Does Contingent Repayment in Microfinance Help the Poor during Natural Disasters?[1]

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Abstract

Microfinance in Bangladesh introduced a contingent repayment system beginning in 2002, which allowed rescheduling of weekly saving and installments during natural disasters for disaster-affected members. This paper examines the determinants of rescheduling and its consequences on individual livelihoods using evidence from a nation-wide flood in 2004.   The empirical analysis employs the instrumental variable model to correct for the endogeneity of the rescheduling treatment.

In employing a uniquely collected dataset, it is found that the repayment burden in the absence of rescheduling increases the probability that females and males skip a meal by 2.48% and 0.53%, respectively.   It is also found that transportation costs to attend member meetings, financial ability to pay saving and installments, and flood damage are important determinants of rescheduling.   These findings imply that the contingent repayment in Microfinance plays a role of safety net and alleviates members facing further poverty during negative shocks.

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1. Introduction

Individuals in developing countries frequently face various negative shocks such as natural disasters and ill-health. However, formal insurance markets barely exist and the available credit sources for the poor are usually only informal credit and Microfinance Institutions (MFIs). Therefore, a poor individual's ability to face the shocks is limited, and there has long been a concern in development about how credit with insurance can work as a safety net for the poor. Udry (1994), for example, shows that the contingent repayment of informal credit plays a role of mutual insurance, but it does not perfectly pool negative shocks (Townsend 1994, Kazianga and Udry 2006, Park 2006). This implies that the further provision of safety net programs may improve the livelihoods of poor people.

In spite of the demand for flexible loan contracts, the standard repayment system of MFIs is quite strict and it sometimes makes borrowers suffer from the repayment burden (Coleman 1999, Zeller et al. 1999). To overcome this problem, most MFIs in Bangladesh have been introducing a contingent repayment system since 2002, which allows rescheduling of repayment during natural disasters for disaster-affected members (Dowla and Barua 2006).

The goal of this paper is to examine determinants and consequences of rescheduling using a unique dataset. A number of articles describe the importance of rescheduling in MFIs and its efficient implementation (Ledgerwood 1998, Norell 2001, Meyer 2002), but no previous studies examine the issue because of the lack of available data. This study is one of the first attempts to evaluate the contingent repayment system in MFIs using a household dataset.

In particular, this study investigates impacts on individual food consumption and

highlights the possibility that impacts vary across gender. Previous studies find that females and children suffer more from the decreases in nutrition intake than working-age males during negative shocks (Behrman 1988, Behrman and Deolalikar 1990). However, Pitt et al. (2003) show that credit provided to females by MFIs improves the nutrition intake of boys and girls. It is also theoretically plausible that food consumption of productive and/or favored members becomes more sensitive to income fluctuations than the other members (Mangyo 2007). Therefore, it is important to empirically examine the heterogeneous impacts, particularly within a MFI household.

To achieve the goals, this paper employs a unique dataset collected after a nation-wide flood in 2004. This particular flood was the only case in which many MFIs rescheduled at the same time. The dataset reports that 39% of MFI members were allowed to reschedule during the flood.

Using the dataset, this paper finds that rescheduling reduces the probability that flood victims skip a meal. In particular, the impact is larger on females than on males. In the absence of rescheduling, the repayment burden to MFIs during negative shocks increases the probability that females skip a meal by 2.48%, while the corresponding change in probability is only 0.53% for males. Although MFI memberships may improve the intra-household bargaining power of women (van Tassel 2004, Pitt et al 2006), it is shown that they still suffer from the burden of repayment more than men during negative shocks.

This paper attempts to contribute to three literatures regarding MFIs: poverty reduction effects, the outreach of programs, and sustainable management of MFIs. First, there is no consensus whether MFIs reduce poverty (Aghion and Morduch 2005)[3].

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[3] Pitt and Khandker (1998) find positive impacts of MFI participations on households'

While this study does not examine the long-term impacts of MFIs, it does find that the newly introduced repayment system could alleviate members temporarily facing further poverty.   Second, vulnerable households are less likely to join MFIs (Amin et al. 2003). The findings of the paper imply an incentive for the vulnerable to avoid joining MFIs because of repayment burden during negative shocks.   This indicates that the effective implementation of rescheduling may improve the outreach of MFIs. Finally, while the standard repayment structure causes the repayment burden and increases the dropout of members, excessive rescheduling of repayments can deteriorate financial sustainability of MFIs.   This tradeoff raises a need to evaluate the rescheduling effect in order to provide an efficient MFI program in disaster-prone countries such as Bangladesh.

This paper begins with the first part of Section 2, which describes features of Bangladeshi floods and repayment system of MFIs.   The second part describes the dataset.   In Section 3, the empirical strategies are discussed and Section 4 shows the results.   Section 5 is the conclusion of this paper.

2. Background and Data

The 2004 Flood and Contingent Repayment Structure in MFIs

MFIs are one of the most common poverty reduction tools in developing countries (Pitt and Khandker 1998, Morduch 1999a; 2000, Aghion and Morduch 2005).   They provide the poor, mainly poor women in Bangladesh, with opportunities for investment loans with low interest rates and without any collateral.

MFIs receive attention from academic and non-academic circles because of their

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outcomes. By contrast, Coleman (1999) shows that MFI membership does not necessarily improve members' livelihoods. Rather, it increases the demand for moneylenders because of the repayment burden to MFIs.

high repayment rates and their unique repayment structure. One feature of microfinance loans is frequent repayment that begins soon after the loan is made; once a MFI member borrows from her MFI, the amount to be repaid is divided into approximately 40 to 50 weekly installments. She is required to pay tightly scheduled weekly installments beginning soon after the loan disbursement.

Another feature is that all MFI members are required to deposit money into the saving account of MFIs every week, regardless of whether they have debt. Borrowers who default are excluded from future access to credit, which provides a dynamic incentive. This structure is considered to be efficient in alleviating the moral hazard problem that is a well known feature of the credit market (Chowdhury 2005, Tedeschi 2006, Gine, Jakiela, Karlan, and Morduch 2006).

