An escape from a poverty trap and the role of entrepreneurship:
Microfinance lending to the ultra poor in Bangladesh

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14:31

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Abstract The existing microcredit programs rarely lend to the ultra poor. With a randomised controlled trial in a rural, low income setting of northern Bangladesh, we assess the creditworthiness of the ultra poor and suitability of various debt contract designs to help them escape from poverty through productive investments. We use a stepped-wedge design over the key features of loans, i.e., small-scale sequential disbursement vs. lumpy upfront disbursement, with vs. without a grace period, and cash vs. in-kind loan with a managerial support program. Compared with the traditional microcredit, provision of large, upfront liquidity increases both repayment rates and net asset levels. This is consistent with the existence of an asset-based poverty trap which can be overcome by increasing the loan size. Provision of a grace period does not change the repayment rates or asset levels. We found that managerial supports induce participation of less experienced and poorer households to microfinance, yet resulted in similar repayment rates and asset accumulation as with other participants, indicating a further outreach to the ultra poor. For all households, labour incomes become larger towards the end of loan cycle while consumption stays the same, which we interpret as evidence of repayment discipline. Our main findings, a large, upfront disbursement results in faster asset accumulation ~~that~~ is suggestive of an escape from a poverty trap and managerial support programs induce the participation of the ultra poor, are generalisable to other rural areas with liquidity constraints.

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Revisions

Title and abstract:

1. Changed per comments.

Introduction:

1. Changed per comments.

Theory:

1. Changed for introducing partial depreciation. Added a figure for clarity but no qualitative changes overall.

Existing studies:

1. Not changed.

Experimental design:

1. Changed per comments.
2. Changed to: Please note the addition of "due to logistical limitations." I hope this addition is OK.

   > Among the traditional members, there were 24 members who received disbursements twice, not three times, due to logistical limitations.

3. Added the maturity extension:

   > Lastly, because of the severe flood damages caused on borrowers and the associated administrative delays in 2013, the repayment was halted in 2013 and resumed after one year in 2014. This resulted in an extension of loan maturity from 36 months to 48 months for all arms. This gave substantial leniency to the borrowers in terms of loan repayment burden.

   It is difficult to understand the impact of maturity extension. But the maturity extension itself needs to be clearly addressed...

Results:

1. Old Figure 6 (All IGAs) is dropped, because I found the reponse rates may not be uniform across arms. It is replaced with:

   > Correspondingly, the data confirms that the traditional arm borrowers hold a diversified IGA portfolio while only a small minority of non-traditional arm borrowers have a diversified portfolio. And its footnote, "Results are available from the authors upon a request."

   As for Kurosaki-san's question, we asked up to 3 IGAs at each loan disbursement. So a note that it is "up to 3 IGAs" should have been added to the old Figure 6, but I cannot be confident when it is asked. I decided to drop the figure as they were answered mostly by the traditional arm members, and there is (new) Figure 6 that gives the same message.

   IGA information used in the old Figure 6 seems to have been asked during the group meetings in conjunction with a loan disbursement. For example, in the captured data, IGA1 is placed next to 1st loan disbursement, IGA2 is placed next to 2nd loan disbursement. It is only the traditional arm members who received more than one loan. So I suspected there would be no reporting of 2nd or 3rd IGAs by the non-traditional arm members, but that was not the case. Some members do report IGA2 and IGA3. I presume that everyone was asked about their IGAs in the meetings, and everyone who wished to report 2nd or 3rd IGA could do so, but that may have been not uniformly or strongly enforced. (Abu-san: Is my understanding correct?)

Regardless of this understanding being correct/incorrect, we know that the traditional arm members as a group have a more diversified portfolio by looking at their first IGAs in FIGURE 6. This still gives us a way to show the different investment strategies between the traditional and non-traditional arm members. So I chose not to use the old Figure 6.

Conclusion:

1. Changed as per comments.

Appendix:

1. Changed various Table numbering issues and wrong/duplicated table footnote issues. Thank you very much, Kurosaki-san, for the helpful directions.
2. For the old Table B13, this is the right panel (non-attriting borrowers) of Table 4 in the main text, so I keep the old Table 13.
3. Regarding the reference to the variables whose p-values are slightly larger than 10%: I am following the concensus emerging in statistics (see `http://www.stat.columbia.edu/~gelman/research/unpublished/amstat.draft2.pdf`), a bit slowly in economics but found in AER, that one should not abruptly change how one treat the relationship between a covariate and the outcome before and after 5% or 10%, because p-values are continuous variables. The point is, 4% and 6% (strong), 9% and 11% (marginal), 10% and 15% (marginal at best) are not very different. I tried not to use "statistical significance" but used p-values explicitly. Admittedly, my reference to covariates around $p \simeq .1$ may lead to strong statements. I can drop them and limit the analysis to $p \simeq .05$ or smaller. The cost of doing so is to lose the interpretation that cattle arm induced more disadvantaged individuals.

   I agree that the strength in permutation tests is to show the lack of correlates (in rejection and attrition). However, given that there are seemingly systematic correlates of participation [(non)rejection] and (non)attrition, I wrote one interpretation of the sorting mechanism. Again, use of variables in pointing the correlation that have not so small p values deserves a stronger reservation. To do so, I added as "weakly hinting":

   On page 38, Appendix B:

   In TABLE B13, we compare if the cattle arm participants (borrowers) differ from participants in other arms at the baseline. It is worth noting that partcipants of cattle arm differ from other arms in having less cattle rearing experience as observed in smaller initial cattle holding (p value = .156) and in having lower net asset values (p value = .058), weakly hinting that the cattle arm's managerial support programs may have encouraged participation of inexperienced or lower asset holders.

   To beef up the interpretation, I also wrote:

   On page 40, Appendix C:

   In TABLE C6, we compare nonattriters of cattle and large grace arms, whose difference is efffectively the presence of managerial supports that the former provides. Comparing against the large grace arm, nonattriting borrowers of the cattle arm are more exposed to the flood (p = .055), have less productive assets (p = .003), have lower net asset values (p = .046), and have fewer livestock (p = .137). This shows that the smaller livestock holders or less experienced individuals are encouraged to participate and continue to operate in the cattle arm that has a managerial support program, with all other features being equal. This is consistent with our analysis of participation in TABLE B13 which weakly hints that the cattle arm's managerial support programs may have encouraged participation of inexperienced or lower asset holders. This also underscores our interpretation that the current impact estimates may be downward biased, if any, as people who would otherwise attrit or reject in cattle arm stayed on. This result is confirmed with lower p values due to a larger sample size when we compare the nonattriters between cattle arm with other arms in TABLE C7. At the baseline, cattle arm nonattriting borrowers have smaller baseline livestock holding (p value = .016) and smaller baseline net asset holding (p value = .007) than other arms' nonattriting borrowers.

So, my strategy is to show different weak angles that point to a common interpretation.

4. Corrected a bug that produced inconsistency between number of observations N and T=2, T=3, T=4. Also added the following text at the beginning of D:

   In this section, the ANCOVA estimates on various outcomes using (2) are presented. In each table, the first column shows the covariate names and their means and standard deviations in the second column in the sample of the richest specification of the table. Specification (1) is OLS estimates on the intercept, $\mathbf{d}_i$, and its period interactions. This is intended to provide a reference to ANCOVA estimates shown in the specification (2) onwards. Specification (2) follows the most basic specification under (2). From (3), we progressively add more covariates to control for the differences in initial conditions in an attempt to get more precise ANCOVA estimates. In the figures (FIGURE 4, FIGURE 7, FIGURE 10) shown in main texts, we omit OLS estimates of specification (1).

   We annotate the number of periods that a household is observed with T. The total number of households is shown for each values of T. T=4 indicates the number of households with complete panel information, T=3 indicates number of households observed three times, T=2 indicates the number of households observed twice. N indicates total number of observations used in ANCOVA estimation, or N=1×(T=2)+2×(T=3)+3×(T=4).

   For FIGURE 4, FIGURE 7, we show cumulative impacts of the arm or functional attribute k relative to the traditional arm as given by b_{2k}, $b_{2k} + b_{3k}$, $b_{2k} + b_{4k}$ for periods 2, 3, and 4. In FIGURE 10, we show contemporaneous impacts relative to the traditional arm as given by b_{2k}, b_{3k}, b_{4k} for periods 2, 3, and 4.

5. Added introductory texts that before TABLE C5.

   For the microfinance institutions (MFIs), attrition of the loan receiving members poses a threat to their business continuation. Financial institutions often use observable characteristics, such as collateralisable assets, and easily surveyed chracteristics, such as job experiences and schooling of borrowers, and are likely to lend if the assets levels are greater and the borrowers have relevant job experiences and more schooling. We examine if the relationship of having "less favourable" values in these characteristics and attrition is mitigated under various loan characteristics. Conditional on receiving a loan, TABLE C5 compares attriters and nonattriters of all arms. It shows nonattriters at the baseline have larger values in livestock and greater number of cattle, and are less affected by the flood, which conforms the conventional wisdom of lenders in using these aspects in their loan decisions.

6. Dropped old FIGURE D1.

7. Separated repayment tables in Appendix E.

Requests for Abu-san

1. (From Kurosaki-san's comments) *p.26, 4th para; p.27, Figure 11, row captions; Appendix Tables D11-D16: Terms for education stages We divide the level of education stages into those for ages 05-12, ages 13-15, and ages 16-18. The last category is called "college" but it is a short for "intermediate college", which is regarded as the upper secondary education, not the tertiary education. After finishing this level, Bangladesh students enter universities or "degree colleges" for bachelor degrees. Therefore, we need to replace terms for the three education stages as "primary, "lower secondary", and "upper secondary", and need to refrain from using "college education" or "tertiary education", if the impact is shown for these levels.

However, the things are more complicated than this, because we use the baseline education stages for classification. At Round 4, age 17 or 18 at the baseline should be at the tertiary education if they are enrolled. However, at Round 2, age 16 or 17 at the baseline should be still at the upper secondary education if they are enrolled. So it is very difficult to decide about the terminology. I would like to know Abu-san' s comments on this issue.

2. Our sample is drawn from the population of river island villages in Northern Bangladesh. Abu-san, please provide the regional characteristics of the area, esp. poverty, using CLP/TUP program data and reports.

3. A leading proponent is the nobel laureate Professor Mohammad Yunus who claims that "we are all entrepreneurs." (Yunus and Jolis, 2003), (Cosic, 2017) [Abu-san: Can you get the exact page number(s) in his book?

4. As we surveyed the area before the study, we note several NGOs provide a relief credit to flood victims, but not regular finance. In selecting the study site, we purposefully chose the population without access to any financial institution.[Abu-san: A better description for this?]

Contrasts with Balboni et al. (2020)

Balboni et al. (2020) collect data from transfer recipients and control group of BRAC's TUP. Using the recipient data, they estimate the equation of motion $K_{t+1} = \phi(K_t)$, show the S shape, and compute the threshold asset level $\hat{k}$ that separates the low and high equilibria. They then show that individuals who are above $\hat{k}$ increase the assets while individuals below it decrease them. The variations of initial asset level allows the identification of bifurcation as these variations effectively allocate inidividuals to below and above the threshold. Anticipating the endogeneity of initial asset levels to asset growths, they show that initial asset levels have no correlation with post intervention asset growths after conditioning on the above-threshold dummy. This is suggestive evidence that the unobservables that correlate with initial asset levels are exogenous to post-transfer asset increases.

In the poverty trap dynamics, the key is the low returns among the low k holders. The returns to high k holders are qualitatively similar in the covex and concave production functions so long as they are above the 45 degree line. Why are they low? Authors show the baseline vehicle ownership is statistically smaller by 4% (but not for other assets, total assets are not tested) for the below threshold households, and the differences relative to the above threshold households grew after the transfer receipt. They conclude that the complimentary assets serve as the fixed inputs of production, and the lack thereof withholds households from escaping the poverty trap.

their strength Large sample size, precise asset and labour data, direct estimation of equation of motion, and associated tests of multiple equilibria.

our strength Experimental variations in contract design (Upfront, support programs), use of IGA information that allows the (poverty trap) interpretations without structural estimation, reference to market costs/prices.

Contrasts with Banerjee et al. (2019)

Banerjee et al. (2019) use regionally matched-pair data under staggered branch opening of an urban MFI. They divide the sample into borrowers with a prior business experience (GE) and others (non-GE), and show that impacts are persistently positive for GE borrowers but not for non-GE borrowers. With structural estimation, given a talent distribution, they interpret this as evidence of a poverty trap through a liquidity constraint. They also note the impact heterogeneity is due to MFI selection but not talent heterogeneity, as pre-MFI entry businesses are more profitable than post-MFI entry businesses of the same firm age.

their strength Urban setting, contrast of long-run versus short-run impacts, data on business outcomes, gross substitute/compliment with demand for informal loans, explaining the lack of average impacts by finding the subpopulation with superior talents and contrasting with other subpopulation.

our strength Ultra poor population, rural and fragile setting, selection on entrepreneurship without affecting outcomes, Upfront leads to faster asset accumulation and higher repayment rates.

What the three papers agree

- A need for larger lending than regular MF.
- Existence of a poverty trap.
- Evidence of a nonconvex production set as a source of poverty trap.

Contents

I Introduction

Since the microcredit became popular in Bangladesh in the late 1980's, the number of borrowers increased rapidly throughout the world. According to over 3700 microfinance institutions (MFIs), there are estimated 204 million borrowers around the world in 2013, of which 110 million are the poor borrowers whose incomes are below the national poverty line (Microcredit Summit Campaign, 2015). The outreach to the extremely poor population or the *ultra poor*, however, is arguably slow in comparison.[*1]

There are demand and supply side reasons behind the slow outreach to the ultra poor. On the demand side, the ultra poor borrowers may not be entrepreneurial enough to demand credits for production, or may face an inferior production possibility than the wealthier borrowers. On the supply side, MFIs may perceive the ultra poor as riskier than the moderately poor, or their loan size may be too small to justify the fixed transaction costs while the lender is constrained to keep the interest rate low to avoid adverse selection and moral hazard.

As the rigorous evaluations of microfinance progress, it has become clear that the impacts are not uniformly positive. A group of influential research has shown that only a subgroup of borrowers, those with prior experiences or high ability, have positive returns from borrowing (Banerjee et al., 2015c; McKenzie, 2017; Buera et al., 2017; Banerjee et al., 2019). This is in a stark contrast to the popular belief in microfinance that anyone can become a successful borrower.[*2] Logically, there must be some minimal level of entrepreneurship to participate and continue as a borrower in any form of finance. Then, the question is, what sort or how much of entrepreneurship is required in microfinance?

To shed light on the required level of entrepreneurship, we took this question to the Northern Bangladesh where a flood threat limits the leading production process to be least complex: livestock rearing. There are residents who own livestock so its know-how is semi-public knowledge. The required entrepreneurship, then, is to gather all the pieces of information, decide to raise livestock, form a production and a sales plan, and implement. This is the definition of entrepreneurship we use in our paper. In our intervention, we provided a heifer to a selected subgroup of participants as an in-kind loan and bundled it with training and consultation services to make sure the borrower has the right cookbook to follow. Under this treatment, the entrepreneurship to decide what to invest and how to come up with a solid plan is no longer a necessity.

In our study, we compare the borrowers who were provided with such knowledge and the managerial supports with the borrowers who were not. By randomising the offers, we identify the causal impacts of not requiring the entrepreneurship on both the participation and the outcomes. We find that our managerial support program, that helps fill the gaps in entrepreneurial skills, induces more residents with fewer experiences in livestock production and a lower asset level to participate while keeping the mean outcomes the same as in the comparison group.

There is yet another motivation for our study. In bridging these two arms that are different in multiple aspects, we introduced intermediate arms. At the end, we were left with an arm of conventional microcredit that disburses small upfront liquidity for three times, and several arms with large upfront liquidity that disburse the equivalent total amount once under three period maturity. This gives an opportunity to test if the upfront liquidity provision, while keeping the total loan size and maturity equivalent, matters in the future asset levels. If the production technology is nonconvex and if there

[*1] MF is not successful in reaching out to the poorest of the poor, or the ultra poor (Scully, 2004). Empirical evidence in Yaron (1994); Navajas et al. (2000); Rahman and Razzaque (2000); Armendáriz-Aghion and Morduch (2007) supports this claim. Some authors discuss the tradeoff between sustainability and outreach for microfinance institutions (MFIs) Hermes and Lensink (2011); Hermes et al. (2011); Cull et al. (2011).

[*2] A leading proponent is the nobel laureate Professor Mohammad Yunus who claims that "we are all entrepreneurs." (Yunus and Jolis, 2003), (Cosic, 2017) [Abu-san: Can you get the exact page number(s) in his book?

is a credit constraint, it gives rise to a poverty trap which can result in larger asset accumulation when provided with large upfront liquidity. While we do not directly test for a poverty trap, the investment choices strongly indicate its existence: Only borrowers without a frontloaded loan opted for smaller, multiple investments. Our experimental design tests if the upfront liquidity provision breaks a poverty trap, under the assumption that there is one, and found that it results in larger asset accumulation without affecting the repayment rates by 48.9 to 52.3 percentage points.

Our study follows the literature of microfinance debt contract design as hallmarked in Field et al. (2013) who found a grace period induces more risk taking and subsequent loan delinquency. Under our setting of limited production choices, it is irrational to invest in riskier assets, such as goats, when the designed grace period suits the heifer cash flow and a heifer's risk-return profile is considered to be Pareto-dominating. A strategic default is also more difficult in our setting because the number of formal credit suppliers is limited, which is probably zero,[*3] and relocation requires a costly boat ride and financially reliable mainland contacts. The repayment rates in our study turned out to be no lower than the comparable microfinance schemes (Banerjee et al., 2015a).

Our study is closely related to a large scale cattle transfer study conducted in the neighbouring area (Bandiera et al., 2017; Balboni et al., 2020). The targeted population of their study is similar to ours, yet our study population resides on less stable terrain, are more exposed to flood and water logging, are considered to be less well connected to the market, are equally less trained, and are probably poorer. The chance of survival for each investment project is expected to be no higher. More prominently, our study is commercially oriented: It uses a loan than a transfer, and charge market level fees to all the services provided.

We find that borrowers of the arm with managerial supports have lower cattle holding, 0.22 while borrowers from other arms have .308 (p value = .156), and smaller net asset values BDT 5603 in contrast to BDT 8204 in other arms (p value = .058). The outcomes and repayment rates are no lower than with the other arms, implying the managerial supports had a further outreach without compromising the outcomes. We also find that, relative to the traditional microfinance lending, the upfront liquidity provision increases the narrow net assets by 1.06 times the baseline standard deviation (denoted hereafter with σ) in the second year, 1.2σ by the end of fourth year, and the number of cattle holding by 0.59σ in the second year, and 0.58σ by the end of fourth year. These results hold broadly with other various definitions of assets and cattle rearing experiences.

