”- a binary variable, as our main independent variable for the study. There is another variable that captures loan delinquency: total missed repayment. In our study the maximum number of total missed repayment is 3. That means no one has missed more than three repayments in total during the loan cycle. Some borrowers

missed it twice; but most defaults came from missing just a single repayment on time. So, the variable “total missed repayment” takes the value between 0 and 3, 0 meaning no missed repayment, or perfect repayment, no delinquency. For the robustness of our findings, we can use this categorical variable “total missed repayment” as the dependent variable and run regression to see if our main results hold. The OLS results are presented in table 5(B). Column 1, 2 and 3 represent the OLS results for the influence of religiosity on repayment performance of borrowers, when the dependent variable is the total number of missed repayments. Column 1 represents the influence of religiosity; column 2 shows if the influence changes with age of the borrower; and finally, column 3 shows if religiosity influences repayment differently based on how religious someone is compared to her neighborhood. In the first column, like our base model specification, the variable religiosity is significant at the 1% level of significance, and has a negative sign. The coefficient is $-.0063$. This means, all other things remaining the same, for each additional RCI-10 score of religiosity the likelihood that a borrower would default on her repayment goes down by 0.63 percentage point. In the second column, we have the results showing if religiosity influences repayment based on one’s age. Our main variable of interest is the age and religiosity interaction term. But this time when we are defining the delinquency using a different approach, the interaction term is found to be insignificant. While the sign of the coefficient remains the same as in the main regression specification (i.e. negative), it is not statistically significant. In the third column, we have the OLS results for the influence of individual religiosity deviation from the average community religiosity on loan repayment. In this specification, our main variable of interest, the individual religiosity deviation is negative, as before, and significant at 1% level. The coefficient is -0.006 . The interpretation remains the same- as one’s religiosity is stronger compared to her neighborhood, her religiosity influenced repayment behavior improves, other things remaining the same. To be precise, for each additional RCI-10 score over the average community level religiosity, a borrower's likelihood of loan default goes down by 0.6 percentage point. Since our dependent variable takes on four possible values: 0,1,2 and 3, we have run multinomial probit regression to run regression for each of the four values of the dependent variable, with 0 as the base value (i.e. against no delinquency, or perfect repayment). Our qualitative results remain the same for individual religiosity, age and religiosity interaction term, and deviation from community

religiosity variable. The only time the results do not hold is when the number of total missed repayments is 3. This is not surprising at all since in our sample there are only 5 incidences of 3 total missed repayments. So, this small sample fails to capture any variation. Other than that, our main results hold for all the variables of interest. Overall, the results of these robustness checks assure us of the robustness of our findings.

5.4.3 Analyzing the Relation between Religiosity and Time of Missing Repayment Using Survival Model

Survival model analysis, also known as “time to event” analysis, is widely used to estimate how long the subjects of interest might survive during some study period. It is also known as “time to event” analysis since it analyzes the probability of an event to happen at some point in time. Cox’s proportional hazard model tests if two distinctive groups display significant difference between their respective survival times. In testing so, Cox proportional survival model lets other factors to be included in the model, which makes it similar to multiple regression model. In Cox proportional survival model, the dependent variable is the ‘hazard’, where hazard is the probability of experiencing something of interest over time. For our research purpose, the week of missed repayment is the hazard, which might take place anytime between the start of the loan cycle and the following 50 weeks during which period the borrowers are to make repayments. In the Cox proportional hazard model that we use as a robustness check for our study, we also include the variables that were included in the multivariate regression we ran as the baseline model.

The time variable is the week of missed repayment, or we can look at it as how long a borrower survives before she fails to survive any further (misses repaying on the due date). Our regression results show that (table 5C), like our baseline model, only the individual religiosity, captured by the variable RCI-10 is significant and has positive hazard ratio. This indicates that, as individual religiosity increases, the survival time significantly rises for the borrower. In other words, more religious individuals are likely to survive longer without failing to make timely repayment. Our main findings are well supported by findings of the survival model as well.