Finally, members form a self-selected joint-liability group in the standard system[4]. If borrowers can not repay their installments on time, they have to ask the other members in the group to reimburse the repayment. Therefore, the joint liability system can potentially play a role of contingent repayment (Townsend 2003). However, this contingent repayment does not work during covariate shocks such as natural disasters when all members in the group suffer from the shocks at the same time (Khan and Kurosaki 2007).

Bangladesh is one of the most flood-prone countries in the world, and floods are clearly the most important risk for households in determining the income level. In recent decades, severe floods have attacked the country in 1974, 1988, 1998, and 2004.

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[4] A number of studies theoretically explain that this joint liability structure causes the high repayment rates (Besley and Coate 1995, Ghatak and Guinnane 1999, Aghion and Gollier 2000). On the contrary, Gine et al. (2006) find that the joint liability would even increase risky investments. Also, Kono (2006) finds that the joint liability increases the default rates.

The flood in 1998, affecting 68% of the country, was particularly severe and affected income and assets of MFI members, causing the repayment burden.

Learning from the 1998 flood, most MFIs in Bangladesh have been introducing a contingent repayment structure since 2002. This new repayment structure allows rescheduling of weekly saving and installments during disasters without charging additional interest. Instead, loan contracts are no longer joint liability but individual lending in the new structure[5].

After the introduction of the contingent repayment structure, the first nation-wide flood occurred in July 2004, attacking 39 out of 64 districts of the country. MFIs postponed collecting weekly saving and installments when the flood started. The rescheduling was targeted to members who had difficulty in attending the member meetings and paying saving and installments. However, MFIs did not use any concrete criteria such as asset holdings and income level to choose beneficiaries of rescheduling.

When the flood started, head offices of MFIs picked out affected districts as the first step. At the second step, officers in affected branches visited each member's residence and determined whether rescheduling should be applied. However, where the flood damages were quite severe and it was dangerous for officers to visit, they gave up visiting the members and allowed to reschedule.

Data Description

This study employs a unique dataset collected from 326 Bangladeshi households including MFI members and non-members. This dataset has some distinctions from

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[5] Also, some of MFIs such as Grameen Bank slightly raised interest rates, which might be able to be considered an insurance premium, but the change in interest rates was not a significant amount. For detail of the change in repayment structure, see Dowla and Barua (2006).

other household surveys. First, it includes data of rescheduling treatments collected using MFI members' bankbooks. The use of the bankbooks alleviates a possibility of recall bias which is common in retrospective surveys. Second, the survey was conducted one year after the 2004 flood, the only case in which most MFIs allowed members to reschedule[6]. Third, it records individual meal frequency data at the periods before and during the flood.

This dataset is a follow-up survey of the International Food Policy Research Institute (IFPRI). IFPRI collected data from 757 households in 1998, 1999 and 2004 to examine the 1998 and the 2004 flood (del Ninno et al. 2001). The IFPRI dataset followed the multistage stratified random sampling methodology for seven districts that were selected depending on their economic status and the severity of the flood damage: Chadpur, Manikganj, Magura, Barisal, Sunamganj, Narsingdi, and Madaripur.

In the second stage, it randomly sampled one Thana from each district and three unions from each of those Thanas. Thanas and unions are administration units of Bangladesh; a union consists of some villages, and each Thana includes multiple unions. In the next stage, about six villages from each union and two clusters from each of the villages were randomly picked out. Finally, approximately three households from each cluster were chosen depending on the village size.

The data in this paper was collected in December 2005 from three out of the seven IFPRI-survey districts that were selected based on flood severity, poverty level, geographical characteristics, and diffusion of MFIs: Chadpur, Manikganj and Magura. This survey succeeded in interviewing 326 out of 335 households that IFPRI surveyed

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[6] Only a few of MFIs allowed rescheduling of installments during the 1998 flood as well.

in 2004[7].

The questionnaire covered the magnitude of flood damage, basic demographic characteristics, labor and non-labor incomes, asset holdings, savings, MFI memberships, rescheduling treatments, and food consumption since January 2004 until December 2005. The survey was conducted only once in December 2005 and the survey period was divided into four sub-periods in order to obtain panel data: mid January to mid July 2004, mid July to mid November 2004 (during the flood), mid November 2004 to mid July 2005, and mid July to December 2005. Each period corresponds to the agricultural calendar in Bangladesh.

Since the focus of this paper is to examine rescheduled and non-rescheduled MFI members, this paper utilizes only MFI member households for empirical analysis. Also, the data of individual meal frequencies were unfortunately collected only before and during the flood periods. Therefore, 289 household-level observations are available for empirical analysis; 141 at the first and 148 at the second period. They include 1461 observations of individuals over the age of two years old.

Table 1 reports the list of self-reported flood damages obtained from the open-response question. In the dataset, the survey team let respondents freely answer from what kinds of damage they suffered. This process creates the whole list of the major flood damage they perceived, and therefore is useful in alleviating the omitted flood damage. It shows that the main damage is the decline in income. The flood also damaged houses and other assets such as livestock. Contrary to expectations, none of the MFI members reported damage to their health condition.

Table 2 presents the dynamics of livelihoods of MFI member households. It shows

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[7] The attrition is 2.7% and this is mainly because of migration.

that the income level during the flood period was approximately 25% lower than the average of non-flood periods. Correspondingly, 39% of MFI members rescheduled at the flood period. The average duration of rescheduling was 2.72 weeks and the average amount was 490Tk. Given that the seasonal labor income during the flood period was 9436 Tk, the amount of rescheduling is equal to approximately 5.2% of labor income[8].

The table also reports that many households reduced meal frequency during the time. In particular, working age people were more likely to skip meals than children; 20.2% and 23.5% of working-age males and females skipped meals during the flood, but the statistics for children is only 11.3%.