We consider our finding is generalisable to rural areas where small scale livestock production is prevalent. While there is a caveat that the domain of our results is a low level herd size and the entrepreneurial capacity to hold a larger herd size can be different from what our study suggests,[*4] the successful livestock transfer program in the neighbouring areas (Bandiera et al., 2017; Balboni et al., 2020) and our results indicate that supporting asset accumulation through large livestock has wide applicability in assisting the rural ultra poor to escape from poverty.

In the following section, we summarise the existing literature. Section II gives the link to the previous literature. Section III gives the brief account of background of study site. Section VI lays out the details of experimental design. Section VII explains the estimation strategy. In section VIII, we provide the experimental results and contents of income generating activities (IGAs). Section IV shows a possible mechanism of poverty trap that our target population is under. Section IX discusses the interpretation of results.

[*3] As we surveyed the area before the study, we note several NGOs provide a relief credit to flood victims, but not regular finance. In selecting the study site, we purposefully chose the population without access to any financial institution.[Abu-san: A better description for this?]

[*4] Our study matches the scale of lower equilibrium of Lybbert et al. (2004) which is much smaller than the scale of the high equilibrium of around 50 herd size.

II A brief review of existing studies

There are four aspects in our study that relate to the existing literature: The role of entrepreneurship in microfinance impacts, variations in debt contract design, empirical assessment of a poverty trap, and targeting the ultra poor. We will discuss these in turn.

Much has been discussed about the poverty reduction impacts of microfinance in the early days of microfinance studies (Pitt and Khandker, 1998; Morduch, 1999). Recently, doubts are cast on the magnitude of microfinance impacts (Banerjee et al., 2015a; Duvendack and Mader, 2019; Meager, 2019) while asset grants (capital injection) remain to show high returns (de Mel et al., 2008; de Mel et al., 2014; Fafchamps et al., 2014; Bandiera et al., 2017). [*5] Lack of mean impacts in microcredit led researchers to look for a particular subgroup which shows impacts, or impact heterogeneity (Banerjee et al., 2017): Borrowers with prior experiences or high ability are shown to have higher returns (Banerjee et al., 2015c; McKenzie, 2017; Buera et al., 2017; Banerjee et al., 2019). The studies with a focus on experienced members or existing firms can be considered as looking at impacts on the intensive margins. In contrast, our study is focused on an isolated greenfield population, or poverty impacts on the extensive margins, which are relatively less studied.

The fact that experienced members gain larger benefits from microcredit is consistent with the positive impacts of capital grant programs on existing firm owners. Whether such experience is trainable for novice entrepreneurs remains unsettled. A recent microfinance study indicates that there is an advantageous selection through talents in the existing firm owners, so trainability is called into a question (Banerjee et al., 2019). A growing body of management capital literature in developing countries is insightful yet most of the research is necessarily geared to existing firms, so it does not inform much on how one can assist novice entrepreneurs.[*6] Karlan and Valdivia (2011); Bruhn and Zia (2011); Argent et al. (2014) are the exceptions, but results and quality of evidence are mixed and inconclusive. The current study explicitly tests if the entrepreneurship matters in microfinance by using a heifer lending with a manegerial support program. We also examine the self-selection on entrepreneurship into microcredit, which we find to exist.

The corporate finance devotes a substantial part of its field in understanding the consequences of contract designs on entrepreneur's incentives. Field et al. (2013) was the first to examine if the traditional lending style of microfinance inhibits the spawning of entrepreneurship by experimentally allocating different types of debt contracts. As we will disscuss in the Section VI, our study follows the similar strategy. In an attempt to tease out the impacts of entrepreneurship, we introduced longer maturity and a grace period in other arms. While there was a strong concern among practitioners that a grace period induces untruthful borrowing, there was no alternative in borrowing other than relatives and money lenders due to ruralness and isolation. This gave us flexibility in designing the debt contracts. Similar to Beaman et al. (2015) who redesigned the repayment schedule to adapt the borrower's cash flow profile (repay after harvest), we designed the debt contract to best suit the cash flow profile of the most popular investment project in the area, rearing a heifer. Our study exemplifies the economic gains from designing the debt contract to match the presumed investment

[*5] This is due partly to insufficient statistical power (McKenzie and Woodruff, 2013). Banerjee et al. (2015a) collects six studies of microfinance lending impacts. They also point the lack of statistical power due to low take up while noting more able and experienced borrowers saw larger "transformative effects." In the current study, in contrast, the take up rate is relatively high at 74.32%, of which 5.16% is lost to the flood.

[*6] Bruhn et al. (2018) shows intensive management consulting services to the small scale firms in Mexico resulted in sustained improvements in management practices which led to higher TFP and larger employment. Others also show effectiveness (Calderon et al., 2011; Berge et al., 2012; Bloom et al., 2013) while others do not (Bruhn et al., 2012; Karlan et al., 2015). McKenzie and Woodruff (2013) put them as: These managerial impacts studies are too different to compare, in terms of population, interventions, measurement (variables, timing), and most importantly, implied statistical power in the design.

choices in microfinance.

Another strand of the literature related to our study links capital grant effectiveness with the production set nonconvexity. Theories base lumpiness and credit market imperfection as keys to a povety trap (e.g., Galor and Zeira, 1993). When the production set is nonconvex, a small scale transfer may not lead to a sustained increase in income, as it can be either consumed or invested to a technology with decreasing marginal returns that brings back to the original income level (i.e., the lower equilibrium of a poverty trap).

Despite its popularity as a theory, the empirical evidence of a poverty trap is mixed. Kraay and McKenzie (2014) note that a poverty trap finding is rare, while Barrett et al. (2016) state the otherwise and there is overwhelming evidence.[*7] Interestingly, however, they both agree that, when there is a range of assets and production opportunities, it is inherently difficult to emipirically single out a particular poverty trap. The latter authors note that existing evidence comes mostly from remote and isolated areas with a single primary production opportunity and an associated asset. Our study is no exception. It comes from a remote and isolated area of northern Bangladesh where the single most important production opportunity to increase income in otherwise subsistence-oriented paddy producing villages is livestock production.

An earlier finding of a poverty trap includes the cattle herd size dynamics of Southern Ethiopian pastoralists that indicates existence of a poverty trap over a 17 year recall period (Lybbert et al., 2004). More recently, Balboni et al. (2020) estimate the equation of motion for assets and show the direct evidence of a poverty trap among the recipients of a large scale transfer program targeted in the neighbouring areas of our study site. The source of nonconvexity is cattle and the complimentary assets (vehicles) at the baseline which serve as a fixed input that the ultra poor cannot afford. Similar to these studies, our study examines the nonconvexity of a higher-return production set. Our study regresses the future asset values on the current asset values and intervention dummies, thereby adding evidence, in the Barrett et al. (2016)'s terminology, using the *direct method*. By complementing this estimated result with the fact that borrowers purchase cattle only when large upfront liquidity is provided, we conclude that there is a poverty trap. In our study, the source of nonconvexity is the price of a heifer that is about three times the price of a goat. We also show that frontloading the liquidity in lending is effective in escaping the poverty trap.

Lastly, selecting the ultra poor as the population to provide supports have often involved free consultation/training and transfers in the past. A handful of studies on ultra poor transfer programs report sustained increase in assets and incomes (Blattman et al., 2014; Banerjee et al., 2015b; Blattman et al., 2016; Haushofer and Shapiro, 2016). A transfer program in the Northern Bangladesh shows an occupational change and an income increase (Bandiera et al., 2017) and long-run asset accumulation (Balboni et al., 2020). In an attempt to test commecial viability, our experimental design makes a reference to markets. It uses loans rather than transfers, and any training and consulting components charge a fee for services. The resulting repayment rates are not lower than the majority of representative microfinance programs, and we also find significant accumulation of assets. Our study can be considered as an example of market based interventions that can play a role in ultra poor graduation programs.

III Background

The study area is in the river island, known as *chars* in Bengali, of northern Bangladesh in Gaibandha and Kurigram districts. Chars are formed by sediments and silt depositions and are

[*7] Kraay and McKenzie (2014) also note that upward transition from one poverty trap to another may negate the notion of a trap, while Barrett et al. (2016) base their affirmation by counting both the direct asset dynamics and the indirect inference that tests the behavioral responses that are consistent with poverty traps. See also Carter and Barrett (2006); Barrett and Carter (2013) for earlier evidence and discussions.

prone to cyclical river erosions and floods. Chars are not stable in size and even in existence, and episodes of their partial or complete erosion or submerging are quite common. Chars accommodate ultra-poor inhabitants who are forced, as a desperate attempt for survival, to relocate across islands due to river erosion and floods.

In the study area, the asset, a heifer, is the prime investment choice. A heifer needs to be at least two years old to start lactation.[*8] Rearing costs are higher for cattle as it requires fodder while a goat will eat the bushes. Cattle requires vaccination shots when a goat is usually left unvaccinated. Reproductive capacity of goats are high.[*9] However, in comparison with cattle, their higher reproductive capacity and lower rearing costs are more than offset by the elevated morbidity and mortality risks,[*10] and a less frequent cash flow.[*11] In comparison with smaller livestock such as goats, cattle is more versatile in flood-prone areas. Residents also report that a goat herd is less mobile than single cattle when they are forced to evacuate during the flood. All of these considerations prompt residents to opt for cattle when they can afford it, and do not expand the herd size of goats, which are both confirmed in our data.

IV Theory

In this section, we use a simplified version of Galor and Zeira (1993) to illustrate a theoretical framework to aid the interpretation of the empirical finding that asset accumulation is faster while the repayment rate is higher for upfront lending. Let us consider that there are two production sets called 'goats' and 'cattle.' Both sets are nonconvex with fixed inputs as shown in Figure 1 (top panel). In the top panel, the current period per capita asset size in monetary units k_t is shown on the horizontal axis, the current period production in monetary units y_t is shown on the vertical axis. For production set $j = \{\text{goats, cattle}\}$, the production becomes positive only after k_t becomes greater than its fixed input portion $\underline{k}_j \in \mathbb{R}_{++}$. The production after $\underline{k}_j$ follows a decreasing return to scale technology.

In the two bottom panels, period t per capita asset size in monetary units k_t is given on the horizontal axis and the period $t+1$ per capita asset size in monetary units k_{t+1} is given on the vertical axis. In the bottom left panel, taking cattle production as an example, saving out of production is given by the dotted line $sf(k_t)$ with a fixed saving rate $s \in (0,1)$. Saving is zero for the flat segment, and becomes positive once the production becomes positive. For $k_t > \underline{k}_{\text{cattle}}$, the saving traces the cattle production set after rescaling with the saving rate s, or $sf(k)$.

The next period net per capita asset size is given by the sum of saving and carry over asset net of depreciation (including mortality) $(1-\delta)k_t$. The depreciation rate $\delta \in (0,1)$ is assumed to be constant. To keep the figure being overly complicated, the depreciation rate is assumed to be common between

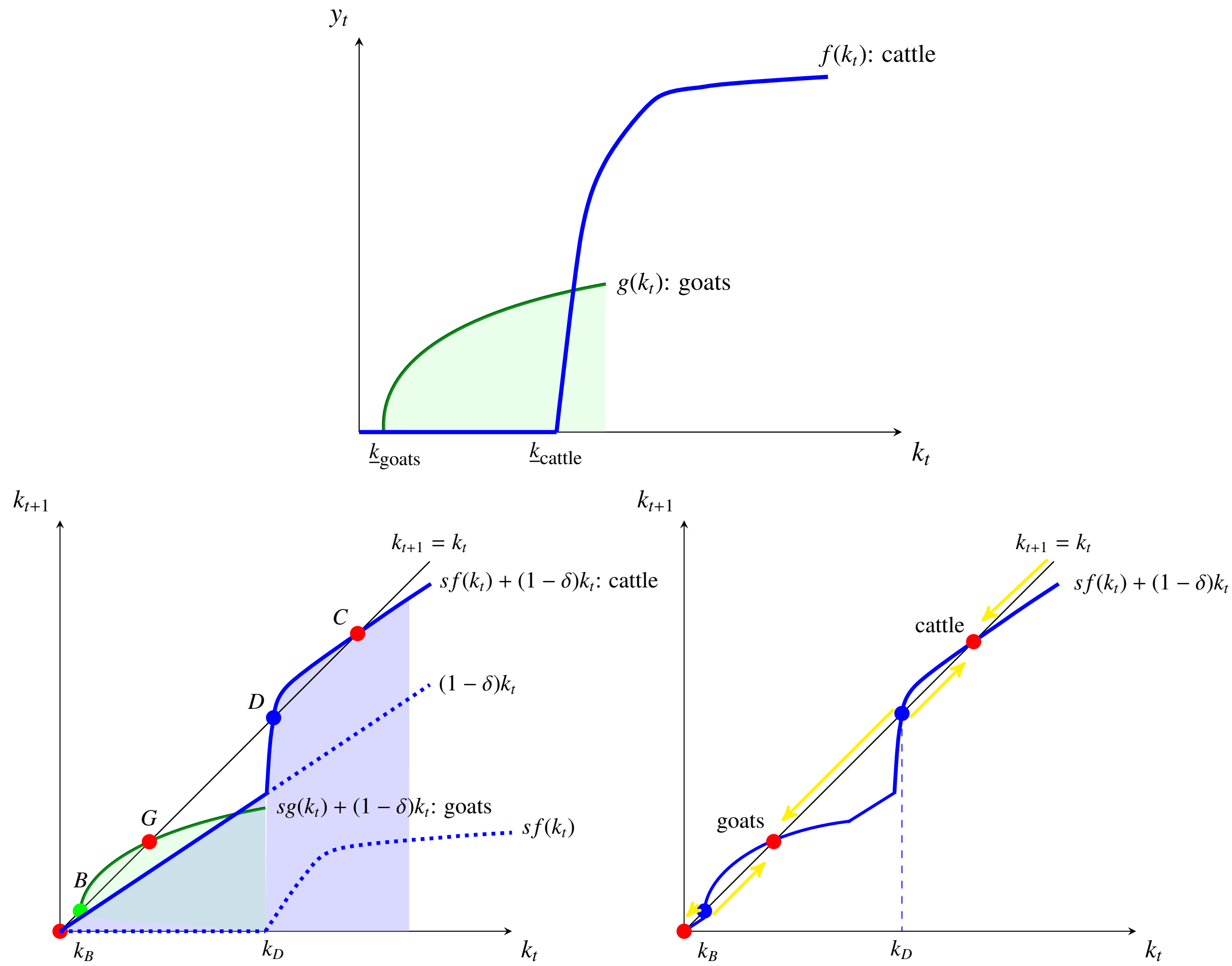
[*8] They typically need to be about 15 months old to be ready for insemination and takes about 9.5 months to deliver a calf as it starts lactation, or the total of about 2 years.

[*9] Parity size approaches to 2 at the third birth, and the birth interval is about 200 days (Hasan et al., 2014). An indigenous cow has a birth interval of 375 to 458 days (Hasan et al., 2018), resulting in about 2 years for gestation and calving interval (Habib et al., 2012) with the mean lifetime births of 4 (Hasan et al., 2018, Table 1).

[*10] Indeed, morbidity of goat kids ranges from 12% (Mahmud et al., 2015) to more than 50% in some diseases (Nandi et al., 2011, Table 5), while cattle morbidity is around 22% (Bangar et al., 2013). Goat kid mortality ranges from 6% (Mahmud et al., 2015) to 30% (Paul et al., 2014, Table 5) (Ershaduzzaman et al., 2007). Heifer mortality is between 5% (Hossain et al., 2014, p.332R) to 10% (Alauddin et al., 2018). Higher morbidity of goat kids partly reflects their eating style that uses lips rather than tongues (as cattles do) and vulnerability to logging water.

[*11] The produce of goats is mostly meat and their milk is seldom marketed. A meat market requires a cluster of relatively high income earners, usually located far from river islands, and the demand is highly seasonal. In contrast, cow milk can be marketed locally with stable demand, the lactation length is 227 days, and milk yield is 2.2 kg per day (Rokonuzzaman et al., 2009).

Figure 1: A poverty trap with goats and cattle



Note: In the top panel, the current period per capita asset size k_t is on the horizontal axis, the current period production y_t is on the vertical axis. For production set $j = \{\text{goats, cattle}\}$, the production becomes positive only after k_t becomes greater than its fixed input portion $\underline{k}_j \in \mathbb{R}_{++}$. The positive production portion follows a decreasing return to scale production function for each j. In two bottom panels, period t per capita asset size in monetary units k_t is given on the horizontal axis and the period $t+1$ per capita asset size in monetary units k_{t+1} on the vertical axis. In the bottom left panel, the production function for cattle $f(k)$ is multiplied with a fixed saving rate s and is added current herd size net of mortality $(1-\delta)k_t$ that is passed on to the next period. The depreciation rate δ is applied in the fixed cost segment. Similar description applies to the goat production function $g(k_t)$. Saving rate and depreciation rate are assumed to be common with the cattle production. The bottom left panel shows each production sets, the bottom right panel shows the contour of two production sets. Red points are stable equilibria, blue points are unstable equilibria.

the cattle and goat production. Carry over asset net of depreciation is given as the linear slope segment next to the origin. Once the production becomes positive, saving out of production is added to the linear carry over asset line, which forms an S-shaped line as depicted with a thick blue line. This line has two intersections, C, D, with the steady state line $k_{t+1} = k_t$. As shown in the bottom left figure, when the current asset level is greater than k_D, the asset level corresponding to the intersection D, the production eventually reaches C, a steady state where the per capita asset size is constant, or $k_{t+1} = k_t$. If the current asset level is smaller than k_D, the producer will not choose to invest.

Similarly for the goat production, there is much smaller fixed inputs and production, hence smaller saving $sg(k_t)$. The shape of next period net per capita asset size is similar with the cattle, only smaller. We note from the previous section that the returns to goats net of mortality and the steady state goat asset size are smaller than the cattle in the region depicted in Figure 1. We also note that a goat investment, when compared to a heifer investment, requires smaller upfront costs but has an infrequent income stream, faces a more limited local demand, shows vulnerability to logging water, all pointing to smaller investments and their returns. We will use these points to assume that the fixed costs and steady state production level are smaller for goats than cattle.