6 Conclusion

This study addresses the question of whether individual religiosity affects loan repayment by studying the loan repayment performance of microcredit borrowers. The collateral free nature of the microcredit lending system allows us to disentangle the role of religiosity from other motives of loan repayment. We then further study- whether religiosity affects loan repayment; and whether the influence remains the same under different scenarios. In particular, we further investigate whether religiosity influences the repayment performance of borrowers of different age differently; and whether the surrounding religiosity of the borrower plays any role to strengthen or weaken the influence of religiosity on repayment. Due to the nature of our main dependent variable “if the borrower missed any repayment”, which is a binary variable, we use probit regression analysis. We find that individual religiosity plays a positive role in the repayment behavior of a borrower. All other things remaining constant, more religious borrowers are better borrowers. But the age and religion interaction reveals an interesting finding: any certain degree of religiosity plays a stronger positive role in repayment behavior of older women compared to their younger counterparts. With age, people become more religious, they become afraid of death and so try to avoid sin, since they have less time to make up for it. Older individuals take the religious teaching and preaching by heart, and are more intrinsic, faith based, and believing individuals. All these make them less willing to commit any strategic default; hence, they display better repayment behavior. Another interesting finding of our study is that, individual religiosity has a stronger influence on the repayment behavior when the individual is more religious compared to her surrounding neighborhood.

While this study is not the very first to analyze the role of religiosity in repayment behavior, our study introduces more comprehensive measure of religiosity, i.e. the RCI-10 score that capture belief and practices alike to capture religiosity. To our knowledge, ours is also the first study to investigate whether the religiosity influenced repayment behavior affects an individual differently under different age and community religiosity. These findings have important implications for practitioners and policymakers alike. Since they know religiosity plays an important role in repayment behavior, they can focus on this factor to improve the repayment rate. For example, sometimes they can use religious preaching or teaching to motivate borrowers to make timely

repayment, which might help to improve their repayment performance. Some other policy recommendations such as the following are also worth mentioning. MFIs can take into consideration the degree of individual and community religiosity before offering loans through some simple questions-based survey along with other information they already collect. These information can help them to decide the intensity of supervision required for individual borrowers or groups to ensure that they pay their installments on time. Based on our study findings, borrowers with higher level of religiosity can possibly go on with minimal level of supervision as they are less likely to default. This reduced supervision/monitoring required by MFI staff can in turn reduce their travel costs, making operations more cost-effective. This will also help free up loan officers' and borrowers' time. Thus, MFIs and borrowers can take advantage of this and invest time to other productive activities. The MFIs can also make better use of the freed-up staff to serve more people, leading to increased coverage.

Table 1: Summary Statistics and Variable Descriptions

Variables	Description	Max Min	Mean (SD)
Age	Age of the subject in years	65 18	31.572 (10.867)
Education	Years of schooling of the subject	16 0	3.612 (3.686)
Muslim	1 if the subject is a Muslim, 0 otherwise	1 0	.926 (.261)
Married	1 if the subject is married, 0 otherwise	1 0	.839 (.368)
Income	Total income of the subject in BDT, the Bangladeshi currency	15,500 2,000	4648.999 (1798.671)
Household members	Total number of household members of the subject	9 2	4.978 (1.391)
Asset	Total value in BDT of the subjects' household assets such as arable land, dwelling, cattle, and other valuables.	350,000 0	69887.26 (79296.01)
If borrower missed any repayment	1 if the borrower missed at least one repayment in due time, 0 otherwise	1 0	.057 (.233)
Non-mandatory savings account	1 if the borrower has a non-mandatory savings account with BEES, 0 otherwise	1 0	.164 (.370)
Religiosity	Religiosity is captured by Religious Commitment Inventory-10 (RCI-10), which is the total score of an individual subject to survey questions about religiosity	44 18	30.017 (6.404)
Community Religiosity	This is the average RCI-10 score of each community covered in the study	40 20	29.489 (2.780)
New business investment	1 if the subject made any investment in any new business in during the loan year, 0 otherwise	1 0	.126 (.332)
Total Missed Repayment	Number of total missed repayment by a borrower on the scheduled date	3 0	.071 .314
Difference between Individual religiosity and the community religiosity	This is measured for each individual by subtracting the average community religiosity score from her individual religiosity score	19 -16	.528 7.078

Table 2(A): Religiosity and Repayment

Probit regression results with and without controls are displayed. The dependent variable is if the borrower missed any repayment, which is a binary variable that takes the value 1 if she missed at least one repayment, 0 otherwise. We cluster standard errors by area.