Figure 1 and Figure 2 show the detail of this tendency. Figure 1 reports the histogram of population by age and Figure 2 depicts the fractions of individuals skipping a meal during the flood. Since Figure 1 reports that there are few observations aged over 60, I mainly discuss the food consumption patterns of individuals under 60. From Figure 2, I find that the two generations who skip a meal the most frequently are those around age 15 and age 35 with the latter being more frequent. It also shows that a gender gap does not appear in the generation under 16. The gap becomes the most prominent in their 20's, and the disparity then becomes moderate in elder generations again.

Table 3 compares household characteristics between the rescheduled and non-rescheduled members. It appears that the rescheduled members were poorer than the non-rescheduled in terms of income and asset holdings. In particular, the average asset holdings of rescheduled households were approximately half of the

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[8] Average monthly labor income is 2359Tk and the flood period has four months.

non-rescheduled.

Looking at the panel of the individual characteristics, the probability of skipping a meal was also higher in the rescheduled members. While 30% of people reduced meal frequency in the rescheduled households, the corresponding statistics for the non-rescheduled households was only 11%. Those distinctions in household and individual characteristics are statistically significant.

3. Estimation Methodology

This section describes the empirical approach to measure the determinants of rescheduling and its impact on individual meal frequency. The major benefit from focusing on the individual meal frequency is to examine the heterogeneous rescheduling impacts within the household. Another return from using this variable is that it alleviates the possibility of measurement error caused by the recall bias; it would be more accurate to recall the individual meal frequency than the value of individual food consumption (Appleton and Collier 1995, pp557).

A growing number of studies attempt randomization approaches to estimate average treatment effects of poverty reduction programs (Duflo and Kremer 2004). However, since examining the determinants of rescheduling, in other words targeting accuracy, is also of our interest, I do not utilize the approach.

Instead, this paper employs the Recursive Bivariate Probit model whose first stage Probit estimates the determinants of rescheduling and second stage examines the rescheduling impacts on individual meal frequency. More specifically, I estimate the following model;

$$C_{ijt}^* = R_{it}\alpha + X_{it}\beta_0 + I_{ijt}\beta_1 + u_{ijt} \tag{1}$$

$$C_{ijt} = \begin{cases} 1 & if \ \ C_{ijt}^* \geq 0 \\ 0 & otherwise \end{cases}$$

$$R_{it}^* = Z_{it}\gamma_0 + X_{it}\gamma_1 + e_{it} \tag{2}$$

$$R_{it} = \begin{cases} 1 & if \ \ R_{it}^* \geq 0 \\ 0 & otherwise \end{cases}$$

$$E[u_{ijt}] = E[e_{it}] = 0 \tag{3}$$

$$var[u_{ijt}] = var[e_{it}] = 1 \tag{4}$$

$$cov[u_{ijt}, e_{it}] = \rho \tag{5}$$

where C_{ijt} takes unity if individual j in household i takes meals less than three times a day at period t and zero otherwise[9]; R_{it} takes unity if household i is allowed to reschedule at least one saving and/or installment during the period t and zero otherwise; X_{it} denotes a vector of household characteristics such as poverty level, flood damage and other control variables; I_{ijt} a vector of individual characteristics; Z_{it} instrumental variables; and finally u_{ijt} and e_{it} indicate residuals of the second and the first stage equations, respectively.

A major issue of this specification is the endogeneity caused by the fact that rescheduling was targeted to disaster-affected and poor members. Therefore, if there are flood damage and other rescheduling determinants which are unobservable to econometricians but observable to MFI officers and they affect the meal frequency, it would cause biased results.

To address this, this paper first reports the self-reported flood damages again in Table 1. Since the table is created based on the open-response question, this process

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[9] In the dataset, nobody reported only one or zero meal a day.

alleviates the bias caused by omitted flood damages. The table shows that the main kind of damage is the declines in income and assets such as livestock and trees. Given that the damage to income and assets could be endogenous, this study controls for the flood damage by adding the flood height of inundation at their houses in the covariates. This will determine the damage to health condition, houses and other assets due to the flood, and these in turn will decrease income.

In order to address other unobservable determinants of rescheduling, I also employ the instrumental variables method. Suitable instrumental variables must satisfy two conditions; they must be determinants of rescheduling and they must affect the individual meal frequency only through the change in possibility of rescheduling.

For the instrument, this study utilizes the distance from member's residence to the place holding MFI member meetings and its quadratic term. According to my field interviews, MFI officers allowed rescheduling mainly for members who had difficulties in attending the meetings and paying installments and saving. Also, as mentioned in the previous section, the officers allowed rescheduling when it was too dangerous for them to visit members because of the flood. The idea is that the further the meeting place is located from members' residences, the more difficult it is for members to attend the meetings during the flood because people are up to their waists in flood water. It is also impossible for officers to visit their residences in such a situation. It would, therefore, increase the possibility of rescheduling, but would not affect the livelihoods of households directly.

One might be concerned that these instrumental variables are correlated to unobservable poverty factors and flood intensity, given a possibility that the locations of meeting places are not randomly determined. For instance, Zeller et al. (1999) find

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that branches of MFIs are more likely to be constructed where access to transportation and electricity infrastructure is good. If this is applicable to the location choice of member meetings, members living far away from the meeting place might also live where access to these infrastructures is poor, such as a riverside. Also, such marginal areas might be more flood-affected, causing a biased estimation. To address the concern, I include geographical characteristics of their residences such as distance to rivers and paved roads into the covariates.

Another possible concern regarding the instruments is that the distance to meeting places might play a role in the screening of MFI memberships. Members who attend the meetings from far away might be young and physically healthy, might not have to stay at home for housekeeping nor childcare, and might not be Muslim, given that unmarried Muslim women are prohibited to walk outside alone. To deal with these potential issues, I also control for the household head, demographic characteristics, and religion in the covariates.

A third potential issue is that the distance might be correlated to characteristics of the particular MFIs. Members commuting the long distance might be members of small local MFIs that have only a few members, and therefore each member has to commute long distances to attend the meetings. Another possibility is that such members join MFIs whose group size is large. If MFI members form a large group compared to the number of total members in the village, the total number of available groups in the village will be small, and therefore each member might have to attend the meetings from far away.