For simplicity, we assume that all individual has an asset no smaller than k_B. Then, when there is only a goat production technology, individuals eventually reaches the point G. When the cattle production technology is added to the picture, there is no change in the equlibrium for individuals whose initial assets are in $[k_B, k_D)$. For individuals with initial assets in $[k_D, \infty)$, one chooses cattle, because the resulting income level is higher, and eventually arrive at the steady state C.[*12]

Over the domain of $k_t \in [0, \infty)$, the production possibility frontier, or the contour of the union of two production sets, becomes M-shaped (BOTTOM RIGHT PANEL). Under the configuration depicted in the figure, there will be five equilibria of which three are stable. Ruling out the zero equilbrium as irrelevant, one is left with two stable equilibria, named as goats and cattle in the figure.[*13]

Formally, one requires the production set $j = \{\text{goat, cattle}\}$ to satisfy: there exists $\underline{k}_j > 0$ that the production is zero for input $k < \underline{k}_j$ and is strictly positive for $k \geqslant \underline{k}_j$. We assume the production set exhibits decreasing returns to scale for $k \geqslant \underline{k}_j$. Let the contour of the production set be $f_j(k)$. Assume for expositional simplcity that the saving rate s and depreciation rate δ are fixed. Further assume that there exists $k_D > \underline{k}_j$ such that $sf_j(k) + (1-\delta)k > k$ for $k \in (k_D, k^*)$, with $k^* > k_D$ is a fixed point $k^* = sf_j(k^*) + (1-\delta)k^*$. Under these assumptions, for j, there exists two intersections between the steady state line, one unstable and the other stable equilibria.[*14]

In light of this argument, a loan that is larger than k_D allows individuals in the goat equilibrium to transition to cattle production and arrive at the cattle equilibrium. If the lending market is competitive, the interest rate is the same as the return on capital and thus lending, not a transfer, suffices for the transition, so long as the upperbound of the loan size is no smaller than k_D. The entire region depicted in the diagram is considered as in the realm of poverty, so it shows a poverty trap within poverty (i.e., goat as ultra poor and cattle as moderately poor).

In the empirical section, we followed Bandiera et al. (2017) in interpreting the lower repayment rates and smaller cattle holding for a smaller upfront loan size as evidence consistent with a poverty trap with a nonconvex production technology.

V Study sample

Our sample is drawn from the population of river island villages in Northern Bangladesh. [Abusan will provide the regional characteristics of the area, esp. poverty, using CLP/TUP program data and reports.]

In the *char* region, the majority of *char*s have only one village. The majority of *char*s have no MFI activity, and we delisted the *char*s if any of MFI, NGO, or *Char Livelihood Program (CLP)* is active. Using a Landsat imagery, we identified 128 *char*s within a day boat ride from the Gaibandha peer and collected information by field visits. From this list of *char*s, we randomly selected 80 *char*s. In each village, we conducted a census of households with their wealth ranking made through a participatory ranking process. Following a process similar to the paired ranking as in Alatas et al. (2012, p.1212) and the Peruvian ultra poor case of Karlan and Thuysbaert (2019, p.66), we asked the least wealthy households in terms of asset ownership. We then asked to form a member committee of 20 households, of which 14 are ultra poor and six are moderately poor. As we admitted households on a first come, first served basis, these 20 households are the first to join the membership

[*12] k_D is an unstable equilibrium that all individuals would deviate from, but we include this point to the region of attraction of C for the sake of simplicity.

[*13] A similar diagram is found in Kraay and McKenzie (2014, Figure 3, with $k-y$ space).

[*14] In FIGURE 1, depreciation below $\underline{k}$ is not accounted as capital cannot be negative. Once the production starts for $k > \underline{k}$, the contour shows net of depreciation so $sf(k) + (1-\delta)k$.

of microfinance in respective poverty classes. After receiving acceptance for study participation ('pre-acceptance' in Figure 3) from 80 groups comprising 1,600 members, baseline data was collected in 2012 prior to the debt contract type randomization. In each group, 10 out of 20 members were randomly offered the credit and the remaining members were kept as pure control groups who did not receive a loan until 1 or 2 years later into the program. Due to a concern for within group spill overs, we do not use the subsample of these control members in this paper. We thus have 800 members for the impact evaluation of this article, who were surveyed in the baseline and offered one of the four credit products. From these 800 members, we exclude 24 members whose intervention did not strictly follow the experimental design explained below.

After receiving acceptance for study participation ('pre-acceptance' in Figure 3), baseline data was collected in 2012 prior to the debt contract type randomisation. After offering the each type of debt contract, three groups opted out as a group, resulting in 77 groups participating the intervention. In addition to the group level rejection, we had 89 individual loan rejectors. This happened despite we had explained about the debt contract types, random assignment process, various other group based obligations, and had obtained everyone's consent to participate before randomisation. Although both type of rejecters refused to receive a loan, they gave a consent to be surveyed so we tracked them in subsequent survey rounds.

While loan rejecters remained in our sample, we lost four groups to floods in 2013. As they relocated, we had no choice but to drop them from the study. This resulted in 76 groups including 4 groups who group-rejected the loans remaining in our data. In our study, attrition refers to a drop out from our household survey. Rejection refers to a loan rejection in our intervention, and majority of rejecters (81.25%) did not attrit from our household survey. Counting all other individual attriters, we have a total of 116 subjects (14.9%) who attrited by the final round of the household survey.

As a result, in the baseline survey sample, there are flood victims whom we do not track, as well as group rejectors, individual rejectors and borrowers that we track. See Takahashi et al. (2017) for more details on the randomisation and acceptance process. We track all — barring the flood victims whose villages were washed away and other attriters — the potential borrowers including who eventually opted out the borrowing in the data. This enables us to estimate the intention-to-treat effects of offering loans with different feartures on the population who showed interests in joining microfinance membership.

Table 1 shows descriptive statistics of sample households. As we randomly allocate them into four different arms named as traditional, large, large grace, and cattle, summary is shown by the arms and the overall. As shown in the Appendix A Table A1, these baseline household characteristics does not differ statistically between the arms. Our sample is characterised by relatively low literacy rate (HeadLiteracy) and relatively young age (HeadAge) of the household heads. Literacy rate is lower than the national average of adult males at 61.54% in 2012 (UNESCO). Household size (HHsize) is not large, 4.189 members overall, due probably to the constant flood threats, as indicated by above 40% exposure at the baseline (FloodInRd1), that do not easily allow a large household formation. Cattle holding per household (NumCows) shows cattle rearing is not common and the mean herd size is between .2 to .4.[*15] Mean net asset values per household (NetValue) and its components, household asset values per household (HAssetAmount) and productive asset values per household (PAssetAmount), differ between the arms, but they mostly reflect sampling errors as indicated by the large standard deviations.[*16] Attrited indicates attrition rates in the household survey, and GRejected and IRejected show group rejection rates and individual rejection rates to the lending program. We will analyse attrition and rejection later in Section VIII.1, VIII.2, but at

[*15] Table A2 in Appendix A shows the test results that NumCows do not differ across arms at the baseline.

[*16] There is an alternative measure for net assets, which we call narrow net assets: Narrow net assets = Narrow assets + net saving - debt to GUK - debts to relatives and money lenders. Narrow assets use only items observed for all 4 rounds for household assets. All estimation results hold with narrow net assets with narrower confidence intervals. See Figure 4 for details.

Table 1: Descriptive statistics by RCT arm for all households including nonparticipants

Variable	Traditional	Large	Large grace	Cattle	Overall
HeadLiteracy	0.097	0.110	0.105	0.155	0.117
	(0.296)	(0.314)	(0.307)	(0.363)	(0.322)
HeadAge	38.429	37.465	38.409	38.015	38.067
	(10.115)	(10.165)	(9.271)	(10.746)	(10.075)
HHsize	4.091	4.295	4.245	4.115	4.189
	(1.447)	(1.506)	(1.492)	(1.368)	(1.454)
FloodInRd1	0.463	0.618	0.407	0.497	0.497
	(0.500)	(0.487)	(0.493)	(0.501)	(0.500)
HAssetAmount	726	768	761	780	760
	(968)	(850)	(956)	(982)	(938)
PAssetAmount	985	1208	1949	768	1235
	(1728)	(2334)	(9254)	(875)	(4948)
NumCows	0.217	0.325	0.270	0.206	0.256
	(0.556)	(0.736)	(0.657)	(0.515)	(0.624)
NetValue	5876	8285	7831	5352	6855
	(12149)	(15379)	(17070)	(10789)	(14113)
Attrited	0.182	0.040	0.145	0.115	0.119
	(0.387)	(0.196)	(0.353)	(0.320)	(0.323)
IRejected	0.176	0.045	0.065	0.185	0.116
	(0.382)	(0.208)	(0.247)	(0.389)	(0.320)
GRejected	0.227	0.100	0.050	0.000	0.090
	(0.420)	(0.301)	(0.218)	(0.000)	(0.287)
Non-attriting borrowers	0.472	0.820	0.800	0.735	0.714
	(0.501)	(0.385)	(0.401)	(0.442)	(0.452)
N	176	200	200	200	776

Source: Information of 776 households in GUK administrative data and household survey data at the baseline. Survey respondents include nonparticipants to the experiments.

Notes: 1. Values are means, values in brackets are standard deviations.

2. HeadLiteracy is an indicator variable of household head literacy. HeadAge is age of household head. HHsize is total number of household members. FloodInRd1 is an indicator variable of flood exposure. HAssetAmount and PAssetAmount are amount of household and productive assets, respectively, in BDT, NumCows is cattle holding per household. NetValue is net asset values in BDT per housheold. Attrited indicates attrition rates in the household survey, and GRejected and IRejected show group rejection rates and individual rejection rates to the lending program. Non-attriting borrowers indicates the ratio of non-attriting borrowers to all borrowers. Because attrition and rejection are separate events, a household can reject and attrit, so non-attrited borrowers ⩾ total - (rejected members + attrited members). USD 1 is about BDT 22.

this point, we just note that the attrition rates are not statistically different between the arms. Non-attriting borrowers indicates the ratio of non-attriting borrowers to all borrowers. Because there are more rejecters in the traditional arm, this ratio is smaller than in other arms.

VI Experimental design

To investigate the detailed demand-side constraints and suitable credit scheme for the ultra poor, we implemented the village-level clustered randomization across the four treatment arms as follows (see Figure 2):

T1 Traditional microcredit. Members of the group receive 5600 BDT (approximately USD 50) credit, and the loan repayment begins two weeks after the disbursement. Members repay with weekly installments and are required to attend weekly meetings as well as to regularly save an amount decided jointly by the group members. The loan maturity is one year, and borrowers are allowed to take another two loan contracts of equivalent amounts over the next consecutive years. The weekly repayment is 125 BDT (approximately USD 1.1) payable in 50 installments.

T2 Upfront lumpy credit. Members receive 16,800 BDT credit with a longer loan maturity, and the loan repayments begin two weeks after the disbursement. The weekly repayment and the design of compulsory saving are exactly the same as in T1 arm. The loan maturity is three years. The required weekly repayment is 125 BDT payable in 150 weekly instalments (for three years).

Figure 2: Description of experimental arms

T1 Traditional microcredit.

- **Credit** 5600 BDT (approximately USD 50).
- **Repayment start** Two weeks after the disbursement.
- **Installments** Repay with weekly installments of 125 BDT (approximately USD 1.1) which amounts to a simple interest rate of 11.61%.
- **Maturity** Total installments of 50 or a loan maturity of one year. Take another two loan contracts of equivalent amounts over the next consecutive years.
- **Weekly obligations** Attend a meeting and deposit an amount decided jointly with group members.

T2 Upfront lumpy credit. Following conditions in black colours differ from T1:

- **Credit** 16,800 BDT (approximately USD 145).
- **Repayment start** Two weeks after the disbursement.
- **Installments** Repay with weekly installments of 125 BDT (approximately USD 1.1)which amounts to a simple interest rate of 11.61%.
- **Maturity** Total installments of 150 or a loan maturity of three years.
- **Weekly obligations** Attend a meeting and deposit an amount decided jointly with group members.

T3 Upfront lumpy credit with a grace period. Following conditions in black colour differ from T2:

- **Credit** 16,800 BDT (approximately USD 145).
- **Repayment start** One year after the disbursement.
- **Installments** Repay with weekly installments of 190 BDT (approximately USD 1.7) which amounts to a simple interest rate of 13.1% when repaying.
- **Maturity** Total installments of 100 or two years.
- **Weekly obligations** Attend a meeting and deposit an amount decided jointly with group members.

T4 In-kind credit with a one-year grace period and managerial support programs. Following conditions in black colours differ from T3:

- **Credit** Receive a credit in the form of a one-year old heifer with the price of 16,000 BDT (approximately USD 145).
- **Repayment start** One year after the disbursement.
- **Installments** Repay with weekly installments of 190 BDT (approximately USD 1.7) which amounts to a simple interest rate of 18.75% when repaying. After adding the support program costs to the principal, the interest rate will be the same as T3.
- **Maturity** Total installments of 100 or two years.
- **Weekly obligations** Attend a meeting and deposit an amount decided jointly with group members.
- **Support program** Provided input support (fodder, veterinary and vaccination services), marketing consultancy (milk sales), and basic training on cattle rearing with the local NGO, at the total fee of 800 BDT (approximately USD 7.2) charged for the three years. With 800 BDT for the support program, the total cost sums to BDT 16,800 which is the same as in all other arms.

T3 Upfront lumpy credit with a grace period. Members receive 16,800 BDT credit with loan repayments begin one year after the disbursement. During the first year grace period, members are required to meet weekly and follow group activities such as compulsory savings just as in other arms. The design of compulsory saving is the same as in the T1, T2 arms. The loan maturity is three years. The required weekly repayment is 190 BDT (approximately USD 1.7) payable in 100 weekly installments, starting after one year.

T4 In-kind credit with a one-year grace period and managerial support programs.[*17] Members receive in-kind credit in the form of a one-year old heifer with the price of 16,000 BDT (approximately USD 145), and the loan repayment begin one year after the disbursement.

[*17] Heifer ownership was never explicitly agreed upon, but it was generally understood by the borrowers that they owned the heifer. T4 is thus more similar to a debt contract with the purchased asset as collateral than to a finance lease under which the asset ownership belongs to the lessor.

The grace period length is equal to the one provided under T3 and T4 arms. In addition, the members receive input (fodder, veterinary and vaccination services) procurement supports, marketing consultancy (milk sales), and basic training on cattle rearing with the local NGO, at the total fee of 800 BDT (approximately USD 7.2) charged for the period of three years. With 800 BDT for the support program, the total cost sums to BDT 16,800 which is the same as in all other arms.

One of the aims of the study is to assess if the entrepreneurship matters in microfinance lending outcomes. Assuming that, below 17000 Taka, the productive asset with the highest return is a heifer, we bundle training and consultation with a heifer lending. At the start of a loan, the NGO's procurement officer buys a heifer from the local market, so the borrower does not have to have the knowledge required for the quality purchase. By providing the knowledge to a group of borrowers through training and disallowing an investment choice with a in-kind, heifer lending, some aspects of entrepreneurship will no longer be a prerequisite. It can be seen that we are offering a capacity to use the best practice or the *cristalised intelligence* related to cattle production (Cattell, 1963). This is only a part of entrepreneurial skills. The remainder, a capacity to apply a suitable action to unforeseen events or the *fluid intelligence* related to cattle production, and other inter-personal skills, are left unchanged. If the entrepreneurship raises productivity, borrowers of other arms who are not provided the knowledge are expected to opt out the loan more frequently or perform worse. One can measure effects of the entrepreneurship on participation and outcomes by comparing these two groups, in-kind credit with training vs. cash credit.

As a natural reference, we want to compare the training cum in-kind loan T4 with the traditional regular microcredit T1, a classic Grameen style loan that is about a third in loan size and maturity with no grace period. In order to make comparison feasible, we added two intermediate treatment arms to bridge them: Two arms with upfront lumpy lending that is equivalent of a heifer price, one with a grace period T3 and another without a grace period T2. With the loan sizes that are three times the traditional microfinance loans, we extended the maturity to three years to even out the repayment burden. The comparison arm, the traditional regular microcredit, has only one year maturity. We therefore provided the total of three loans in three loan cycles in T1 which are unconditionally disbursed annually, so the total loaned amount will be aligned and there is no exit-selection due to delinquency before three cycles are complete.

Under this setting, frontloading liquidity without changing the total loan size eases a liquidity constraint, attaching a grace period under the same loan size and disbursement timing eases a saving constraint prior to a loan receipt, and offering an in-kind loan with a managerial support without changing other features eases an entrepreneurship constraint. In effect, we constructed a stepped-wedge design over these key features of loans, namely, upfront liquidity (Upfront), a grace period (WithGrace), and in-kind with managerial supports (InKind), to assess the impacts of respective constraints on participation and outcomes as indicated in Table 2.

An in-kind offer in treatment T4 is generally thought to be less efficient than a cash offer as it takes away an investment choice from the borrower. However, the local microfinance practitioners widely agree that other production opportunities are limited, so not much is lost in terms of the choice set, under our setting of island location and occasional floods.[*18] Given the small set of the productive investment choices, our experiment gives a unique chance to compare cash lending against in-kind lending, even without controlling for a potentially wider choice set of cash lending. Indeed, we found in our data that most of T2 and T3 cash borrowers started to invest in cattle after receiving a loan. Consequently, in our study, the cash-grace-period and in-kind-grace-period lending differ effectively only in the managerial support services bundled in the latter.

All loan products are of individual liability and the committee was intended to serve as an activity platform for microfinance operations. Among the traditional members, there were 24 members who

[*18] A closely related project in the neighbouring areas transfers an asset in the form of a cow (Bandiera et al., 2017).

Table 2: A 4×4 factorial, stepped wedge design

	Large, grace	Large	Traditional
Cattle	entrepreneurship constraint (InKind)	saving constraint (WithGrace)	liquidity constraint (Upfront)
Large, grace		saving constraint (WithGrace)	liquidity constraint (Upfront)
Large			liquidity constraint (Upfront)

Note: Cell contents are hypothesised constraints on investments that exists in the column arm but are eased in the row arm. Contents in brackets are variable names of respective attributes.

received disbursements twice, not three times, due to logistical limitations. We drop them from the analysis and use 776 members in the below.

Lastly, because of the severe flood damages caused on borrowers and the associated administrative delays in 2013, the repayment was halted in 2013 and resumed after one year in 2014. This resulted in an extension of loan maturity from 36 months to 48 months for all arms. This gave substantial leniency to the borrowers in terms of loan repayment burden.

VII Empirical strategy

We collected data at one baseline survey and three annual follow up surveys. With successful randomisation (see Section VIII.1 and Appendix A), we use ANCOVA estimators to measure impacts of each experimental arms and loan attributes. ANCOVA estimators are more efficient than DID estimators (Frison and Pocock, 1992; McKenzie, 2012). As we include loan rejecters, what we are estimating is intention-to-treat effects. For an ease of interpretation, we sometimes use indicator variables of each attributes, Upfront, WithGrace, InKind in place of arms in several estimating equations. Numerically, both are equivalent. In what follows, we will refer to these attributes as *functional attributes*.