VARIABLES	(1) Probit (with control variables)	(2) Marginal effects after probit regression
Religiosity	-0.046*** (0.009)	-0.005
Age of the borrower	0.004 (0.003)	0.000
Years of education	-0.012 (0.012)	-0.001
If the borrower is married	0.256* (0.151)	0.022
Total income	.000 (.000)	0.000
Natural log of total asset	0.009 (0.009)	0.001
Total household members	0.024 (0.019)	0.002
If the borrower has a non-mandatory saving account	0.176 (0.140)	0.020
Constant	0.898*** (0.338)	
Observations	1,849	
Pseudo R-squared	0.0532	

Clustered standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2(B): Hausman Test for Endogeneity

In the first step, we regress the endogenous variable “religiosity” on the instruments and all other exogenous variables to test if the instruments jointly can significantly determine the endogenous variable.

VARIABLES	OLS
Age	0.0163 (0.0168)
Education	-0.0599 (0.0508)
If the borrower is married	-0.113 (0.516)
Income	1.95e-06 (0.000106)
Total household member	-0.0559 (0.134)
Log of assets	-0.0616* (0.0349)
If the borrower has non-mandatory saving account	0.920* (0.502)
Household head religiosity	-0.00707 (0.374)
Average community prayer per day	-1.097*** (0.260)
Constant	32.25*** (1.252)
Observations	1,178
R-squared	0.022

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Test: if (community_prayer=0) (hhh_religiosity=0)

- (1) Community prayer = 0
 - (2) Household head religiosity = 0
- F(2, 1168) = 8.93
 Prob > F = 0.0001

The above F-test results show that, the community prayer and household head religiosity together are significant determinants or individual religiosity.

Table 2(C): The Durbin-Wu-Hausman test for Endogeneity, and the Use of Instrumental Variable

The endogenous variable is religiosity (rci10). We use household head religiosity and community average prayer per day as instrumental variable. The Wald test of exogeneity of the instrumental variable has a very small p value (0.0000), and so we reject the null hypothesis of no endogeneity.

VARIABLES	Coefficient.	Std. Err.	z	P> z	[95% Conf. Interval]	
Religiosity	-.1672999	.0053569	-31.23	0.000	-.1777992	-.1568006
Age	.0023383	.0033098	0.71	0.480	-.0041488	.0088255
Education	-.0156066	.0102524	-1.52	0.128	-.0357008	.0044877
Married	.0811918	.10771	0.75	0.451	-.129916	.2922996
Income	.0000174	.0000208	0.84	0.403	-.0000234	.0000582
Asset	-.0027329	.0071371	-0.38	0.702	-.0167213	.0112555
Have non-mandatory saving acct	.2334395	.0978357	2.39	0.017	.0416851	.4251939
Total number of household members	.006292	.026434	0.24	0.812	-.0455176	.0581017
Constant	4.097799	.371679	11.03	0.000	3.369321	4.826276
Corr(e.Religiosity, e.If borrower missed any repaymen)	.921548	.043649			.7745883	.9740944
sd(e.rci10)	6.366387	.131184			6.114394	6.628766
Instrumented: rci10						
Instruments: Age Education Married Income Asset Have non-mandatory saving account Household members Household head religiosity Community prayer						
Wald test of exogeneity (corr = 0) : chi2(1) = 30.50			Prob > chi2 = 0.0000			

Table 3: Religiosity, Age and Repayment

Regression results for probit regression analysis, with and without control variables, are presented here. As before, the dependent variable is a dummy variable, if the borrower missed any repayment. It takes the value one if she has missed at least one repayment on due date, 0 otherwise. We have included the interaction variable age*religiosity here. Standard errors are clustered at the area level.

VARIABLES	Probit (with control variables)
Years of education	-0.010 (0.013)
If the borrower is married	0.249* (0.147)
Total income	0.000 (0.000)
Natural log of total asset value	0.009 (0.009)
Total number of house hold members	0.030 (0.027)
If the borrower has a non-mandatory saving account with BEES	0.146 (0.120)
The interaction of age and religiosity of the borrower	0.0003* (0.0001)
Constant	-1.8800 *** (0.278)
Observations	1,849
Pseudo R-squared	0.0140

Clustered standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4: Individual religiosity, Community Religiosity and Loan Repayment

Probit regression results are displayed here. The dependent variable is the dummy variable “if the borrower missed any repayment”, which takes the value 1 if she has missed at least one repayment on due date, 0 otherwise. Standard errors are clustered by area. The variable deviation from community religiosity captures one’s deviation from the mean community religiosity.