Unfortunately, it is not adequate to address these possibilities by adding MFI group characteristics into the covariates, since these would be endogenously determined by

households. Instead, I compare the average distance to meeting places [1] between major and local MFIs, and [2] between MFIs forming large and small groups. The results are reported in Table 4. Neither of them rejects the null that average distance is the same between the two groups, implying that this issue is negligible.

Finally, if members attend the meetings from far away during the flood, it might cause them to be sick and to affect their meal frequency. Table 1 is helpful in addressing the issue again. None of the MFI households reported an incidence of ill-health/injury as a major shock during the flood, supporting the validity of the instrumental variables. The individual-level data regarding ill-health also report few incidences of ill-health (not reported in tables). Given these discussions, this study considers that these instrumental variables are adequate to control for the endogeneity of rescheduling.

Another issue in estimating Equation (1) and (2) using the Bivariate Probit model is the impossibility of controlling for individual fixed effects because of the incidental parameter problem (Lancaster 2000). It may be an option to estimate a linear-probability model with an individual-level fixed effect, but this approach suffers from two concerns. The first is that the predicted probability does not range between zero and one. Another is that the instrumental variables are also time-invariant. Therefore, I am unable to employ fixed effects in the estimation.

4. Estimation Results

Determinants of Rescheduling

Table 5 presents the estimation results of the first stage Probit examining the determinants of rescheduling. The estimation has 1461 observations for individuals

aged 2 and over[10]. The covariates include the valid instruments of distance to the meeting place and its quadratic term, demographics, household heads, geographical characteristics, flood intensity, and asset holdings.

I employ cluster-adjusted robust standard errors to address the possible correlation of residuals within each cluster. In obtaining the clusters, individual-level observations are divided into 80 groups based on villages and data periods. I further divide each village-period group into three subgroups depending on the demographic characteristics: males 16 and over, females 16 and over, and children under 16[11].

Table 5 shows that the rescheduling was targeted to poor and disaster-affected members. The coefficient of inundation at home is positive and significant. Also, a 1000 Tk of grain storage holding reduces the probability of being rescheduled by 3.44%. Holding jewelry also significantly reduces the probability, but the marginal effect at mean is smaller than that of grain storage; the estimated marginal effect is 0.87% per 1000Tk. Note that the coefficient of grain storage potentially suffers from a possibility of attenuation caused by recall bias. Unlike the other asset holdings, the amount of grain storage fluctuates through the time and this might cause a severe recall bias. Therefore, it would be better to interpret the marginal effect at mean of grain storage as being *at least* 3.44%. This high marginal effect of grain storage is likely because it directly affects food consumption and the subsistence nutrition intake. It therefore is expected to be a more important determinant than other assets.

Transportation costs to attend member meetings are also found to increase the possibility of rescheduling. Members living far away from the meeting place are more

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[10] I drop observations aged less than two since their meal frequencies are irregular.
[11] I also attempt household-period level clusters and non-clustered robust standard errors, but they do not change the main findings (not reported in tables).

likely to have the opportunity to reschedule. This is consistent to the discussion in Section 3. The bottom row of the table rejects the null that the coefficients of instrumental variables are jointly zero, rejecting the possibility of weak instruments.

Finally, the table also shows some counter-intuitive findings. For instance, members owning fewer productive assets are not necessarily targeted. Also, less educated and/or female headed households do not intensively benefit from the rescheduling in spite of their vulnerability to negative shocks.

Rescheduling Effects on Individual Meal Frequency

The first column of Table 6 presents the second stage Probit estimation showing the impact of rescheduling on the individual meal frequency. Dependent variables take unity if the individual takes meals less than three times a day and zero otherwise. The table shows a statistically significant rescheduling effect on mitigating people skipping meals during the flood. The repayment burden in the absence of rescheduling increases the probability that people skip a meal by 1.94%.

The inundation at home significantly reduces food consumption. This is likely through at least two channels. First, the damage to assets and labor income reduces food consumption. Second, it changes people's eating habits.

It is also found that asset holdings decrease the probability that an individual reduces meal frequency; all six coefficients regarding the physical assets show negative signs and four of them are statistically significant. However, the results show diversified marginal effects on meal frequency across asset categories. As expected, grain storage plays the most important role of ensuring food consumption. A 1000 Tk of grain storage reduces the probability of skipping meals at least by 0.64%, while

jewelry and livestock reduce by 0.28% and 0.09%, respectively[12].

Rosenzweig and Wolpin (1993) find that livestock is an important buffer stock in smoothing consumption when people are affected by a negative shock. By contrast, this study shows consistent findings with Fafchamps et al. (1998) and Kazianga and Udry (2006), which state that people mainly utilize grain storage rather than livestock to ensure their consumption. Interestingly, owning agricultural fields does not necessarily mitigate the declines in food consumption, implying that it is not available as a buffer stock during covariate shocks.

The second column focuses on the effects on landless households. Since they are poorer and more vulnerable to risks (Foster 1995), the demand for rescheduling and the expected marginal effect should be high. The table confirms that the rescheduling effect is larger for landless households than for the entire sample. The coefficients of asset holdings show a similar tendency to the first column and the marginal effects are larger on the landless.

Heterogeneous Rescheduling Effects across Gender

As mentioned in Section 2, I find no gender gap in skipping a meal in the younger generation under 16. However, a gender gap does appear in the elder generation. To further examine this, I divide the individual observations into three sub-samples: 1) males age 16 and over, 2) females age 16 and over, and 3) girls and boys under age 16.

Table 7 presents the results from estimations on the sub-samples of age groups. First, the inundation at home significantly affects food consumption of both adult males and females. In particular, females are more sensitive to damage. Second, the results

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[12] Note that there still is a possibility of attenuation bias in the coefficient of grain storage.

confirm that rich members are less likely to reduce the meal frequency; all of 18 coefficients regarding physical assets in the table are negative and eight of them are statistically significant. Third, the marginal effects of asset holdings on females are strictly larger than those on males at four out of six asset categories[13]. For instance, a 1000Tk of decline in grain storage increases the probability for female by 0.96%, while it increases the probability for males by only 0.25%.