The basic estimating equation for our intention-to-treat effects is:

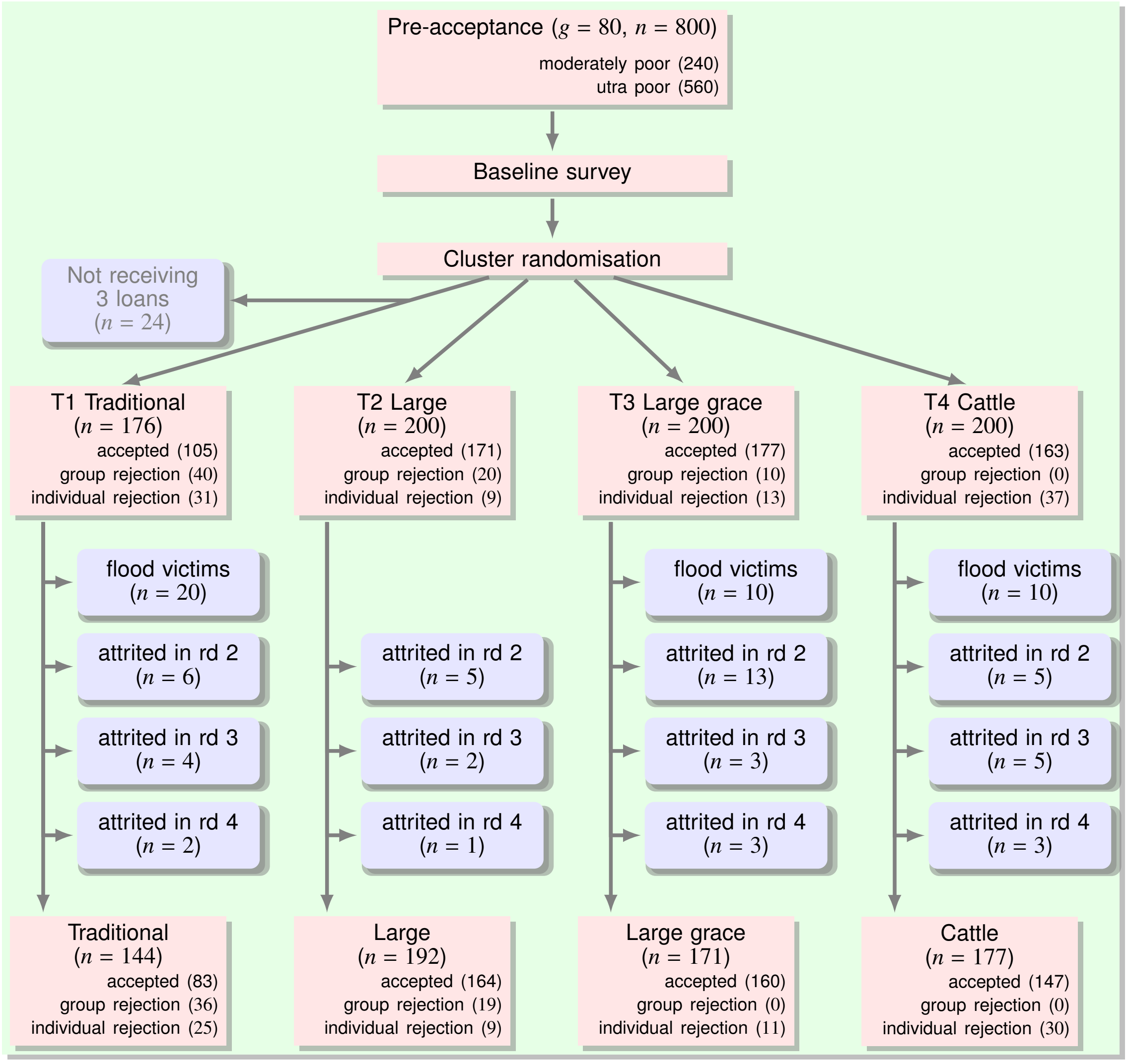
$$y_{it} = b_0 + b_1 y_{i1} + \boldsymbol{b}'\mathbf{d}_i + e_{it}, \quad t = 2, 3, 4, \tag{1}$$

where, for member i in period t (t refers to the survey round with $t = 1$ as the baseline), y_{it} is an outcome measure, $\mathbf{d}_i$ is a vector of three indicator variables in nontraditional arms or functional attributes that i receives, e_{it} is an error term. For the traditional arm, the conditional mean of outcome given covariates and baseline outcome variable is given by b_{10}. For an arm or a functional attribute a, the impact relative to the traditional arm is measured with b_{1a}. As we are interested in the time course of impacts, we extend equation (1) as:

$$y_{it} = b_1 y_{i1} + b_2 + \boldsymbol{b}_2'\mathbf{d}_i + b_3 c_{3t} + \boldsymbol{b}_3'\mathbf{d}_i c_{3t} + b_4 c_{4t} + \boldsymbol{b}_4'\mathbf{d}_i c_{4t} + e_{it}, \quad t = 2, 3, 4, \tag{2}$$

where c_{3t} is a dummy variable for $t = 3$ and c_{4t} is a dummy variable for $t = 4$. Our main interest is on the cumulative deviation of impacts of a non-traditional arm (use subscript k for this) from impacts of the traditional arm. In equation (2), this is captured by b_{2k} for period 2, $b_{2k} + b_{3k}$ for period 3, and $b_{2k} + b_{4k}$ for period 4. We thus plot these estimates for cumulative impacts in main figures in the next section. In some specifications, equation (2) is further extended to include controls of other baseline characteristics and their interactions with treatment dummies to allow heterogeneous impacts. All the standard errors are clustered at the group (char) level as suggested by Abadie et al. (2017).

FIGURE 3: SAMPLING FRAMEWORK, REJECTION, AND ATTRITION



VIII Results

The reasons behind nonparticipation are fundamental in understanding the outreach. We analyse nonparticipation in relation to the debt contract design that they were randomly allocated to. In addition, selective attrition from the household surveys, if any, biases the estimates so we need to compare the attriter's characteristics with the nonattriters. In this section, we check how participation and attrition are different between the arms by using permutation tests. We use the coin package of R with 100000 random draws from all admissible permutations.

VIII.1 Participation

As noted in Section VI, there are two kinds of rejecters in participation. One is group rejecters who jointly turned down the offer as a group, and another is individual rejecters who decided not to participate while fellow members of the group participated.

Group rejecters of traditional and non-traditional arms differ in household characteristics. In the Appendix B, it is shown that the asset-poor households did not participate in the traditional arm,

Table 3: Individual rejecters vs. non-rejecters

	Traditional arm			non-Traditional arms			All arms		
variables	Not rejected	Rejected	p value	Not rejected	Rejected	p value	Not rejected	Rejected	p value
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
HeadLiteracy	0.095	0.161	0.261	0.133	0.068	0.181	0.127	0.100	0.443
HeadAge	38.848	36.258	0.213	38.000	39.732	0.224	38.145	38.494	0.764
HHsize	4.181	3.645	0.066	4.270	3.932	0.096	4.255	3.833	0.010
Arm							0.830	0.656	0.000
FloodInRd1	0.514	0.533	0.919	0.467	0.627	0.024	0.475	0.596	0.035
HAssetAmount	714	547	0.433	794	724	0.589	780	664	0.281
PAssetAmount	996	851	0.720	1392	784	0.181	1324	807	0.194
LivestockValue	6095	3333	0.282	5619	3051	0.151	5700	3146	0.085
NumCows	0.305	0.167	0.281	0.281	0.153	0.151	0.285	0.157	0.084
NetValue	7685	4731	0.297	7483	4443	0.129	7518	4540	0.068
n	105	31	(rate 0.228)	511	59	(rate 0.104)	616	90	(rate 0.127)

Note: Individual rejecters are the members who did not accept a loan based on an individual decision after the period when group rejection was decided. After 70 people group-rejected, the total number of individuals who was in a position to individually reject the loan was 706 people, of which 90 individually rejected. Non-traditional arms are large, large grace and cattle arms. The variable Arm is the ratio of traditional arm members in individual nonrejecters and individual rejecters. Respective rejection rates are given in the brackets in the row n. HeadLiteracy is an indicator variable of household head literacy. HeadAge is age of household head. HHsize is total number of household members. FloodInRd1 is an indicator variable of flood exposure. HAssetAmount and PAssetAmount are amount of household and productive assets, respectively, in BDT, NumCows is cattle holding per household. NetValue is net asset values in BDT per housheold. Attrited indicates attrition rates in the household survey, and GRejected and IRejected show group rejection rates and individual rejection rates to the lending program. Non-attriting borrowers indicates the ratio of non-attriting borrowers to all borrowers. Because attrition and rejection are separate events, a household can reject and attrit, so non-attrited borrowers ⩾ total - (rejected members + attrited members). USD 1 is about BDT 22.

Table 4: Contrasting cattle arm and other arms, borrowers and non-attriting borrowers

	Borrowers			Non-attriting borrowers		
variables	Cattle arm	Other arms	p value	Cattle arm	Other arms	p value
	(1)	(2)	(3)	(4)	(5)	(6)
HeadLiteracy	0.172	0.110	0.047	0.150	0.113	0.275
HeadAge	37.642	38.325	0.446	37.973	38.226	0.788
HHsize	4.166	4.287	0.341	4.102	4.285	0.171
FloodInRd1	0.463	0.479	0.751	0.459	0.484	0.595
HAssetAmount	779	781	0.980	785	780	0.956
PAssetAmount	765	1526	0.119	753	1298	0.028
LivestockValue	4444	6150	0.159	3425	6437	0.016
NumCows	0.222	0.308	0.156	0.171	0.322	0.016
NetValue	5603	8204	0.058	4702	8315	0.007
n	163	453	(rate 0.265)	147	407	(rate 0.265)

Note: Borrowers are members who accepted a loan, non-attriting borrowers are borrowers who stayed in the household survey until the final round. Both borrower panel and non-attriting borrower panel show the contrasts between the cattle arm and all other arms. Borrower panel compares the difference in participant characteristics between cattle and other arms. Non-attriting borrower panel compares the difference in non-attriting participant characteristics between cattle and other arms. Both show cattle arm induced participation of asset-poor households at the beginning and until the end of the project. Respective rejection rates are given in the brackets in the row n. HeadLiteracy is an indicator variable of household head literacy. HeadAge is age of household head. HHsize is total number of household members. FloodInRd1 is an indicator variable of flood exposure. HAssetAmount and PAssetAmount are amount of household and productive assets, respectively, in BDT, NumCows is cattle holding per household. NetValue is net asset values in BDT per housheold. Attrited indicates attrition rates in the household survey, and GRejected and IRejected show group rejection rates and individual rejection rates to the lending program. Non-attriting borrowers indicates the ratio of non-attriting borrowers to all borrowers. Because attrition and rejection are separate events, a household can reject and attrit, so non-attrited borrowers ⩾ total - (rejected members + attrited members). USD 1 is about BDT 22.

while it is recent flood victims who did not participate in the non-traditional arms. We conjecture that it is lack of Upfront liquidity that prevented asset-poor households of traditional arm from participating because they cannot purchase cattle due to insufficient net asset values or an insufficient resale value of owned livestock, when members of similar characteristics partcipated in non-traditional arms. Group rejecters of non-traditional arms did not participate because of negative asset shocks.

Table 3 compares individual rejecters and non individual rejecters for traditional arm and non-traditional arms. Rejecters of both arms share similar characteristics. In the panel comparing individual rejecters and non individual rejecters of all arms, the common factors associated with non-participation are a smaller household size and smaller livestock holding,[*19] although the p value for livestock holding difference between individual rejecters and non individual rejecters is .084.

These hint that it may take a larger household size to raise cattle. It is possible that smaller households may be facing a domestic labour constraint or a space limitation to accommodate cattle under the roof. These constraints are expected to be absent in asset transfer programs where targeted residents can sell the asset if either of constraints binds. We conjecture that the households under a binding liquidity constraint and/or a binding domestic capacity constraint did not meet the conditions to raise cattle, and have withheld themselves from the program with an individual rejection. This self-selection may have caused the repayment rates to be higher than when everyone participated.

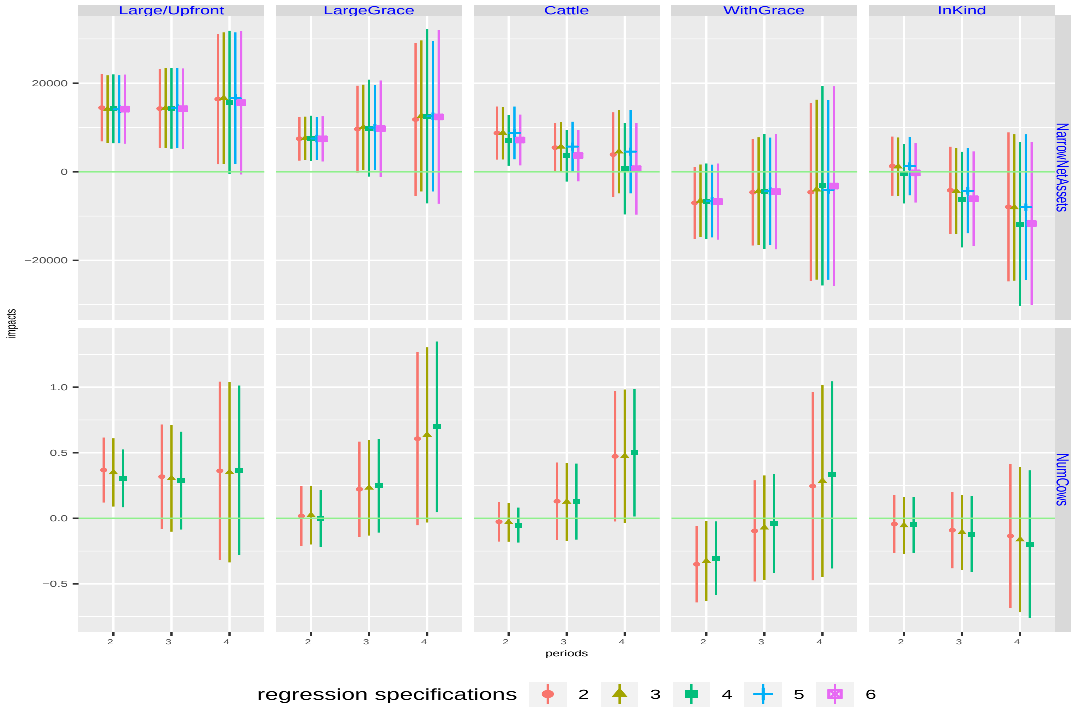
A strong correlation between baseline flood exposure and individual rejection among the non-traditional arm members suggests that a population prone to natural calamity and associated asset shocks have voluntarily opted out the borrowing. This partly explains the lack of commercial and even noncommercial/NGO lenders in the flood prone area.

In Table 4, we compare if the cattle arm participants (borrowers) differ from participants in other arms at the baseline. In the left panel, we compare participants. It is worth noting that partcipants of cattle arm differ from other arms in having less cattle rearing experience as observed in smaller initial cattle holding (p value = .156) and in having lower net asset values (p value = .058). These features that are plausibly disadvantageous in rearing a heifer notwithstanding, the cattle arm with training induced partcipation. As we will see in Section VIII.3, the choice of lending instrument (cash or in-kind) does not matter in investments. So it is natural to infer that the training component has induced the members with less experiences and fewer assets to take up loans. In the right panel, we compare the borrowers who did not attrit by the end of final survey round between cattle arm with other arms. At the baseline, cattle arm non-attriting borrowers have smaller baseline livestock holding (p value = .016) and smaller baseline net asset holding (p value = .007) than other arms' non-attriting borrowers. These hint that more disadvantaged borrowers participated and managed to stay on the survey until the end of the study in the cattle arm with a help of managerial supports.

VIII.2 Attrition

The survey resulted in the attrition (including the flood victims) of a moderate rate, 14.9%. We checked for systematic differences between attriters and nonattriters and found the attrition is not correlated with any household level characteristics (see more detailed attrition examination in Appendix C). We also found that traditional arm attriters have a lower rate of head literacy while non-traditional arm attriters are more exposed to the flood and have a larger household size. One can argue that, with attrition, the estimated impacts of borrowing could have increased for the traditional arm while not for the non-traditional arms. Such a conjecture hints there may be underestimation, if any, but it is unlikely to inflate the impact estimates.

FIGURE 4: CUMULATIVE EFFECTS ON LIVESTOCK AND NARROW NET ASSETS



Source: Constructed from ANCOVA estimation results TABLE D1, TABLE D3, TABLE D5, TABLE D6.

Note: Panels show cumulative impacts of respective arm or attributes k relative to tradiotional arm which are obtained by 2nd period = b_{2k}, 3rd period = $b_{2k} + b_{3k}$, 4th period = $b_{2k} + b_{4k}$ in the estimating equation $y_{it} = b_1 y_{i1} + b_2 + \mathbf{b}_2'\mathbf{d}_i + b_3 c_{3t} + \mathbf{b}_3'\mathbf{d}_i c_{3t} + b_4 c_{4t} + \mathbf{b}_4'\mathbf{d}_i c_{4t} + e_{it}$, $t = 2, 3, 4$, where y_{it} is the outcome measure of member i in period t, $\mathbf{d}_i$ is a vector of arms or functional attributes, c_{3t}, c_{4t} are indicator variables of period 3 and 4. Bars show 95% confidence intervals using cluster robust standard errors. Narrow net assets = narrow assets + net saving - debt to GUK - debts to relatives and money lenders, where narrow assets use only items observed for all 4 rounds for household assets.

VIII.3 Impacts

FIGURE 4 summarises the cumulative impacts on assets in time-varying specification of (2). See Appendix D for full estimation results. There are two stock outcome variables, number of cattle and net asset values, where net assets are defined as total assets less debt outstanding to all sources. For each outcome, there are five panels of arms and functional attributes. Since large arm and Upfront functional attribute are numerically same in (2), they are put in one panel column. In all panels, points show the estimates of cumulative deviation from concurrent traditional arm values, or how much the impacts relative to traditional arm have evolved. Vertical bars indicate 95% confidence intervals. For all panels, in each period, there are several estimation specifications bunched side-by-side. [*20] This is intended to show robustness to specification changes at a glance.[*21] One sees that there is little variation across specifications.

There are notable tendencies in the figure. First, in both cattle holding and net asset panels, point estimates show there is a one time increase at period 2 in the Large/Upfront column. The non-traditional arms have increased cattle holding and net assets once and stayed increased relative to

[*19] NetValue also shows a difference but this is due mostly to a difference in livestock holding.

[*20] Specification 1 is omitted from the plot, because it is an OLS regression without the baseline outcome that is intended to provide a reference for ANCOVA estimates.

[*21] As multiple specifications are estimated to show uniformity of results, not to pick one specific estimate, inference corrections for multiple testing are unncessary.

the traditional arm. As time passes, standard errors get necessarily magnified because borrowers get exposed to more random variations, so the bars grow longer, making the estimates noisier and error bars crossing the zero line in round 4.