VARIABLES	Probit (with control variables)
Years of education	-0.011 (0.013)
If the borrower is married	0.212 (0.154)
Total income	0.000 (0.000)
Natural log of total assets of the household	0.008 (0.009)
Total number of household members	0.022 (0.028)
If the borrower has any non-mandatory saving account	0.182 (0.124)
Deviation of individual religiosity from the mean community religiosity	-0.044*** (0.007)
Constant	-2.197 (0.280)
Observations	1,849
Pseudo R-squared	0.0587

Clustered standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5(A): Probit Regression Results for Robustness Check

Here, the dependent variable, whether the borrower missed any repayment, is a binary variable taking the value 1 if she missed at least one repayment, 0 otherwise. We cluster standard errors by community. In column 1 we have the results for individual religiosity and repayment. Column 2 and 3 report the results to check if borrowers' individual religiosity affects their repayment behavior differently based on their age, and on their relative religiosity compared to the average community religiosity. In all the specifications, religiosity is measured by the number of times one says his/her prayers per day; hence, only the Muslims (who comprise 93% of our total sample size) have been considered here.

VARIABLES	(1) Probit (Individual religiosity and repayment)	(2) Probit (Religiosity, age and repayment)	(3) Probit (Deviation of individual religiosity from the community religiosity and repayment)
Religiosity	-0.187*** (0.026)		
Age of the borrower	0.004 (.004)		0.005 (.004)
Years of education	-0.012 (0.014)	-0.011 (0.014)	-0.017 (0.015)
If the borrower is married	0.250 (0.151)	0.250* (0.148)	0.294 (0.155)
Total income	0.000 (0.000)	.000 (.000)	0.000 (0.000)
Natural log of total asset	0.011 (0.009)	0.011 (0.009)	0.013 (0.009)
Total household members	0.027 (0.028)	0.030 (0.027)	0.032 (0.030)
If the borrower has a non- mandatory saving account	0.177 (0.125)	0.168 (0.122)	0.205 (0.131)
Age and Religiosity Interaction		-0.004 (0.001)***	
Deviation of individual religiosity from the community religiosity			-0.311*** (0.030)
Constant	-1.800*** (0.297)	-1.839*** (0.251)	-2.321 (0.306)
Observations	1,713	1,713	1,713
Pseudo R-squared	0.0662	0.0677	0.1536

Clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5(B): OLS Regression Results for Robustness Check

Here, the dependent variable is the total number of missed repayments, another measure of loan delinquency, ranging between 0 to 3. In column 1, we have the influence of individual religiosity, measured by RCI-10 score; in column 2, we have the age-religiosity interaction term as main variable of interest; and in column 3, we have the individual religiosity deviation from the average community religiosity and its impact on repayment performance. We cluster standard error by the borrowers' community.

VARIABLES	(1) OLS (Individual religiosity and repayment)	(2) OLS (Religiosity, age and repayment)	(3) OLS (Deviation of individual religiosity from community religiosity and repayment)
Religiosity	-0.006*** (0.056)		
Age of the borrower	0.001 (.001)		
Years of education	-0.003 (0.002)	-0.002 (0.002)	-0.003 (0.002)
If the borrower is married	0.029 (0.020)	0.028* (0.018)	0.024 (0.018)
Total income	0.000 (0.000)	.000 (.000)	0.000 (0.000)
Natural log of total asset	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
Total household members	0.004 (0.005)	0.005 (0.005)	0.004 (0.005)
If the borrower has a non- mandatory saving account	0.032 (0.020)	0.031 (0.024)	0.032 (0.024)
Age and Religiosity Interaction		-0.000 (0.000)	
Deviation of individual religiosity from the mean community religiosity			-0.006*** (0.001)
Constant	-0.187*** (0.256)	0.045*** (0.039)	.026*** (0.035)
Observations	1,849	1,849	1,849
R-squared	0.0208	0.0055	0.0222

Clustered standard errors in parenthesis

*** p<0.01, ** p<0.05, * p<0.1

Table 5(C): Robustness Check Using Survival Model

Here, time of first missed repayment is the time variable indicating the survival duration.

VARIABLES	Hazard Ratio (SE)
Religiosity	0.909*** (0.015)
Age	1.005 (.009)
Years of Education	0.978 (.026)
If the borrower is married	1.670 (0.000)
Household Income	1.000 (0.000)
Natural log of the total Asset	1.014 (0.019)

Clustered standard errors in parenthesis
 ***p<0.01, ** p<0.05, * p<0.1

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