A similar tendency is found in the coefficients of rescheduling effects. The absence of rescheduling brings the burden of repayment and significantly increases the probability of skipping meals for both males and females. However, while the marginal effect for females is 2.48%, the corresponding statistics for males is only 0.53%. Females are more likely to sacrifice meals in the face of negative shocks. This is consistent with the findings by Behrman (1988) and Behrman and Deolalikar (1990). In other words, females might be able to benefit from the rescheduling in ensuring the subsistence level of food consumption and nutrition-intake more than males.

As for the results regarding children, the table counter-intuitively shows a positive coefficient of rescheduling treatment because of the weak instruments; the bottom row of the third column reports that it does not reject the null that the coefficients of instruments are jointly zero. Therefore, it is impossible to discuss the rescheduling effect on children from this table. This counter-intuitive coefficient implies that the rescheduling was endogenously targeted to poor households who were more likely to skip meals.

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[13] The coefficients of owned land assets show the opposite tendency. However, the estimated effects are negligibly small for both males and females; 4.12% and 3.22% per one million Tk of landholdings, respectively.

5. Conclusion

Microfinance Institutions have recently undergone dramatic changes. On the heels of large weather shocks, MFIs in Bangladesh introduced a contingent repayment system which allowed rescheduling of weekly saving and installments during natural disasters. This paper investigates the determinants and impact of increased repayment flexibility and finds that MFIs are more likely to allow rescheduling for those who have difficulty in attending member meetings and in repaying installments and deposits. It is also found that the rescheduling helps MFI members ensure their food consumption. In particular, impacts on females are higher than on males; the absence of rescheduling increases the probability that females skip a meal by 2.48%, as opposed to only 0.53% for males.

How can we interpret this heterogeneous rescheduling effect across gender? This may be partly attributed to differences in productivity (Pitt et al. 1990), bargaining power (McElroy and Horney 1981) and so forth. Although MFI memberships may improve the intra-household bargaining power of women (van Tassel 2004, Pitt et al 2006), it is shown that they still suffer from the burden of repayment more than men during negative shocks.

It would be helpful to examine which intra-household decision making mechanism causes this heterogeneous effect. Some theoretical frameworks predict the Pareto efficient resource allocation, while the others do not (Alderman et al. 1995). Unfortunately, this study does not tackle this question because of the limitation of data, although it gives an opportunity for future research.

These findings, combined with previous studies, have various implications to

academic circles and policymakers. First, Amin et al. (2003) find that households who are vulnerable to risks are less likely to join MFIs and they interpret that the vulnerable poor who are "hopeless" are excluded from the programs (pp 79). This paper finds a possibility that the vulnerable may actually choose not to join MFIs. Negative shocks and the frequent repayment requirement in the absence of rescheduling would reduce food consumption significantly. In particular, this would be more severe for vulnerable households. Therefore, they may hesitate to join MFIs since the risks are too high[14]. This implies that the effective implementation of rescheduling may improve the outreach of MFIs.

The second implication is related to the poverty reduction effect of MFIs. While some studies report positive impacts of MFI membership on households' livelihoods (Pitt and Khandker 1998), others do not (Coleman 1999). The literature does not reach at any consensus regarding the issue (Aghion and Morduch 2005 pp222). While this study does not examine the long-term impacts of MFIs loans, it is found that the newly introduced contingent repayment system could work as a safety net during negative shocks, and alleviate members temporarily facing further poverty caused by the repayment burden.

The final implication is related to the self-sustainable management of MFIs. Morduch (1999b) claims that it is difficult for MFIs to manage their projects sustainably without subsidies. Although the standard strictly scheduled repayment structure burdens members' livelihoods, a significant amount of arrears caused by excessive rescheduling could obstruct the sustainable management of MFIs. Thus, there is a tradeoff between the standard and contingent repayment structures, and therefore it is

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[14] Pearlman (2007) theoretically reveals a possibility that the vulnerable choose not to participate in MFIs, and empirically finds a consistent result.

important for MFI providers to implement rescheduling efficiently. The findings concerning the targeting accuracy of rescheduling and its impact on poverty will be helpful to tackle the issue.

MFIs have undergone dramatic recent changes. However, most previous studies regarding MFIs examine the earlier system. This study's findings suggest the importance of further investigations into new structures in MFIs.

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Table 1: Flood Damages based on Open-Response Question (Multiple answers)

	MFI members		Non members	
	Frequency	Fraction	Frequency	Fraction
Income	137	77.0%	130	63.7%
House/utensil	4	2.2%	5	2.5%
Other assets	7	3.9%	12	5.9%
Death of household member	0	0.0%	1	0.5%
Injury/sickness of member	0	0.0%	1	0.5%
No damage	30	16.9%	55	27.0%
Total	178	100.0%	204	100.0%

Table 2: Dynamics of Livelihoods at the Flood Period

	Jan to Jul 2004		Jul to Nov 2004 (Flood period)		Nov to Jul 2005		Jul to Dec 2005	
	Mean	S. D.	Mean	S. D.	Mean	S. D.	Mean	S. D.
Monthly labor income (Tk)	3198	(4872)	2359	(4757)	3004	(4439)	3170	(5119)
Dummy =1 if rescheduled	0.000	(0.000)	0.392	(0.490)	0.023	(0.150)	0.095	(0.294)
N (MFI members)	141		148		174		179	
Only for rescheduled members								
Amount of rescheduling (Tk)	-	-	489.53	(496.78)	311.50	(270.82)	263.00	(180.56)
Duration of rescheduling (week)	-	-	2.72	(1.78)	1.00	(0.00)	1.20	(0.41)
N (Rescheduled MFI members)	0		57		2		15	
Individual-level observations								
Dummy =1 if a male aged 16 and over reduces frequency of meals	0.031	(0.173)	0.202	(0.402)				
N (Males)	228		233					
Dummy =1 if a female aged 16 and over reduces frequency of meals	0.031	(0.174)	0.235	(0.425)				
N(Females)	224		234					
Dummy =1 if a child aged 1 to 15 reduces frequency of meals	0.026	(0.160)	0.113	(0.317)				
N(Children)	267		275					

Standard deviations are in parentheses.