Secondly, it is the Upfront functinal attribute that shows positive impacts in both outcomes. This is consistent with the nonconvex production technology of a larger investment under a liquidity constraint, coupled with an inferior, smaller investment technology. TABLES D1, D5 in the Appendix [specification (2)] show that, relative to the traditional microfinance lending, the upfront liquidity provision increases the narrow net assets by BDT 14478 (CI 6868, 22088) or 1.06σ (of the baseline standard deviation) in the second year, BDT 16417 (CI 1700, 31135) or 1.2σ by the end of fourth year, and the number of cattle holding by 0.37 (CI 0.12, 0.62) or 0.59σ in the second year, and 0.36 (CI -0.32, 1.04) or 0.58σ by the end of fourth year. These results hold when other various definitions of assets are adopted or cattle rearing experiences are controlled.

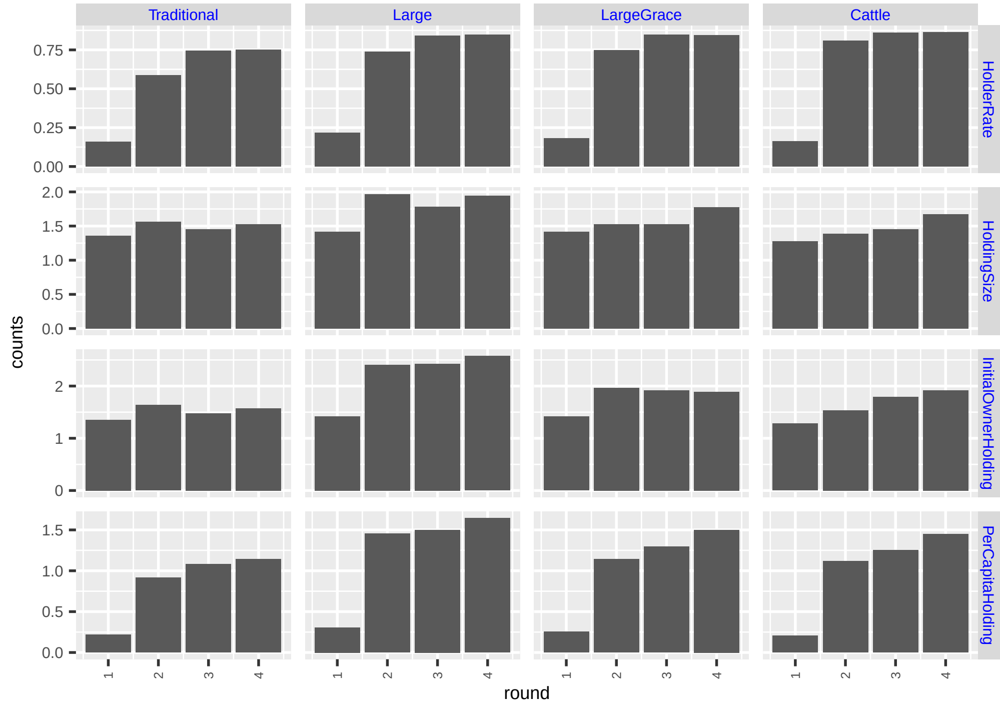
Thirdly, comparing the impacts of the InKind attribute on both stock outcomes against Upfront and WithGrace, we see statistically zero differences. In light of the fact that individuals with less cattle rearing experiences and lower asset values participated and survived in the cattle arm, the finding that their outcomes are statistically indistinguishable from other non-traditional arms implies the treatment arm facilitated the returns to cattle rearing at no lower level. The managerial supports of cattle arm have induced participation and achieved the same level of impacts among the members who would otherwise not take a loan, probably out of their relatively disadvantaged background characteristics. The reason can either the managerial support program complimented the necessary codifiable knowledge, or these participants had the same level of knowledge as other participants but noticed the managerial support program as useful. Either possibility is consisitent with the finding by previous studies that only the experienced or skilled members could reap the benefits of microfinance. Previous studies cited in the Section I have targeted the population with a richer set of investment possibilities in a more urbanised setting under which the experience may have a positive return. In the current study, the population resides in a remote, rural area. Even the simpler production process of cattle farming that consists of procuring feeding, grazing, insemination and calving turns out to demand unignorable codifiable skills, or the crystalised intelligence, to participate and sustain in microfinance.

The NumCows row in FIGURE 4 shows the number of cattle owned and it also serves as a check that non-traditional members actually own cattle once the loan/lease is made. The ANCOVA estimates plotted in the figure are net of baseline cattle holding, so even the non-traditional holding estimates sometimes add up to less than 1. The figure shows that, on average, the non-traditional arms continue to own about .4 more cattle than the traditional arm members, conditional on the initial cattle holding.

FIGURE 5 shows more detailed changes in cattle ownership by arm. Holder rates are the number of cattle owners per arm size, holding size is average holding per owner, initial owner holding are herd size for owners who held cattle at baseline, and per capita holding is mean cattle holding in each arm. Initial owner holding and holder rates show impacts on the intensive and extensive margins, respectively. Per capita holding tracks impacts on both the intensive margins (growth of initial owners) and the extensive margins (growth of new owners). All the indicators are similar across arms at the baseline.

We see that the holder rates increased in all arms, although the increase was smallest for the traditional. This shows that, even the small upfront lending of traditional arm helped increase catte ownership but to a lesser degree. Without equally large upfront liquidity and with the repayment installments that began immediately, a smaller fraction of borrowers could purchase their first cattle. Holding size increased in all non-traditional arms, while the traditional arm remained stagnant. It is also the traditional arm that has the smallest, or negligible, impacts on the initial owners. [These initial owners, overall, diversified their portfolio rather than increasing the cattle investments.] For the non-traditional arm, Initial owner holding size is larger than the average holding size per owner, indicating the higher returns to members with experiences. The per capita holding growth was smallest in the traditional arm. This is due to smaller impacts on the extensive margins (fewer new

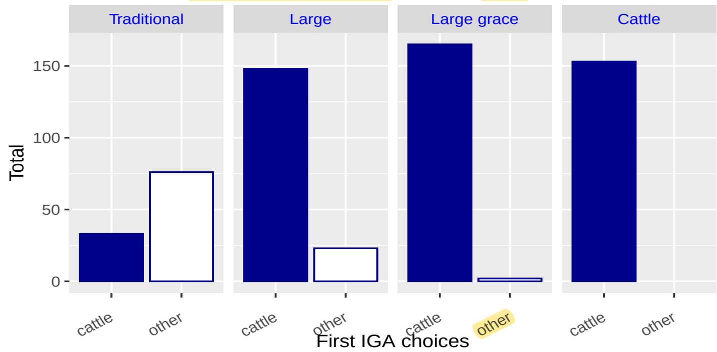
FIGURE 5: CATTLE HOLDING BY ARM



Source: Household survey data.

Note: HolderRate is the ratio of cattle owners in each arm, HoldingSize is average holding per owner, InitialOownerHolding are average holding per owner who held cattle at baseline, and PerCapitaHolding is cattle owned per arm member. InitialOownerHolding and HolderRates show impacts on the intensive and extensive margins, respectively. PerCapitaHolding shows the time trend in mean cattle holding.

FIGURE 6: CONTENTS OF FIRST IGA



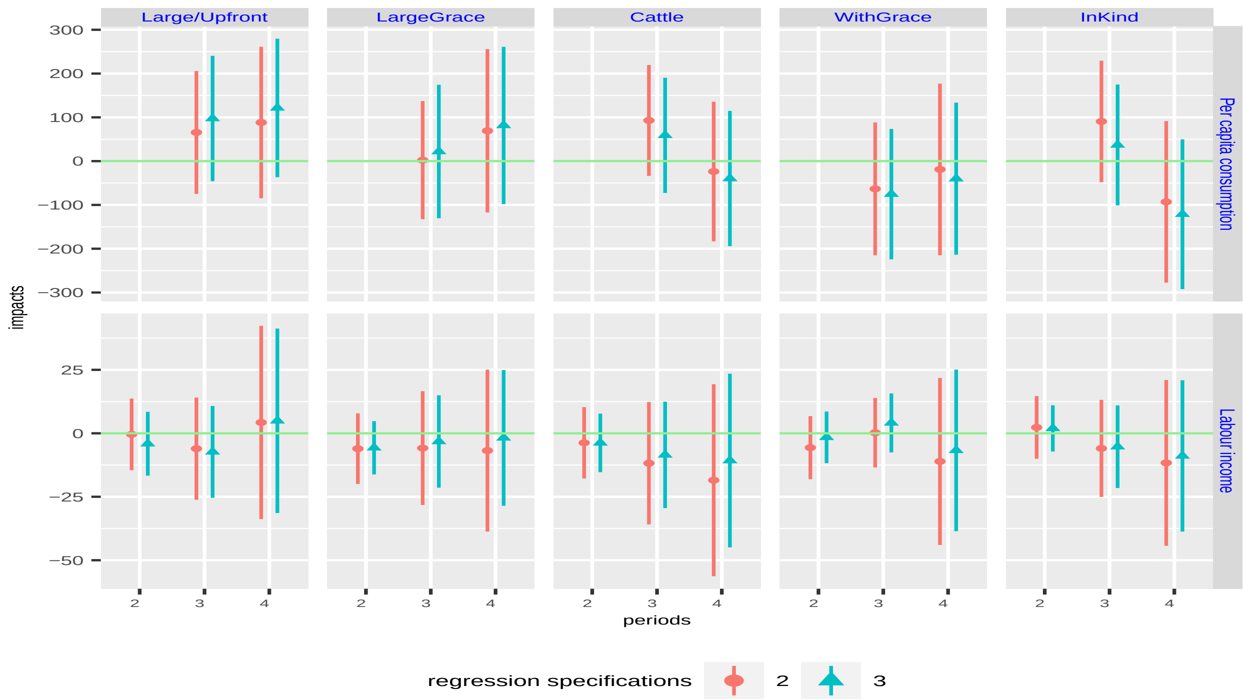
Source: Administrative data, based on the information reported at the weekly meeting. Only borrowing member data are shown.

Note: Contents of IGAs are cattle, goat/sheep, growing cereals (paddy, corn) and nuts, small trades, and house and land leasing. The first IGA is defined as the oldest IGA for the household. Blue bars are the cattle rearing, white bars are the sum of all other projects.

ownership, smaller growth by new owners) and little impacts on the intensive margins (negligible growth by initial owners).

To understand the reasons behind the slower pace of asset accumulation of traditional arm, in FIGURE 6, we plot the contents of first IGAs of members. The first IGA is defined as the oldest IGA for the household. For most of the households, the oldest IGA had started after the baseline, and it is the IGA with the largest cash flow. Of course, there are a small percentage of households with an existing IGA before the baseline, but, with randomisation, the fraction of such households are similar across arms. Therefore, the between arm comparison of the first IGA gives us an idea about how the households had chosen the initial investments. In the traditional arm, there are 33 borrowing members who report cattle as their first IGA, and 76 borrowing members (69.72%) who report other than cattle

Figure 7: Cumulative effects on labour income and per capita consumption



Source: Constructed from ANCOVA estimation results Table D7, Table D8, Table D9, Table D10.

Note: Panels show cumulative impacts of respective arm or attributes k relative to tradiotional arm which are obtained by 2nd period = b_{2k}, 3rd period = $b_{2k} + b_{3k}$, 4th period = $b_{2k} + b_{4k}$ in the estimating equation $y_{it} = b_1 y_{i1} + b_2 + \boldsymbol{b}_2' \mathbf{d}_i + b_3 c_{3t} + \boldsymbol{b}_3' \mathbf{d}_i c_{3t} + b_4 c_{4t} + \boldsymbol{b}_4' \mathbf{d}_i c_{4t} + e_{it}$, $t = 2, 3, 4$, where y_{it} is the outcome measure of member i in period t, $\mathbf{d}_i$ is a vector of arms or functional attributes, c_{3t}, c_{4t} are indicator variables of period 3 and 4. Bars show 95% confidence intervals using cluster robust standard errors. Per capita consumption is a total of food, hygiene, social, and energy expenditure divided by the number of household members, expressed as the annuaslied values in BDT. In-kind consumption of home made products is imputed at median prices. Labour income is labour incomes of household in 1000 BDT units.

as their first IGA. This contrasts with the non-traditional arms that 466 borrowing members who report cattle as their first IGA and 25 borrowing members (5.09%) other than cattle as their first IGA. Correspondingly, the data confirms that the traditional arm borrowers hold a diversified IGA portfolio while only a small minority of non-traditional arm borrowers have a diversified portfolio.[*22]

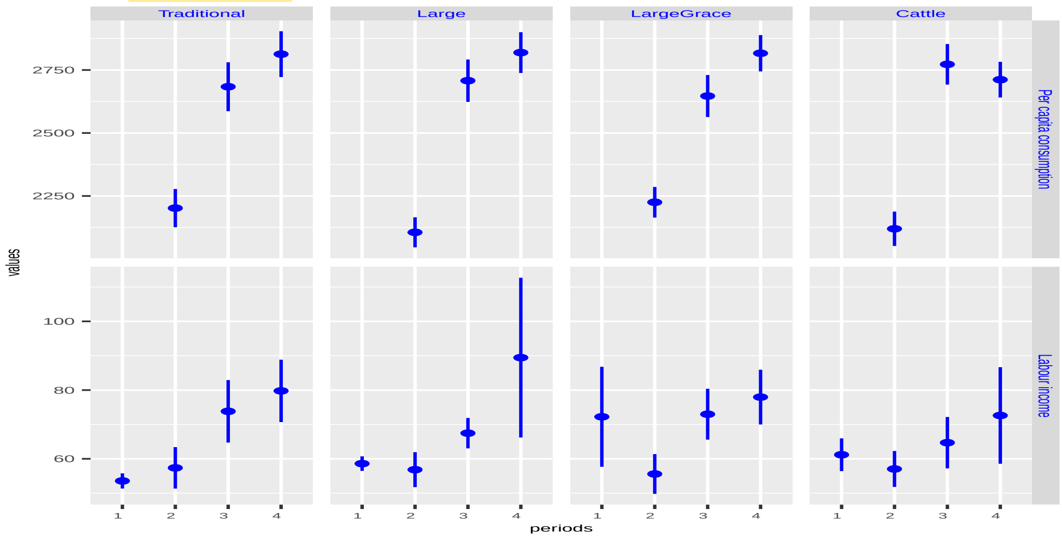
Figure 7 shows impacts on consumption and labour incomes. Style and placement of panels follow the Figure 4. Consumption is not measured at the baseline, so we do not use it to understand the welfare impacts. Instead, using period 2 consumption as the reference point, we can understand how the members have dealt with the loan repayment through consumption choices. Given randomisation, one can still identify impacts on repayment efforts in terms of consumption suppression relative to the traditional arm. The upper row of Figure 7 plots ANCOVA estimates, conditional on period 2 consumption. In theory, this can be problematic as period 2 consumption is correlated with arm assignment. But the results do not change if we estimate without period 2 consumption as a covariate in specification 1. Consumption is per capita expenditure of the household. Labour income is a household level variable and measures earnings from casual jobs. Both consumption and labour incomes do not show any impact by the arms or functional attributes.

In Figure 8, we see that, in all arms, the labour income is increasing from period 3, and per capita consumption did not change between periods 3 and 4 despite the growths in labour incomes.[*23]

[*22] Results are available from the authors upon a request.

[*23] One notes that the labour income is lowest in period 2 for all non-traditional arms, second lowest for the traditional arm, and start increasing from period 3. The fall in period 2 is due to the floods. Period 2 consumption is reportedly

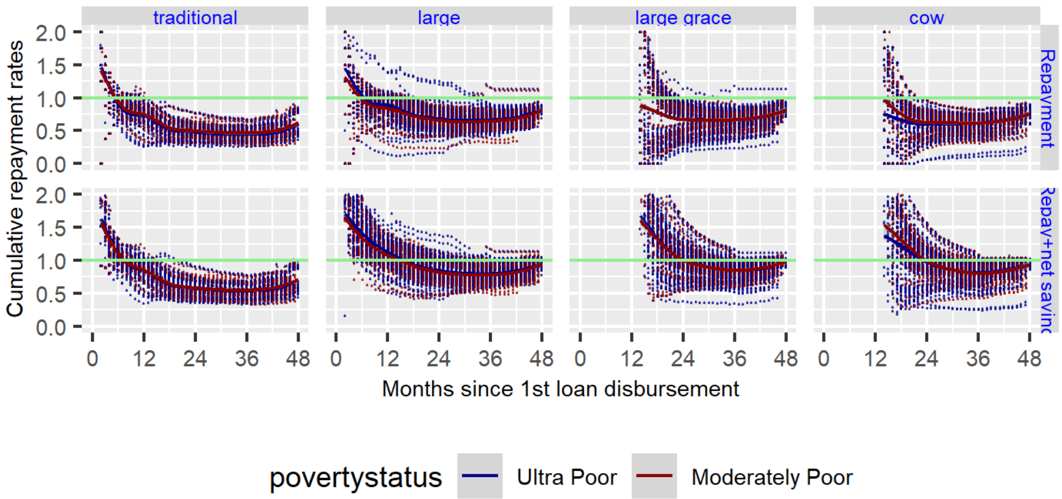
Figure 8: Mean per capita consumption and labour incomes by arm and period



Source: Survey data.

Note: Points indicate means, vertical bars indicate 95% confidence intervals. Per capita consumption is an annualised total of food, hygiene, social, and energy expenditure divided by the number of household members in BDT. In-kind consumption of home made products is imputed at median prices. Labour income is labour incomes of household in 1000 BDT units.

Figure 9: Cumulative weekly repayment rates



Note: Each dot represents weekly observations. Only members who received loans are shown. Each panel shows ratio of cumulative repayment sum to cumulative due amount sum, ratio of sum of cumulative repayment and cumulative net saving (saving - withdrawal) sum to cumulative due amount sum, both are plotted against weeks after first disbursement. Value of 1 indicates the member is at per with repayment schedule. Horizontal lines has a Y intercept at 1. Lines are smoothed lines with a penalized cubic regression spline in ggplot2::geom_smooth function, originally from mgcv::gam with bs='cs'.

The households seem to have put asset accumulation and repayment a priority before consumption growths. It indicates that the borrowers did not choose to strategically default but tried to repay.

Figure 9 shows the repayment results. Top panel shows the ratios of cumulative repayment to cumulative planned installment, the bottom panel shows the ratios of sum of cumulative repayment and cumulative net saving (saving - withdrawal) to cumulative planned installment. Both are plotted against weeks after first disbursement. Each dot represents a member at each time point. Value of 1, which is given by a horizontal line, indicates the member is at per with repayment schedule. Some members saved more than the required repayment at each time points that go beyond 1 in the figure.

lower than period 3 and 4 because of flood damages.