Table 3: Characteristics of Rescheduled and Non-Rescheduled Groups

	During Flood				Mean Difference
	Rescheduled		Non-Rescheduled		
	Mean	S.D.	Mean	S.D.	
Household Characteristics					
Monthly labor income (Tk)	1624	(1642)	2832	(5921)	*
Height of inundation at home (Feet)	0.06	(0.23)	0.02	(0.17)	
Grain storage (Tk)	643	(1125)	2332	(3692)	***
Deposit (Tk)	2639	(5728)	4964	(9785)	*
Jewelry (Tk)	2045	(3070)	6911	(11177)	***
Livestock (Tk)	3733	(6848)	7804	(11235)	***
Owned field (Tk)	72371	(117513)	156603	(312711)	**
Other productive assets (Tk)	2358	(4084)	7073	(27793)	
Males over 16	1.43	(0.75)	1.74	(1.01)	**
Females over 16	1.55	(0.71)	1.70	(0.88)	
Children under 16	2.05	(1.23)	1.97	(1.52)	
Dummy=1 if Hindu	0.09	(0.28)	0.11	(0.32)	
Distance to river (km)	2.48	(2.62)	1.68	(1.66)	**
Distance to paved road (km)	0.77	(0.78)	0.58	(0.53)	
Distance to group meeting (km)	0.23	(0.22)	0.19	(0.21)	
Age	46.48	(10.69)	48.92	(12.20)	
Education	2.29	(3.38)	2.56	(3.47)	
Dummy =1 if Female head	0.12	(0.33)	0.09	(0.29)	
Observations	58		90		
Individual Characteristics					
Dummy=1 if skip a meal	0.30	(0.46)	0.11	(0.31)	***
Age	24.82	(17.73)	26.94	(18.82)	
Education	2.63	(3.15)	3.01	(3.41)	
Dummy=1 if female	0.49	(0.50)	0.49	(0.50)	
Dummy=1 if married	0.43	(0.50)	0.49	(0.50)	
Observations	285		471		

Standard deviations are in parentheses.
*** 1% significant, ** 5% significant, * 10% significant, respectively.

Table 4: Distance to Group Meeting and MFI Characteristics

Whether member of major MFIs (Grameen Bank, ASA, BRAC)			
Major MFIs	Local MFIs	Mean Difference	p-value
0.220	0.189	0.030	0.144
(0.219)	(0.207)		
Whether the number of MFI group member is 10 and larger			
Large Group	Small Group	Mean Difference	p-value
0.212	0.213	-0.001	0.960
(0.231)	(0.211)		

Standard deviations are in parentheses.

Table 5: Determinants of Rescheduling (First Stage Probit)
Dependent Variable: Dummy =1 If Rescheduled Saving and/or Installments

	Coefficient	S.E.	Marginal Effect
Instrumental Variables			
Distance to group meeting	1.34**	(0.54)	[20.78%]
Quadratic term	-1.49***	(0.58)	[-23.09%]
Flood Damage and Asset Holdings			
Height of inundation at home (Feet)	1.15***	(0.34)	[17.84%]
Grain storage (Tk x10^3)	-0.22***	(0.04)	[-3.44%]
Deposit (Tk x10^3)	-0.004	(0.011)	[-0.06%]
Jewelry (Tk x10^3)	-0.06***	(0.02)	[-0.87%]
Livestock (Tk x10^3)	-0.01	(0.01)	[-0.17%]
Owned field (Tk x10^6)	0.43	(0.33)	[6.74%]
Other productive assets (Tk x10^3)	-0.003	(0.004)	[-0.05%]
Household Characteristics			
Males over 16	-0.12**	(0.06)	[-1.82%]
Females over 16	0.05	(0.08)	[0.71%]
Children under 16	-0.14***	(0.04)	[-2.18%]
Dummy=1 if Hindu	0.001	(0.300)	[0.02%]
Household Head Characteristics			
Age	0.003	(0.006)	[0.05%]
Education	0.02	(0.02)	[0.38%]
Dummy =1 if female head	-0.41*	(0.24)	[-4.98%]
Geographical Characteristics			
Distance to river (km)	0.07**	(0.03)	[1.12%]
Distance to paved road (km)	0.19*	(0.11)	[3.02%]
Constant	-0.57***	(0.31)	
H_0: Coefficients of IVs are zero	6.84**		
Observations	1461		
The number of clusters	238		

Cluster-adjusted robust standard errors are in parentheses, and marginal effects at mean are in brackets.

*** 1% significant, ** 5% significant, * 10% significant, respectively

Table 6: Rescheduling Effect on Individual Consumption (Second Stage Probit)
Dependent Variable: Dummy =1 If Reduce Frequency of Meal