One sees that repayment rates are above 1 at the beginning but stay below 1 for most of the time. The majority of borrowing members did not repay the loan by the 48th month with prespecified installments. One notes the traditional arm has more of lower repayment rates among all arms. When a member does not reach the due amount with installments, they had to repay from the (net) saving, an arrangement to which the lender and the borrowers made at the loan contract signment. Repayment rates after using net saving are 44.71, 93.57, 97.01, 95.42%, respectively, for traditional, large, large grace, cow arms, 87.85% for overall, and 95.32% for the average of non-traditional lending arms. The overall repayment rate is comparable to the two microfinance programs with repayment rate information 74% and 99% examined in Banerjee et al. (2015a), and the non-traditional lending has exceptionally high repayment rates. The low repayment rates among traditional arm borrowers may be due to our experimental design that a new loan is disbursed unconditionally up to three cycles, lacking the dynamic incentives to repay, or due to the fact that they had lower returns on their investments. Our finding of labour income growths and the steady consumption indicates the latter possibility is more likely.

There is little difference in repayment rates by poverty classes. FIGURE 9 depicts both moderately poor and ultra poor in different colours. It is impossible to distinguish between them with eyeballs, and ANCOVA estimates also confirm this (see Appendix D, TABLE **??**, **??** for details). We also observe that impacts on all outcome measures are not statistically different between the poverty classes (results are avaiable from the authors on request, OR see Appendix D). This is in contrast to a popular belief that the ultra poor are the riskiest among all income classes.

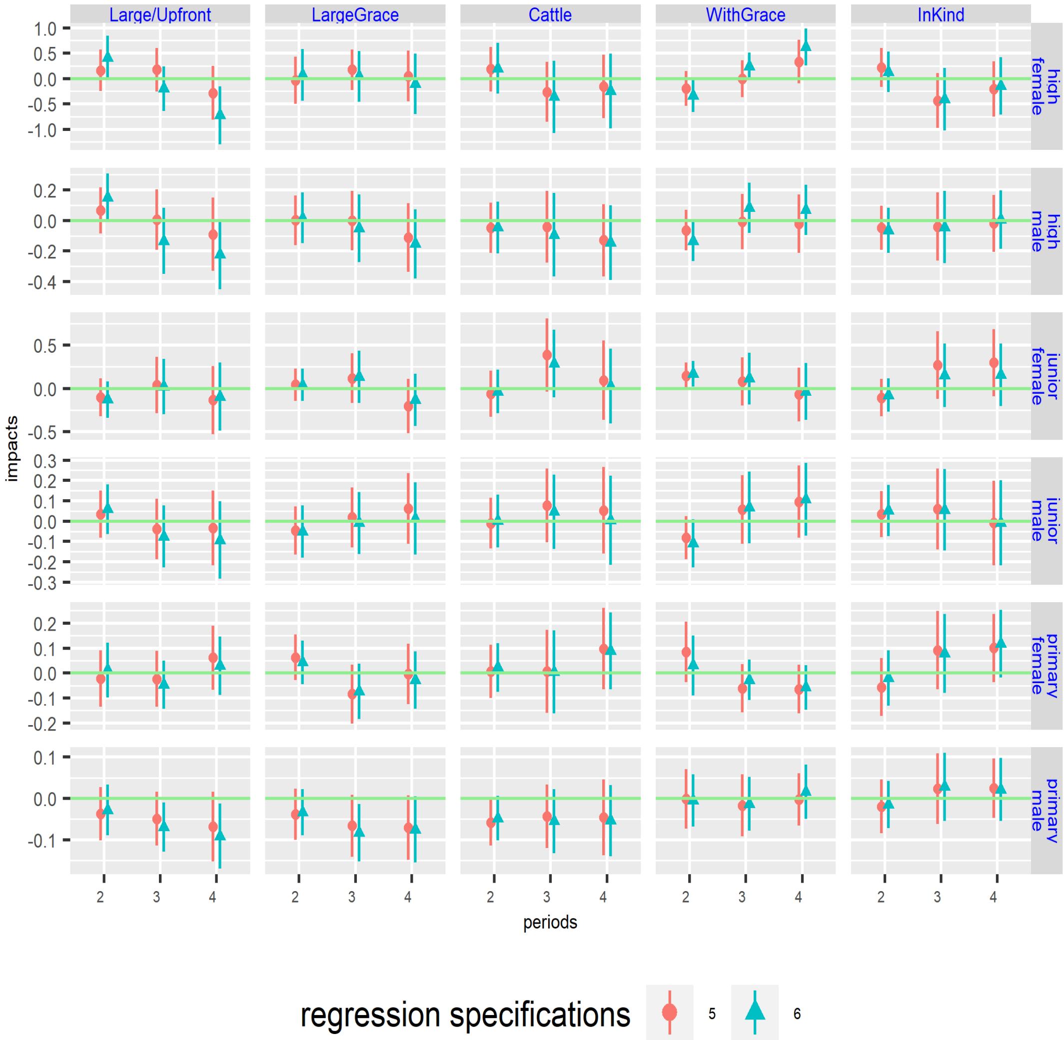
Smaller cumulative impacts and lower repayment rates of traditional arm members stand out once we acknowledge that they are receiving an equivalent amount and their contract differs with other arms only in the attributes we focus. These differences arose partly from the different investment choices observed in FIGURE **??**, 6, which were induced by the lack of Upfront functional attribute in lending.

In Section VIII.1, we observed that nonparticipation is correlated with smaller household size. If the household size limits the participation to microfinance, we may observe adverse impacts of borrowing on the children's school enrollment. In FIGURE 10, the effects on child school enrollment are displayed. Unlike the previous figures, we show per period impacts relative to the concurrent traditional arm values. Using estimated parameters of (2), what we display in FIGURE 10 are the per period impacts ($\boldsymbol{b}_{3k}$ for period 3 and $\boldsymbol{b}_{4k}$ for period 4), not the cumulative impacts ($\boldsymbol{b}_{2k}+\boldsymbol{b}_{3k}$ for period 3 and $\boldsymbol{b}_{2k}+\boldsymbol{b}_{4k}$ for period 4). We chose to show per period impacts because annual enrollment status matters in schooling.

In general, there is no detectable impact of the intervention, except for a negative impact for women at the college level for Upfront in period 4 and a positive impact for women at the college level for WithGrace in period 4. Women at the college level were found from about 5.9% of the whole sample, so the effective sample size of each cell is about 11-12 (=776*.059/4), and it is difficult to interpret the results on these small samples. If anything, negative impacts of elder girl's schooling may be due to stronger demand for cattle production in a household. This is in line with the finding in rejection that the limited household size can be a constraint on participation, especially when there is no grace period. Cattle ownership naturally shifts the relative shadow prices in a household against child schooling, especially for the elder girls as their returns on human capital are considered to be lower than younger girls, and the task contents of cattle rearing labour are less brawn intensive yet requires to be above the primary school ages. This may be a potential downside of having greater cattle production in a household.

In summary, we found that our managerial support programs induce the members of disadvantaged background to participate in microfinance, achieving the further outreach, and achieve the results that are no different with other borrowers. This is consistent with the finding of the previous studies that a certain level of skills is necessary for participation, and our managerial support progams supplemented the lack thereof. We found that the large upfront disbursements allow borrowers to invest in cattle while members with sequential disbursements mostly opted for smaller

FIGURE 10: PERIOD WISE EFFECTS ON SCHOOLING



Source: Constructed from ANCOVA estimation results TABLE D11, TABLE D12.

Note: Left most column panel shows the conditional means of traditional arm which serves as a benchmark in estimating impacts. In other column panels, all points show the relative difference from concurrent traditional levels depicted in the left most column. Large and Upfront are the same values. Other column panels are grouped either by arm or by attribute. Row panels show different outcomes. Bars show 95% confidence intervals using cluster robust standard errors.

livestock and small trades. In combination with a greater return to cattle on net asset accumulation and a greater rate of loan repayment, we consider it as evidence of a poverty trap and an effective measure to break it. We also found the impacts and repayment rates are indistinguishable between the moderately poor and the ultra poor.

IX Conclusion

Conclusion

- Entrepreneurship is necessary for project success, even with a simpler production process.

- Upfront liquidity increases asset holding and repayment rates.
- Cattle has higher returns and lower risks, resulting in higher repayment rates, but also has larger initial fixed costs, possibly generating a poverty trap.
- Lending uptake is impeded by small household size, asset shocks, and a lack of supports for managerial capacity.
- If these are relaxed, a poverty trap may be overcome.
- In the remote rural setting, larger upfront loan suited to the project cash flow is shown to be Pareto improving, despite widely believed fears of inefficiency due to information asymmetry.
- Consumption and labour incomes were not affected in non-traditional arms. Labour incomes increased toward the end of repayment for all arms which can be a repayment effort.
- Schooling was not affected in general. It finds a sign of a loss to college level women, hinting a domestic labour constraint in cattle production. But there was also a positive impact for women at the college level in WithGrace arm. While these are possibilities, cell sample sizes are too small to draw anything conclusive.

The poverty reduction impacts of microfinance was a firm belief in the early days of microfinance. Yet it suffered from a puzzling weak spot that microfinance is slow to reach the ultra poor, which is still debated today. Recently, even the poverty reduction impacts are subject to doubts, and it has been shown that the only borrowers with experience or skills are able to leap benefits. In this study, we examined the role of entrepreneurship in leaping benefits. We showed, under the rural setting, experiences or entrepreneurship seem to matter for participation. We note the usefulness of having consulting services available for the prospective clients of MFIs when expanding the credit to the ultra poor.

This study employs a stepped-wedge design of multiple arms to isolate different functional attributes of loan contract: Frontloading, a grace period, and in-kind loan with management supports. These map to a liquidity constraint, a saving constraint, and an entrepreneurship constraint. Only frontloading the disbursement matters in all outcomes, which signifies the importance of a liquidity constraint. With evidence that borrowers with frontloaded arms invested in cattle while the borrowers under incremental lending invested in multiple, smaller projects, and the repayment rates are higher for the frontloaded arms, we conclude that there is a poverty trap which cannot be overcome by the traditional approach of microfinance. Under the study's setting, escaping from the poverty trap requires frontloading the lending, not lending incrementally as practiced by the majority of microfinance institutions. In addition, lending rather than a transfer may suffice to support the transition.

While we did not observe additional impacts of managerial supports, we found that more members with disadvantaged background participated. This implies that managerial supports can invite more disadvantaged prospective borrowers without adversely affecting the outcomes. To expand the coverage to the ultra poor, it may be useful to have consulting services.

We have witnessed that a binding domestic capacity constraint may impede potential borrowers from participation. This limits the potential benefit of lending a larger amount from the start of the program. While it in unclear why the outsourced labour cannot substitute the domestic labour, one can consider organising an arrangement in each group, tended by the group members, to collectively graze the cattle during the daytime. This partly eases the domestic labour and/or space constraints faced by small households.

We note that our study site is rich in rainfall, giving more advantages to cattle production over sheep/goat production. In contrast, if the climate is more arid, sheep and goats are better suited because of less water logging and their greater viability in relying on natural grass. This raises a concern that our results may not directly transferrable to more arid areas. However, the key lesson from the study is the presence of fixed inputs in scaling the herd size. While sheep/goats are easier to scale than cattle, it will require larger land and roofed facilities at some point as one increases the herd size. This can effectively form nonconvexity in the production set, and large enough finance may allow herders to go pass the threshold.

We have seen that borrowers accumulated assets, increased labour supplies, but not increasing the consumption. This is consistent with a high morale of repayment, which can partly be explained by the lack of alternative lenders in the study area. With stronger incentives to repay, the evidence on stronger repayment discipline of large sized arm members need not generalise in the areas outside the study site. On the other hand, the necessity of codifiable knowledge in participation even for a simple production process and the scope for escaping the poverty trap with large, frontloaded lending may be more generalisable to other rural areas with liquidity constraints.

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A Randomisation checks

Table A1: Permutation test results

Variables	P-value	P-value adjustments: step-down			
		traditional	large	large grace	cow
MeanHeadLiteracy	0.213	0.213	0.753	0.917	0.510
MeanHeadAge	0.882	0.882	0.882	0.882	0.882
MeanHHsize	0.198	0.831	0.198	0.920	0.459
MeanFlood	0.177	0.933	0.271	0.177	0.964
MeanFemale	0.693	0.896	0.924	0.924	0.693
MeanEnrolled	0.880	0.950	0.950	0.950	0.880
MeanHAssetAmount	0.877	0.877	0.959	0.986	0.986
MeanPAssetAmount	0.183	0.628	0.628	0.183	0.183
MeanLivestockValue	0.440	0.806	0.532	0.806	0.440
MeanNumCows	0.440	0.808	0.534	0.808	0.440

Source: Estimated with GUK administrative and survey data.

Notes: 1. R's package `coin` is used for baseline group mean covariates to conduct approximate permutation tests. Number of repetition is set to 100000. Number of groups is 72.

2. ***, **, * indicate statistical significance at 1%, 5%, 10%, respetively. Standard errors are clustered at group (village) level.

3. See the footnote of Table 3 for description of variables.

Table A2: Anova results for cattle holding equality by arm

	(1)	(2)	(3)	(4)	(5)
Tests	rd4	rd4 edited	rd3	rd2	rd1
a	b	c	d	e	f
ANOVA	0.0006	0.0004	0.0017	0.0001	0.3490
Kruskal-Wallis	0.0007	0.0002	0.0052	0.0010	0.4263
Tukey HST					
large-traditional	0.5016	0.5016	0.4172	0.5392	0.0894
	(0.0002)	(0.0002)	(0.0007)	(0.0001)	(0.4858)
large grace-traditional	0.3561	0.3561	0.2113	0.2286	0.0391
	(0.0235)	(0.0205)	(0.2254)	(0.2496)	(0.9248)
cow-traditional	0.3031	0.3737	0.1713	0.2044	−0.0111
	(0.0690)	(0.0119)	(0.3963)	(0.3190)	(0.9980)
large grace-large	−0.1455	−0.1455	−0.2059	−0.3106	−0.0503
	(0.5796)	(0.5663)	(0.2105)	(0.0409)	(0.8419)
cow-large	−0.1984	−0.1279	−0.2459	−0.3348	−0.1005
	(0.2935)	(0.6568)	(0.0859)	(0.0168)	(0.3497)
cow-large grace	−0.0529	0.0176	−0.0400	−0.0242	−0.0503
	(0.9692)	(0.9987)	(0.9821)	(0.9968)	(0.8419)

Source: Survey data.

Note: Each column uses respective year cattle ownership information. Columns (1) to (5) tests cattle holding equality for each survey rounds. In column (2), we edited the data by assigning 1 to members of `cow` arm who report holding is NA or zero. For ANOVA and Kruskal-Wallis, each entry indicates p values. ANOVA tests for the null of equality of all means under normality. Kruskal-Wallis tests for the null of no stochastic dominance among samples without using the normality assumption. Tukey's honest significant tests show difference in means and p values in parenthesis that account for multiple testing under the normality assumption.

B Rejection

Among 776 observations, there are 40 whose villages are washed away and 70 who by group rejected the assigned arms (traditional, large, large grace with 40, 20, 10 individuals, respectively). There are 31, 9, 13, 37 individuals who individually rejected traditional, large, large grace, cow, respectively.

Use coin package's independence_test: Approximate permutation tests by randomly resampling 100000 times.

Table B1: Permutation test results of rejection

variables	NonRejected	Rejected	p-value.lower	p-value.mid	p-value.upper
HeadLiteracy	0.127	0.081	0.096	0.112	0.128
HeadAge	38.145	37.763	0.669	0.671	0.673
HHsize	4.255	3.938	0.014	0.015	0.015
Arm	0.830	0.556	0.000	0.000	0.000
FloodInRd1	0.475	0.585	0.013	0.015	0.017
HAssetAmount	780	682	0.238	0.239	0.239
PAssetAmount	1324	889	0.295	0.295	0.295
LivestockValue	5700	2685	0.007	0.008	0.008
NumCows	0.285	0.134	0.007	0.008	0.008
NetValue	7518	4125	0.008	0.008	0.008
n	616	160	(rate: 0.206)		

Source: Estimated with GUK administrative and survey data.

Notes: 1. R's package coin is used for baseline mean covariates to conduct approximate permutation tests. Number of repetition is set to 100000. Step-down method is used to adjust for multiple testing of a multi-factor grouping variable. The second and third columns show means of each group. For Arm, proportions of non-traditional arm between two groups are tested.
2. Standard errors are clustered at group (village) level. p-value.lower, p-value.mid, p-value.upper indicate lower-bound, mid p value, and upper-bound of the observed test statistic and the null distribution.
3. See the footnote of Table 3 for description of variables.

Table B2: Permutation test results of rejection among traditional arm

variables	NonRejected	Rejected	p-value.lower	p-value.mid	p-value.upper
HeadLiteracy	0.095	0.099	0.795	0.897	1.000
HeadAge	38.848	37.800	0.498	0.503	0.508
HHsize	4.181	3.958	0.318	0.331	0.344
FloodInRd1	0.514	0.386	0.090	0.106	0.122
HAssetAmount	714	744	0.839	0.841	0.843
PAssetAmount	996	967	0.959	0.959	0.959
LivestockValue	6095	1714	0.007	0.009	0.011
NumCows	0.305	0.086	0.007	0.009	0.011
NetValue	7685	3161	0.014	0.014	0.014
n	105	71	(rate: 0.403)		

Source: Estimated with GUK administrative and survey data.

Notes: 1. R's package coin is used for baseline mean covariates to conduct approximate permutation tests. Number of repetition is set to 100000. Step-down method is used to adjust for multiple testing of a multi-factor grouping variable. The second and third columns show means of each group.
2. Standard errors are clustered at group (village) level. p-value.lower, p-value.mid, p-value.upper indicate lower-bound, mid p value, and upper-bound of the observed test statistic and the null distribution.
3. See the footnote of Table 3 for description of variables.

Table B3: Permutation test results of rejection among non-traditional arm

variables	NonRejected	Rejected	p-value.lower	p-value.mid	p-value.upper
HeadLiteracy	0.133	0.067	0.083	0.099	0.115
HeadAge	38.000	37.733	0.819	0.821	0.823
HHsize	4.270	3.921	0.036	0.038	0.039
FloodInRd1	0.467	0.742	0.000	0.000	0.000
HAssetAmount	794	633	0.131	0.131	0.131
PAssetAmount	1392	828	0.215	0.215	0.215
LivestockValue	5619	3544	0.156	0.173	0.190
NumCows	0.281	0.177	0.156	0.173	0.190
NetValue	7483	4979	0.156	0.156	0.156
n	511	89	(rate: 0.148)		

Source: Estimated with GUK administrative and survey data.

Notes: 1. R's package coin is used for baseline mean covariates to conduct approximate permutation tests. Number of repetition is set to 100000.
2. See footnotes of Table B2.