	All			Landless		
	Coefficient	S.E.	Marginal Effect	Coefficient	S.E.	Marginal Effect
Dummy=1 if rescheduled	-0.83***	(0.29)	[-1.94%]	-0.76***	(0.16)	[-3.54%]
Flood Damage and Asset Holdings						
Height of inundation at home (Feet)	1.20***	(0.31)	[4.41%]	1.20***	(0.34)	[8.03%]
Grain storage (Tk x10^3)	-0.17***	(0.04)	[-0.64%]	-0.13***	(0.04)	[-0.86%]
Deposit (Tk x10^3)	-0.01	(0.01)	[-0.05%]	-0.02	(0.02)	[-0.12%]
Jewelry (Tk x10^3)	-0.07***	(0.02)	[-0.28%]	-0.13***	(0.04)	[-0.89%]
Livestock (Tk x10^3)	-0.02**	(0.01)	[-0.09%]	-0.02	(0.01)	[-0.12%]
Owned field (Tk x10^6)	-1.38	(1.72)	[-5.11%]			
Other productive assets (Tk x10^3)	-0.11***	(0.04)	[-0.40%]	-0.11**	(0.05)	[-0.74%]
Household Characteristics						
Males over 16	0.06	(0.08)	[0.22%]	0.04	(0.09)	[0.30%]
Females over 16	0.02	(0.07)	[0.08%]	0.09	(0.11)	[0.57%]
Children under 16	-0.07	(0.04)	[-0.26%]	0.01	(0.06)	[0.05%]
Dummy=1 if Hindu	-0.39	(0.34)	[-1.04%]	-0.94**	(0.47)	[-3.26%]
Household Head Characteristics						
Age	0.0002	(0.0065)	[0.001%]	-0.005	(0.009)	[-0.03%]
Education	0.02	(0.02)	[0.07%]	-0.04	(0.03)	[-0.29%]
Dummy =1 if female head	0.01	(0.26)	[0.04%]	0.18	(0.36)	[1.38%]
Geographical Characteristics						
Distance to river (km)	0.07***	(0.03)	[0.27%]	0.04	(0.03)	[0.25%]
Distance to paved road (km)	0.10	(0.10)	[0.39%]	0.08	(0.13)	[0.55%]
Individual Characteristics						
Age	0.005	(0.003)	[0.02%]	0.010***	(0.003)	[0.07%]
Education	0.01	(0.01)	[0.04%]	0.03	(0.02)	[0.19%]
Dummy=1 if female	0.07	(0.09)	[0.28%]	0.07	(0.14)	[0.44%]
Dummy=1 if married	0.19	(0.13)	[0.71%]	0.18	(0.14)	[1.21%]
Constant	-0.59	(0.40)		-0.69	(0.51)	
H$_0$: Coefficients of IVs are zero	6.84**			6.99**		
Observations	1461			721		
The number of clusters	238			215		

Cluster-adjusted robust standard errors are in parentheses, and marginal effects at mean are in brackets.

*** 1% significant, ** 5% significant, * 10% significant, respectively

Table 7: Heterogeneous Rescheduling Effect across Gender
Dependent Variable: Dummy =1 If Reduce Frequency of Meal

	Males			Females			Children		
	Coefficient	S.E.	Marginal Effect	Coefficient	S.E.	Marginal Effect	Coefficient	S.E.	Marginal Effect
Dummy=1 if rescheduled	-0.72***	(0.13)	[-0.53%]	-0.76***	(0.11)	[-2.48%]	2.18***	(0.20)	[11.13%]
Flood Damage and Asset Holdings									
Height of inundation at home (Feet)	2.02*	(1.12)	[2.47%]	1.06*	(0.59)	[5.21%]	-0.47	(0.67)	[-0.24%]
Grain storage (Tk x10^3)	-0.20***	(0.07)	[-0.25%]	-0.19***	(0.05)	[-0.96%]	-0.03	(0.06)	[-0.01%]
Deposit (Tk x10^3)	-0.06	(0.04)	[-0.07%]	-0.01	(0.02)	[-0.07%]	-0.01	(0.02)	[-0.003%]
Jewelry (Tk x10^3)	-0.05	(0.03)	[-0.06%]	-0.10***	(0.04)	[-0.49%]	-0.02	(0.05)	[-0.01%]
Livestock (Tk x10^3)	-0.02*	(0.01)	[-0.02%]	-0.03**	(0.01)	[-0.13%]	-0.01	(0.02)	[-0.01%]
Owned field (Tk x10^6)	-3.38***	(1.16)	[-4.12%]	-0.65	(0.72)	[-3.22%]	-1.20	(1.33)	[-0.62%]
Other productive assets (Tk x10^3)	-0.08	(0.06)	[-0.10%]	-0.07**	(0.03)	[-0.36%]	-0.24**	(0.11)	[-0.12%]
Household Characteristics									
Males over 16	0.12	(0.09)	[0.14%]	0.04	(0.09)	[0.18%]	0.16	(0.11)	[0.08%]
Females over 16	-0.02	(0.13)	[-0.03%]	0.07	(0.12)	[0.36%]	-0.09	(0.15)	[-0.05%]
Children under 16	-0.08	(0.08)	[-0.10%]	-0.02	(0.08)	[-0.09%]	0.02	(0.11)	[0.01%]
Dummy=1 if Hindu	-0.15	(0.49)	[-0.16%]	-0.11	(0.54)	[-0.52%]	-7.57***	(0.24)	[-0.62%]
Household Head Characteristics									
Age	-0.02**	(0.01)	[-0.03%]	0.002	(0.009)	[0.01%]	0.001	(0.013)	[0.0004%]
Education	0.02	(0.05)	[0.02%]	0.02	(0.03)	[0.11%]	0.02	(0.04)	[0.01%]
Dummy=1 if female head	0.28	(0.45)	[0.48%]	-0.06	(0.31)	[-0.30%]	0.42	(0.45)	[0.39%]
Geographical Characteristics									
Distance to river (km)	0.13**	(0.06)	[0.16%]	0.11**	(0.05)	[0.53%]	-0.07	(0.07)	[-0.03%]
Distance to paved road (km)	0.11	(0.16)	[0.13%]	0.13	(0.17)	[0.64%]	-0.39**	(0.18)	[-0.20%]
Individual Characteristics									
Age	0.02***	(0.01)	[0.03%]	-0.002	(0.004)	[-0.01%]	0.10***	(0.04)	[0.05%]
Education	0.01	(0.02)	[0.01%]	0.003	(0.028)	[0.01%]	-0.11	(0.07)	[-0.06%]
Dummy=1 if female							-0.02	(0.10)	[-0.01%]
Dummy=1 if married	-0.52**	(0.22)	[-0.89%]	0.28	(0.22)	[1.20%]	-7.11***	(0.32)	[-0.21%]

Constant	0.14	(0.55)	-0.68	(0.61)	-1.86***	(0.57)
H_0: Coefficients of IVs are zero	4.92*		7.12**		0.45	
Observations	461		458		542	
The number of clusters	80		80		78	

Cluster-adjusted robust standard errors are in parentheses, and marginal effects at mean are in brackets.