Table B4: Permutation test results of rejecters, traditional vs. non-traditional arm

variables	NonTradArm	TradArm	p-value.lower	p-value.mid	p-value.upper
HeadLiteracy	0.067	0.099	0.386	0.474	0.562
HeadAge	37.733	37.800	0.967	0.969	0.972
HHsize	3.921	3.958	0.881	0.901	0.920
FloodInRd1	0.742	0.386	0.000	0.000	0.000
HAssetAmount	633	744	0.389	0.391	0.392
PAssetAmount	828	967	0.329	0.329	0.329
LivestockValue	3544	1714	0.170	0.203	0.236
NumCows	0.177	0.086	0.170	0.204	0.238
NetValue	4979	3161	0.211	0.211	0.211
n	89	71	(rate: 0.444)		

Source: Estimated with GUK administrative and survey data.
Notes: 1. R's package coin is used for baseline mean covariates to conduct approximate permutation tests. Number of repetition is set to 100000.
2. See footnotes of Table B2.

Table B5: Permutation test results of group rejection

variables	NonGRejected	GRejected	p-value.lower	p-value.mid	p-value.upper
HeadLiteracy	0.123	0.057	0.077	0.098	0.119
HeadAge	38.188	36.841	0.287	0.288	0.290
HHsize	4.201	4.071	0.464	0.478	0.492
Arm	0.807	0.429	0.000	0.000	0.000
FloodInRd1	0.490	0.571	0.168	0.190	0.212
HAssetAmount	766	705	0.608	0.609	0.609
PAssetAmount	1259	994	0.627	0.627	0.627
LivestockValue	5377	2000	0.040	0.044	0.049
NumCows	0.269	0.100	0.040	0.045	0.050
NetValue	7141	3509	0.052	0.052	0.052
n	706	70	(rate: 0.090)		

Source: Estimated with GUK administrative and survey data.
Notes: 1. R's package coin is used for baseline mean covariates to conduct approximate permutation tests. Number of repetition is set to 100000.
2. See footnotes of Table B1.

Table B6: Permutation test results of group rejection among traditional arm

variables	NonGRejected	GRejected	p-value.lower	p-value.mid	p-value.upper
HeadLiteracy	0.110	0.050	0.222	0.293	0.365
HeadAge	38.257	39.026	0.674	0.677	0.680
HHsize	4.059	4.200	0.577	0.599	0.620
FloodInRd1	0.519	0.275	0.003	0.005	0.007
HAssetAmount	677	892	0.218	0.219	0.220
PAssetAmount	964	1054	0.779	0.779	0.779
LivestockValue	5481	500	0.010	0.011	0.012
NumCows	0.274	0.025	0.009	0.011	0.012
NetValue	7029	1984	0.019	0.019	0.019
n	136	40	(rate: 0.227)		

Source: Estimated with GUK administrative and survey data.
Notes: 1. R's package coin is used for baseline mean covariates to conduct approximate permutation tests. Number of repetition is set to 100000.
2. See footnotes of Table B2.

Table B7: Permutation test results of group rejection among non-traditional arm

variables	NonGRejected	GRejected	p-value.lower	p-value.mid	p-value.upper
HeadLiteracy	0.126	0.067	0.247	0.330	0.413
HeadAge	38.171	34.000	0.028	0.028	0.028
HHsize	4.235	3.900	0.196	0.208	0.221
FloodInRd1	0.483	0.967	0.000	0.000	0.000
HAssetAmount	786	455	0.055	0.055	0.056
PAssetAmount	1329	914	0.541	0.541	0.542
LivestockValue	5352	5000	0.859	0.929	1.000
NumCows	0.268	0.250	0.857	0.929	1.000
NetValue	7167	6557	0.854	0.854	0.854
n	570	30	(rate: 0.050)		

Source: Estimated with GUK administrative and survey data.
Notes: 1. R's package coin is used for baseline mean covariates to conduct approximate permutation tests. Number of repetition is set to 100000.
2. See footnotes of Table B2.

Table B8: Permutation test results of group rejecters, traditional vs. non-traditional arm

variables	NonTradArm	TradArm	p-value.lower	p-value.mid	p-value.upper
HeadLiteracy	0.067	0.050	0.627	0.814	1.000
HeadAge	34.000	39.026	0.027	0.027	0.028
HHsize	3.900	4.200	0.342	0.366	0.390
FloodInRd1	0.967	0.275	0.000	0.000	0.000
HAssetAmount	455	892	0.024	0.025	0.025
PAssetAmount	914	1054	0.596	0.596	0.596
LivestockValue	5000	500	0.001	0.007	0.013
NumCows	0.250	0.025	0.001	0.007	0.013
NetValue	6557	1984	0.010	0.010	0.010
n	30	40	(rate: 0.571)		

Source: Estimated with GUK administrative and survey data.
Notes: 1. R's package coin is used for baseline mean covariates to conduct approximate permutation tests. Number of repetition is set to 100000.
2. See footnotes of Table B2.

Table B9: Permutation test results of individual rejection

variables	NonIRejected	IRejected	p-value.lower	p-value.mid	p-value.upper
HeadLiteracy	0.127	0.100	0.387	0.443	0.499
HeadAge	38.145	38.494	0.762	0.764	0.767
HHsize	4.255	3.833	0.009	0.010	0.011
Arm	0.830	0.656	0.000	0.000	0.000
FloodInRd1	0.475	0.596	0.030	0.035	0.040
HAssetAmount	780	664	0.280	0.281	0.281
PAssetAmount	1324	807	0.194	0.194	0.194
LivestockValue	5700	3146	0.077	0.085	0.092
NumCows	0.285	0.157	0.076	0.084	0.091
NetValue	7518	4540	0.068	0.068	0.068
n	616	90	(rate: 0.127)		

Source: Estimated with GUK administrative and survey data.
Notes: 1. R's package coin is used for baseline mean covariates to conduct approximate permutation tests. Number of repetition is set to 100000.
2. See footnotes of Table B1.

Table B10: Permutation test results of individual rejection among traditional arm

variables	NonIRejected	IRejected	p-value.lower	p-value.mid	p-value.upper
HeadLiteracy	0.095	0.161	0.190	0.261	0.331
HeadAge	38.848	36.258	0.212	0.213	0.215
HHsize	4.181	3.645	0.061	0.066	0.072
FloodInRd1	0.514	0.533	0.839	0.919	1.000
HAssetAmount	714	547	0.430	0.433	0.435
PAssetAmount	996	851	0.719	0.720	0.720
LivestockValue	6095	3333	0.239	0.282	0.324
NumCows	0.305	0.167	0.239	0.281	0.324
NetValue	7685	4731	0.297	0.297	0.297
n	105	31	(rate: 0.228)		

Source: Estimated with GUK administrative and survey data.
Notes: 1. R's package coin is used for baseline mean covariates to conduct approximate permutation tests. Number of repetition is set to 100000.
2. See footnotes of Table B2.

Table B11: Permutation test results of individual rejection among non-traditional arm

variables	NonIRejected	IRejected	p-value.lower	p-value.mid	p-value.upper
HeadLiteracy	0.133	0.068	0.149	0.181	0.212
HeadAge	38.000	39.732	0.223	0.224	0.225
HHsize	4.270	3.932	0.092	0.096	0.101
FloodInRd1	0.467	0.627	0.021	0.024	0.028
HAssetAmount	794	724	0.587	0.589	0.591
PAssetAmount	1392	784	0.181	0.181	0.181
LivestockValue	5619	3051	0.135	0.151	0.168
NumCows	0.281	0.153	0.134	0.151	0.167
NetValue	7483	4443	0.129	0.129	0.129
n	511	59	(rate: 0.104)		

Source: Estimated with GUK administrative and survey data.
Notes: 1. R's package coin is used for baseline mean covariates to conduct approximate permutation tests. Number of repetition is set to 100000.
2. See footnotes of Table B2.

Table B12: Permutation test results of individual rejecters, traditional vs. non-traditional arm

variables	NonTradArm	TradArm	p-value.lower	p-value.mid	p-value.upper
HeadLiteracy	0.068	0.161	0.157	0.211	0.265
HeadAge	39.732	36.258	0.219	0.220	0.222
HHsize	3.932	3.645	0.445	0.465	0.484
FloodInRd1	0.627	0.533	0.369	0.432	0.495
HAssetAmount	724	547	0.328	0.332	0.335
PAssetAmount	784	851	0.679	0.680	0.680
LivestockValue	3051	3333	0.820	0.910	1.000
NumCows	0.153	0.167	0.823	0.912	1.000
NetValue	4443	4731	0.904	0.904	0.904
n	59	31	(rate: 0.344)		

Source: Estimated with GUK administrative and survey data.
Notes: 1. R's package coin is used for baseline mean covariates to conduct approximate permutation tests. Number of repetition is set to 100000.
2. See footnotes of Table B2.

Table B13: Permutation test results of borrowers, cattle vs. non-cattle arms

variables	NonCowArm	CowArm	p-value.lower	p-value.mid	p-value.upper
HeadLiteracy	0.110	0.172	0.039	0.047	0.054
HeadAge	38.325	37.642	0.444	0.446	0.447
HHsize	4.287	4.166	0.333	0.341	0.350
FloodInRd1	0.479	0.463	0.717	0.751	0.785
HAssetAmount	781	779	0.979	0.980	0.980
PAssetAmount	1526	765	0.119	0.119	0.119
LivestockValue	6150	4444	0.148	0.159	0.170
NumCows	0.308	0.222	0.145	0.156	0.167
NetValue	8204	5603	0.058	0.058	0.058
n	453	163	(rate: 0.265)		

Source: Estimated with GUK administrative and survey data.
Notes: 1. R's package coin is used for baseline mean covariates to conduct approximate permutation tests. Number of repetition is set to 100000.
2. See footnotes of Table B2.

Table B1 shows test results of independence between loan receivers and nonreceivers (group, individual rejecters) on the analysis sample of 776 members. It shows that lower head literacy, smaller household size, being affected by flood at the baseline, smaller livestock holding, and smaller net assets are correlated with opting out the offered type of lending. Table B2 indicates that lower asset and livestock holding is more pronounced among traditional rejecters relative to loan receivers. It also shows that flood exposure is less frequent, contrary to Table B1, among the rejecters. Table B3 indicates that lower head literacy, smaller household size, higher flood exposure, are more pronounced among non-traditional rejecters relative to loan receivers. It also shows that asset and livestock holding is no different relative to the receivers. Comparing rejecters of traditional arm, lower flood exposure may be the only stark difference against non-traditional arm members, and smaller asset and livestock holding is merely suggestive (Table B4).

Group rejecters and non-group rejecters are compared in Table B5. Marked differences are found in arm (traditional vs. non-traditional) and net asset values and head literacy are noted. Table B6 compares group rejecters in traditional arm and finds smaller flood exposure and lower livestock and net asset holding are associated with group rejection. Group rejecters in non-traditional arm are examined in Table B7 and younger head age, flood at baseline, and smaller household asset holding are correlated with rejection. Comparing group rejecters between traditional and non-traditional arms in Table B8, younger head age, higher flood exposure, larger net asset values and livestock holding are noted among the non-traditional group rejecters. These hint that for non-traditional arm group rejecters, it is the smaller household size and the baseline flood that may have constrained them from participation, and for traditional group rejecters, it is the low asset levels.

Acknowledging the reasons for rejection can be different, we tested the independence of each characteristics for individual rejecters (vs. non-individual rejeceters) in Table B9. Smaller HHsize, being affected with FloodInRd1, and smaller LivestockValue, NumCows, and NetValue are associated with individual rejecters. Individual decisions not to participate may be more straightforward: Smaller household size may indicate difficulty in securing the cattle production labour in a household, being hit with a flood may have resulted in lower livestock levels that would prompt them to reconsider partaking in another livestock project.

Table B10 and Table B11 compare individual rejecters and nonrejecters in traditional arm and non-traditional arms, respectively. For traditional rejecters, livestock and other asset values are not correlated with rejection, but the values are similar to non-traditional and higher p values may be due to smaller sample size. For non-traditional arm rejecters, household size and flood exposure are correlated. Comparison of individual rejecters between traditional and non-traditional arms show no detectable difference (Table B12). This suggests that indvidual rejecters in all arms were constrained with small household size and small asset holding. In Table B13, we compare if the cattle arm participants (borrowers) differ from participants in other arms at the baseline. It is worth noting that partcipants of cattle arm differ from other arms in having less cattle rearing experience as observed in smaller initial cattle holding (p value = .156) and in having lower net asset values (p value = .058), weakly hinting that the cattle arm's managerial support programs may have encouraged participation of inexperienced or lower asset holders.

C Attrition

Table C1: Permutation test results of attrition

variables	NonAttrited	Attrited	p-value.lower	p-value.mid	p-value.upper
HeadLiteracy	0.115	0.130	0.609	0.670	0.731
HeadAge	37.996	38.598	0.591	0.593	0.595
HHsize	4.178	4.272	0.542	0.555	0.568
Arm	0.789	0.652	0.000	0.000	0.000
FloodInRd1	0.493	0.527	0.502	0.540	0.577
HAssetAmount	763	741	0.833	0.834	0.836
PAssetAmount	1109	2181	0.105	0.105	0.105
LivestockValue	5124	5000	0.924	0.962	1.000
NumCows	0.256	0.250	0.923	0.962	1.000
NetValue	6786	7446	0.696	0.696	0.697
n	684	92	(rate: 0.119)		

Source: Estimated with GUK administrative and survey data.
Notes: 1. R's package coin is used for baseline mean covariates to conduct approximate permutation tests. Number of repetition is set to 100000.
2. See footnotes of Table B1.

Table C2: Permutation test results of attrition among traditional arm

variables	NonAttrited	Attrited	p-value.lower	p-value.mid	p-value.upper
HeadLiteracy	0.118	0.000	0.018	0.032	0.046
HeadAge	38.497	38.125	0.848	0.852	0.856
HHsize	4.167	3.750	0.137	0.147	0.156
FloodInRd1	0.479	0.387	0.326	0.377	0.428
HAssetAmount	702	842	0.470	0.473	0.475
PAssetAmount	997	926	0.813	0.813	0.814
LivestockValue	4722	2581	0.283	0.336	0.388
NumCows	0.236	0.129	0.285	0.336	0.388
NetValue	6206	4343	0.446	0.446	0.446
n	144	32	(rate: 0.182)		

Source: Estimated with GUK administrative and survey data.
Notes: 1. R's package coin is used for baseline mean covariates to conduct approximate permutation tests. Number of repetition is set to 100000.
2. See footnotes of Table B2.

Table C3: Permutation test results of attrition among non-traditional arm

variables	NonAttrited	Attrited	p-value.lower	p-value.mid	p-value.upper
HeadLiteracy	0.115	0.200	0.036	0.051	0.065
HeadAge	37.862	38.850	0.470	0.472	0.474
HHsize	4.181	4.550	0.061	0.064	0.067
FloodInRd1	0.497	0.600	0.102	0.120	0.138
HAssetAmount	779	688	0.473	0.475	0.477
PAssetAmount	1139	2829	0.093	0.093	0.093
LivestockValue	5232	6531	0.498	0.530	0.563
NumCows	0.262	0.327	0.499	0.531	0.564
NetValue	6941	9409	0.255	0.255	0.255
n	540	60	(rate: 0.100)		

Source: Estimated with GUK administrative and survey data.
Notes: 1. R's package coin is used for baseline mean covariates to conduct approximate permutation tests. Number of repetition is set to 100000.
2. See footnotes of Table B2.

Table C4: Permutation test results of attriters of traditional and non-traditional arms

variables	NonTradArm	TradArm	p-value.lower	p-value.mid	p-value.upper
HeadLiteracy	0.200	0.000	0.003	0.005	0.007
HeadAge	38.850	38.125	0.768	0.772	0.776
HHsize	4.550	3.750	0.021	0.023	0.026
FloodInRd1	0.600	0.387	0.048	0.062	0.075
HAssetAmount	688	842	0.522	0.525	0.528
PAssetAmount	2829	926	0.834	0.834	0.834
LivestockValue	6531	2581	0.170	0.203	0.237
NumCows	0.327	0.129	0.171	0.204	0.237
NetValue	9409	4343	0.309	0.309	0.309
n	60	32	(rate: 0.348)		

Source: Estimated with GUK administrative and survey data.
Notes: 1. R's package coin is used for baseline mean covariates to conduct approximate permutation tests. Number of repetition is set to 100000.
2. See footnotes of Table B2.

Table C5: Permutation test results of survival

variables	NonSurvived	Survived	p-value.lower	p-value.mid	p-value.upper
HeadLiteracy	0.104	0.123	0.389	0.427	0.465
HeadAge	37.835	38.159	0.688	0.690	0.691
HHsize	4.072	4.236	0.149	0.153	0.157
Arm	0.581	0.850	0.000	0.000	0.000
FloodInRd1	0.548	0.477	0.066	0.072	0.079
HAssetAmount	707	781	0.321	0.322	0.322
PAssetAmount	1440	1154	0.550	0.550	0.550
LivestockValue	3714	5642	0.052	0.056	0.060
NumCows	0.186	0.282	0.050	0.054	0.058
NetValue	5521	7362	0.108	0.108	0.108
n	222	554	(rate: 0.714)		

Source: Estimated with GUK administrative and survey data.
Notes: 1. R's package coin is used for baseline mean covariates to conduct approximate permutation tests. Number of repetition is set to 100000.
2. See footnotes of Table B1.

Table C6: Permutation test results of surviving members of cattle and large grace

variables	NonCowArm	CowArm	p-value.lower	p-value.mid	p-value.upper
HeadLiteracy	0.106	0.150	0.236	0.271	0.306
HeadAge	38.481	37.973	0.644	0.647	0.649
HHsize	4.181	4.102	0.573	0.589	0.604
FloodInRd1	0.352	0.459	0.046	0.055	0.063
HAssetAmount	798	785	0.905	0.906	0.907
PAssetAmount	1480	753	0.003	0.003	0.003
LivestockValue	5375	3425	0.126	0.139	0.152
NumCows	0.269	0.171	0.124	0.137	0.150
NetValue	7448	4702	0.046	0.046	0.046
n	160	147	(rate: 0.479)		

Source: Estimated with GUK administrative and survey data.
Notes: 1. R's package coin is used for baseline mean covariates to conduct approximate permutation tests. Number of repetition is set to 100000.
2. See footnotes of Table B2.