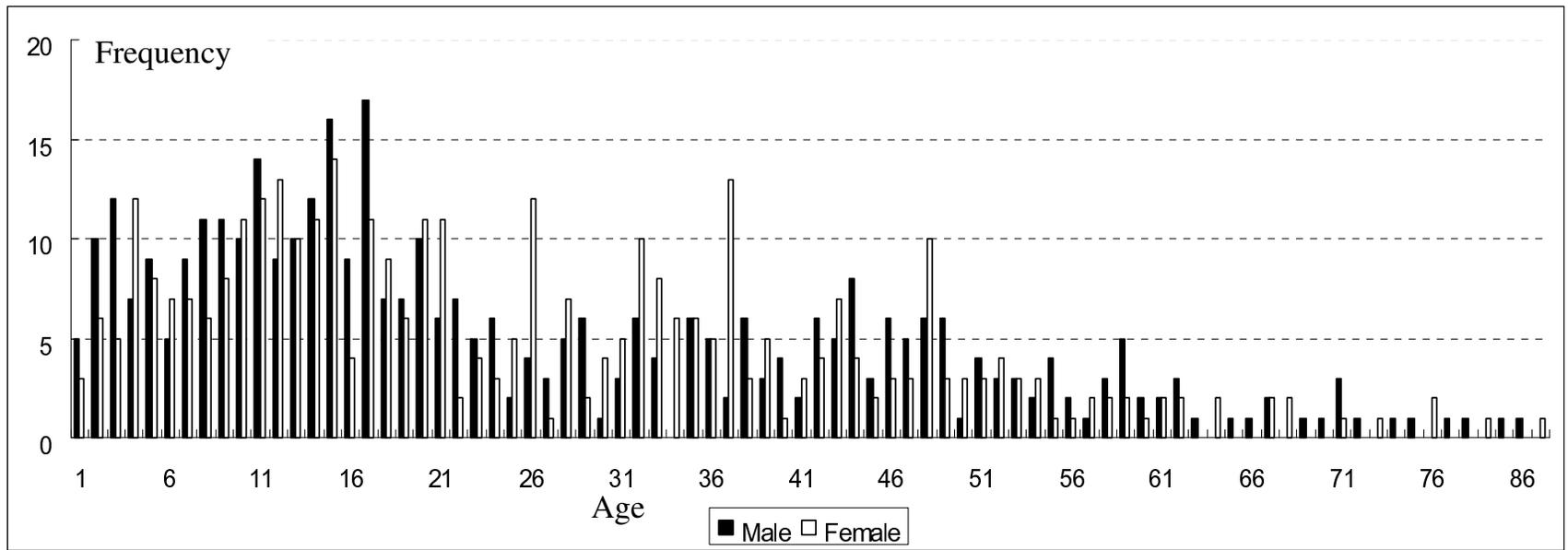*** 1% significant, ** 5% significant, * 10% significant, respectively
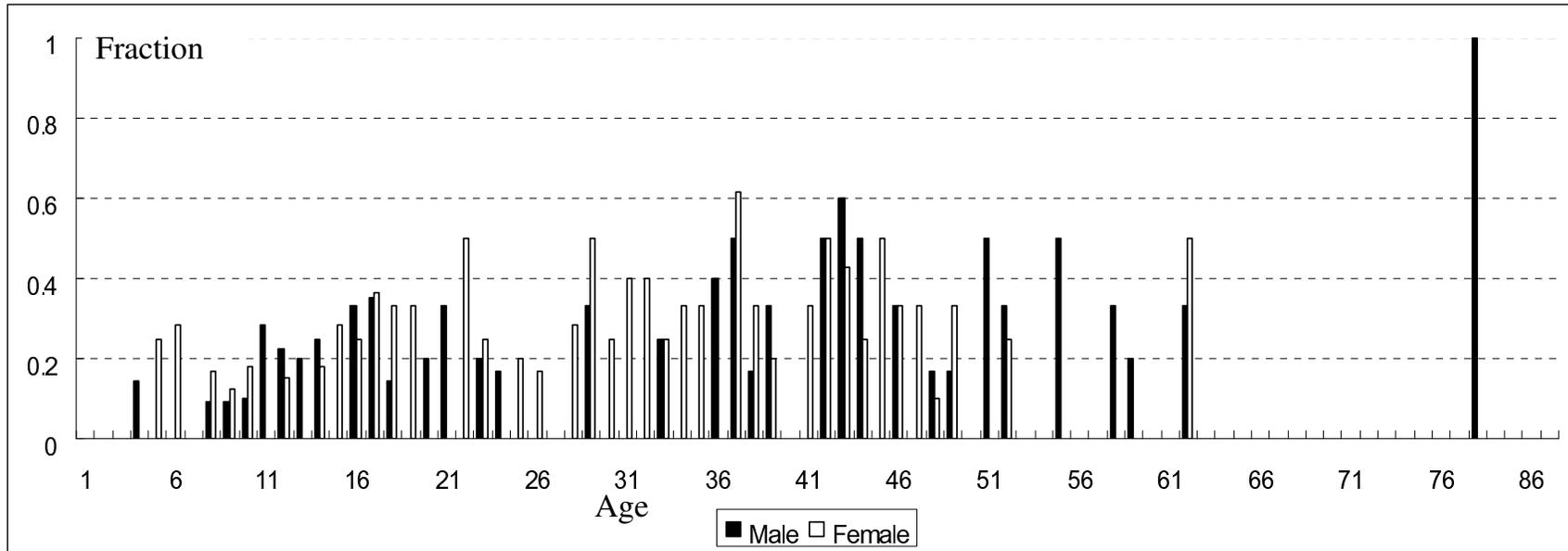
Figure 1: Population Histogram

Figure 2: Probability of Skipping a Meal during the 2004 Flood by Age