Table C7: Permutation test results of surviving members of cattle and all other arms

variables	NonCowArm	CowArm	p-value.lower	p-value.mid	p-value.upper
HeadLiteracy	0.113	0.150	0.246	0.275	0.304
HeadAge	38.226	37.973	0.786	0.788	0.790
HHsize	4.285	4.102	0.166	0.171	0.177
FloodInRd1	0.484	0.459	0.561	0.595	0.629
HAssetAmount	780	785	0.956	0.956	0.957
PAssetAmount	1298	753	0.028	0.028	0.028
LivestockValue	6437	3425	0.015	0.016	0.018
NumCows	0.322	0.171	0.015	0.016	0.018
NetValue	8315	4702	0.007	0.007	0.007
n	407	147	(rate: 0.265)		

Source: Estimated with GUK administrative and survey data.
Notes: 1. R's package coin is used for baseline mean covariates to conduct approximate permutation tests. Number of repetition is set to 100000.
2. See footnotes of Table B2.

Table C1 shows results from tests of independence between attriters and nonattriters. We see the moderate rate of attrition is not correlated with household level characteristics at the conventional p value level. Productive asset amounts seem to differ between attriters and nonattriters, with the former being larger than the latter. This positive attrition selection can cause underestimation of impacts, if the asset values are positively correlated with entrepreneurial capacity. Table C2 shows attrition in the traditional arm. Household heads of attriters are relatively less literate than nonattriters. Table C3 compares attriters and nonattriters in the non-traditional arm. Unlike traditional arm attriters, non-traditional arm attriters have more literate household heads, have a larger household size, are more exposed to floods, and have larger productive assets. The traditional arm attriters may be less entrepreneurial, if anything, so their attrition may upwardly bias the positive gains of the arm, hence understate the impacts of non-traditional arm. These are explicitly shown in Table C4 where we compare attriters of traditional and non-traditional arms. Overall, attrition may have attenuated the impacts but is not likely to have inflated them.[*24]

For the microfinance institutions (MFIs), attrition of the loan receiving members poses a threat to their business continuation. Financial institutions often use observable characteristics, such as collateralisable assets, and easily surveyed chracteristics, such as job experiences and schooling of borrowers, and are likely to lend if the assets levels are greater and the borrowers have relevant job experiences and more schooling. We examine if the relationship of having "less favourable" values in these characteristics and attrition is mitigated under various loan characteristics. Conditional on receiving a loan, Table C5 compares attriters and nonattriters of all arms. It shows nonattriters at the baseline have larger values in livestock and greater number of cattle, and are less affected by the flood, which conforms the conventional wisdom of lenders in using these aspects in their loan decisions. In Table C6, we compare nonattriters of cattle and large grace arms, whose difference is efffectively the presence of managerial supports that the former provides. Comparing against the large grace arm, nonattriting borrowers of the cattle arm are more exposed to the flood ($p = .055$), have less productive assets ($p = .003$), have lower net asset values ($p = .046$), and have fewer livestock ($p = .137$). This shows that the smaller livestock holders or less experienced individuals are encouraged to participate and continue to operate in the cattle arm that has a managerial support program, with all other features being equal. This is consistent with our analysis of participation in Table B13 which weakly hints that the cattle arm's managerial support programs may have encouraged participation of inexperienced or lower asset holders. This also underscores our interpretation that the current impact estimates may be downward biased, if any, as people who would otherwise attrit or reject in cattle arm stayed on. This result is confirmed with lower p values due to a larger sample size when we compare the nonattriters between cattle arm with other arms in Table C7. At the baseline, cattle arm nonattriting borrowers have smaller baseline livestock holding (p value =

[*24] So one can employ the Lee bounds for stronger results, but doing so will give us less precision and require more assumptions. We will not use the Lee bounds [we can show them if necessary].

.016) and smaller baseline net asset holding (p value = .007) than other arms' nonattriting borrowers.

D Estimation results for the impact

In this section, the ANCOVA estimates on various outcomes using (2) are presented. In each table, the first column shows the covariate names and their means and standard deviations in the second column in the sample of the richest specification of the table. Specification (1) is OLS estimates on the intercept, $\mathbf{d}_i$, and its period interactions. This is intended to provide a reference to ANCOVA estimates shown in the specification (2) onwards. Specification (2) follows the most basic specification under (2). From (3), we progressively add more covariates to control for the differences in initial conditions in an attempt to get more precise ANCOVA estimates. In the figures (Figure 4, Figure 7, Figure 10) shown in main texts, we omit OLS estimates of specification (1).

We annotate the number of periods that a household is observed with T. The total number of households is shown for each values of T. T=4 indicates the number of households with complete panel information, T=3 indicates number of households observed three times, T=2 indicates the number of households observed twice. N indicates total number of observations used in ANCOVA estimation, or N=1×(T=2)+2×(T=3)+3×(T=4).

For Figure 4, Figure 7, we show cumulative impacts of the arm or functional attribute k relative to the traditional arm as given by b_{2k}, $b_{2k} + b_{3k}$, $b_{2k} + b_{4k}$ for periods 2, 3, and 4. In Figure 10, we show contemporaneous impacts relative to the traditional arm as given by b_{2k}, b_{3k}, b_{4k} for periods 2, 3, and 4.

Table D1: ANCOVA estimation of narrow net assets by period

covariates	mean/std	(1)	(2)	(3)	(4)	(5)	(6)
(Intercept)		16308.0 (0.0)	13568.2 (0.0)	6252.3 (5.6)	11040.5 (0.2)	6227.0 (5.8)	10942.5 (0.2)
Large	0.272 (0.45)	15678.2 (0.0)	14478.1 (0.0)	14120.4 (0.0)	14213.5 (0.0)	14112.5 (0.0)	14154.1 (0.0)
LargeGrace	0.243 (0.43)	8166.5 (0.4)	7471.2 (0.3)	7560.6 (0.2)	7537.9 (0.4)	7511.3 (0.3)	7429.3 (0.4)
Cattle	0.275 (0.45)	8447.2 (0.4)	8747.4 (0.4)	8728.1 (0.4)	7110.8 (1.5)	8770.8 (0.4)	7178.4 (1.4)
rd 3	0.342 (0.47)	5079.7 (0.0)	5003.1 (0.0)	5136.5 (0.0)	5943.8 (0.0)	5137.9 (0.0)	5948.8 (0.0)
Large × rd 3	0.091 (0.29)	−260.6 (92.0)	−207.1 (93.6)	259.4 (92.0)	87.6 (97.7)	258.9 (92.1)	82.5 (97.8)
LargeGrace × rd 3	0.083 (0.28)	2046.8 (56.4)	2164.8 (54.3)	2460.3 (48.6)	2325.5 (57.4)	2460.7 (48.6)	2315.2 (57.5)
Cattle × rd 3	0.093 (0.29)	−3473.6 (20.4)	−3294.2 (22.5)	−3081.0 (24.7)	−3521.6 (23.9)	−3082.6 (24.7)	−3529.5 (23.8)
rd 4	0.316 (0.47)	6325.9 (0.0)	6313.8 (0.0)	6394.8 (0.0)	8213.3 (0.0)	6390.6 (0.0)	8198.8 (0.0)
Large × rd 4	0.090 (0.29)	2029.4 (62.4)	2146.5 (59.7)	2262.3 (57.5)	1377.0 (76.7)	2250.8 (57.8)	1366.5 (76.9)
LargeGrace × rd 4	0.078 (0.27)	2028.2 (62.2)	2174.6 (59.7)	2589.2 (52.9)	2659.7 (58.7)	2578.0 (53.0)	2639.8 (59.0)
Cattle × rd 4	0.087 (0.28)	−2255.2 (49.3)	−1567.3 (63.9)	−1091.5 (73.0)	−2869.2 (41.4)	−1135.2 (72.0)	−2962.4 (39.8)
HadCattle	0.206 (0.40)				1536.5 (77.1)		3007.4 (66.3)
HadCattle × rd 3	0.071 (0.26)				−361.7 (90.0)		−354.2 (90.2)
HadCattle × rd 4	0.065 (0.25)				−3101.8 (44.3)		−3157.7 (43.4)
FloodInRd1	0.484 (0.50)			873.2 (66.1)	1958.0 (35.9)	907.0 (65.2)	2042.1 (34.8)
Head literate0	0.113 (0.32)			−955.3 (76.5)	511.2 (88.0)	−966.2 (76.3)	470.4 (89.0)
Narrownet asset value$_1$	6668.224 (13472.56)		0.5 (0.0)	0.5 (0.0)	0.4 (4.2)	0.7 (5.9)	0.7 (4.3)
HHsize0	4.249 (1.43)			1703.7 (1.2)	1118.5 (10.4)	1682.1 (1.3)	1076.9 (11.4)
HadCattle × Large	0.067 (0.25)				14794.1 (10.9)		15193.8 (10.2)
HadCattle × Large × rd 3	0.022 (0.15)				8210.8 (25.2)		8183.8 (25.3)
HadCattle × Large × rd 4	0.022 (0.15)				−167.8 (98.9)		−65.2 (99.6)
HadCattle × LargeGrace	0.052 (0.22)				9567.6 (15.8)		9478.2 (16.4)
HadCattle × LargeGrace × rd 3	0.018 (0.13)				−6075.5 (51.4)		−6109.2 (51.2)
HadCattle × LargeGrace × rd 4	0.017 (0.13)				−15761.2 (17.7)		−15676.3 (18.0)
HadCattle × Cattle	0.046 (0.21)				2554.3 (70.2)		2551.4 (70.0)
HadCattle × Cattle × rd 3	0.017 (0.13)				9013.6 (21.5)		8978.7 (21.6)
HadCattle × Cattle × rd 4	0.013 (0.11)				8893.3 (44.3)		8800.3 (44.5)
cattle holding$_1$attle0	0.282 (0.64)					−3638.4 (67.9)	−7607.9 (48.5)
mean of dependent variable		28534	28534	28534	28534	28534	28534
$T = 2$		16	16	16	19	16	19
$T = 3$		53	53	50	54	50	54
$T = 4$		666	666	666	582	666	582
$\bar{R}^2$		0.035	0.081	0.087	0.078	0.087	0.078
N	1873	2120	2120	2114	1873	2114	1873

Source: Estimated with GUK administrative and survey data.

Notes: 1. ANCOVA estimates using administrative and survey data. Post treatment regressands are regressed on categorical variables, pre-treatment regressand and other covariates. FloodInRd1 and HeadLiterate0 are indicator variables for the presence of self reported damage by a flood at the baseline, and literacy of household head, respectively. HHsize0 is household size at the baseline. We annotate the number of periods that a household is observed with T. The total number of households is shown for each values of T. T=4 indicates the number of households with complete panel information, T=3 indicates number of households observed three times, T=2 indicates the number of households observed twice. N indicates total number of observations used in ANCOVA estimation, or N=1×(T=2)+2×(T=3)+3×(T=4). Large, LargeGrace, Cattle are indicator variables of the large, large grace, and cattle arms, respectively. The default arm category is traditional arm. Narrow net assets = Narrow assets + net saving - debt to GUK - debts to relatives and money lenders. Narrow assets use only items observed for all 4 rounds for household assets. Household assets do not include livestock. Regressions (1)-(3), (5)-(6) use only arm and calendar information. (4) and (7) use previous six month repayment and saving information which is lacking in rd 1, hence starts from rd 2.

2. P values in percentages in parentheses. Standard errors are clustered at group (village) level.

Table D2: ANCOVA estimation of net assets by period

covariates	mean/std	(1)	(2)	(3)	(4)	(5)	(6)
(Intercept)		22352.8	18800.1	6738.8	12250.1	6570.6	11966.0
		(0.0)	(0.0)	(15.2)	(1.3)	(16.4)	(1.6)
Large	0.272	15943.6	14484.0	14780.0	15621.3	14716.6	15453.4
	(0.45)	(0.0)	(0.1)	(0.1)	(0.0)	(0.1)	(0.1)
LargeGrace	0.243	8913.5	8050.7	7524.9	7459.7	7392.6	7269.6
	(0.43)	(0.7)	(1.2)	(1.1)	(2.0)	(1.4)	(2.3)
Cattle	0.275	10429.6	10767.1	10913.8	9163.3	11011.5	9261.3
	(0.45)	(2.8)	(2.7)	(2.1)	(5.3)	(2.0)	(5.0)
rd 3	0.342	13627.2	13531.3	13695.4	14870.5	13700.5	14880.0
	(0.47)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Large × rd 3	0.091	1496.5	1566.3	2220.4	2109.1	2220.2	2099.9
	(0.29)	(72.7)	(71.5)	(60.1)	(62.9)	(60.1)	(63.1)
LargeGrace × rd 3	0.083	4424.0	4546.5	5114.7	5178.5	5116.0	5156.7
	(0.28)	(35.4)	(33.9)	(27.3)	(30.7)	(27.4)	(30.9)
Cattle × rd 3	0.093	−2983.1	−2762.7	−2400.9	−2606.3	−2398.9	−2618.3
	(0.29)	(49.0)	(52.0)	(56.9)	(55.3)	(57.0)	(55.2)
rd 4	0.316	17001.8	16984.5	17171.6	19482.3	17162.3	19464.5
	(0.47)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Large × rd 4	0.090	3164.7	3298.7	3536.6	2887.4	3501.8	2856.6
	(0.29)	(57.3)	(55.4)	(52.5)	(64.7)	(52.9)	(65.1)
LargeGrace × rd 4	0.078	2190.2	2332.7	2858.0	3050.8	2821.9	2997.9
	(0.27)	(66.8)	(64.7)	(57.0)	(61.2)	(57.5)	(61.8)
Cattle × rd 4	0.087	−2850.5	−2031.6	−1288.6	−2895.1	−1399.0	−3057.1
	(0.28)	(54.1)	(66.9)	(77.7)	(55.2)	(75.7)	(52.9)
HadCattle	0.206				−1210.3		1427.0
	(0.40)				(86.0)		(86.4)
HadCattle × rd 3	0.071				4824.7		4832.1
	(0.26)				(16.1)		(16.1)
HadCattle × rd 4	0.065				1994.7		1889.5
	(0.25)				(70.6)		(71.9)
FloodInRd1	0.484			−5064.2	−4363.5	−4838.0	−4048.7
	(0.50)			(6.3)	(12.5)	(7.1)	(15.2)
Head literate0	0.113			412.2	2829.4	315.2	2693.1
	(0.32)			(92.4)	(54.9)	(94.2)	(56.9)
net asset value$_1$	7306.291		0.6	0.6	0.5	1.0	1.0
	(13598.88)		(0.0)	(0.0)	(4.1)	(0.5)	(0.9)
HHsize0	4.249			3510.5	2803.1	3410.7	2682.8
	(1.43)			(0.0)	(0.4)	(0.0)	(0.4)
HadCattle × Large	0.067				14617.4		15196.4
	(0.25)				(12.5)		(11.7)
HadCattle × Large × rd 3	0.022				11555.9		11508.0
	(0.15)				(22.6)		(22.9)
HadCattle × Large × rd 4	0.022				3648.3		3823.1
	(0.15)				(83.0)		(82.2)
HadCattle × LargeGrace	0.052				4475.5		4336.2
	(0.22)				(55.2)		(57.1)
HadCattle × LargeGrace × rd 3	0.018				−14216.1		−14271.0
	(0.13)				(19.6)		(19.5)
HadCattle × LargeGrace × rd 4	0.017				−21711.7		−21554.8
	(0.13)				(16.6)		(16.9)
HadCattle × Cattle	0.046				690.1		649.1
	(0.21)				(93.6)		(94.0)
HadCattle × Cattle × rd 3	0.017				6192.4		6135.2
	(0.13)				(49.3)		(49.8)
HadCattle × Cattle × rd 4	0.013				13548.5		13370.6
	(0.11)				(40.2)		(40.5)
cattle holding$_1$attle0	0.282					−9359.5	−12320.6
	(0.64)					(24.8)	(25.1)
mean of dependent variable		41708	41708	41708	41708	41708	41708
$T = 2$		16	16	16	19	16	19
$T = 3$		53	53	50	54	50	54
$T = 4$		666	666	666	582	666	582
$\bar{R}^2$		0.047	0.083	0.102	0.096	0.103	0.097
N	1873	2120	2120	2114	1873	2114	1873

Notes : See footnotes of Table D1.

Table D3: ANCOVA estimation of narrow net assets by attrbutes and period

covariates	mean/std	(1)	(2)	(3)	(4)	(5)	(6)
(Intercept)		16308.0 (0.0)	13568.2 (0.0)	6252.3 (5.6)	11040.5 (0.2)	6227.0 (5.8)	10942.5 (0.2)
Upfront	0.790 (0.41)	15678.2 (0.0)	14478.1 (0.0)	14120.4 (0.0)	14213.5 (0.0)	14112.5 (0.0)	14154.1 (0.0)
WithGrace	0.518 (0.50)	−7511.8 (9.6)	−7006.9 (9.1)	−6559.8 (11.7)	−6675.6 (12.6)	−6601.2 (11.5)	−6724.8 (12.5)
InKind	0.275 (0.45)	280.8 (93.5)	1276.2 (70.8)	1167.5 (72.8)	−427.1 (90.1)	1259.5 (70.7)	−251.0 (94.1)
rd 3	0.342 (0.47)	5079.7 (0.0)	5003.1 (0.0)	5136.5 (0.0)	5943.8 (0.0)	5137.9 (0.0)	5948.8 (0.0)
Upfront × rd 3	0.268 (0.44)	−260.6 (92.0)	−207.1 (93.6)	259.4 (92.0)	87.6 (97.7)	258.9 (92.1)	82.5 (97.8)
WithGrace × rd 3	0.177 (0.38)	2307.4 (51.0)	2371.9 (50.1)	2200.9 (53.3)	2237.8 (57.9)	2201.8 (53.3)	2232.7 (58.0)
InKind × rd 3	0.093 (0.29)	−5520.4 (12.6)	−5459.0 (13.3)	−5541.2 (12.2)	−5847.1 (14.8)	−5543.3 (12.2)	−5844.7 (14.8)
rd 4	0.316 (0.47)	6325.9 (0.0)	6313.8 (0.0)	6394.8 (0.0)	8213.3 (0.0)	6390.6 (0.0)	8198.8 (0.0)
Upfront × rd 4	0.255 (0.44)	2029.4 (62.4)	2146.5 (59.7)	2262.3 (57.5)	1377.0 (76.7)	2250.8 (57.8)	1366.5 (76.9)
WithGrace × rd 4	0.165 (0.37)	−1.1 (100.0)	28.1 (99.6)	326.9 (94.8)	1282.6 (82.0)	327.2 (94.8)	1273.3 (82.1)
InKind × rd 4	0.087 (0.28)	−4283.5 (32.4)	−3741.9 (40.5)	−3680.7 (39.9)	−5528.9 (23.9)	−3713.2 (39.7)	−5602.2 (23.6)
HadCattle	0.206 (0.40)				1536.5 (77.1)		3007.4 (66.3)
HadCattle × rd 3	0.071 (0.26)				−361.7 (90.0)		−354.2 (90.2)
HadCattle × rd 4	0.065 (0.25)				−3101.8 (44.3)		−3157.7 (43.4)
FloodInRd1	0.484 (0.50)			873.2 (66.1)	1958.0 (35.9)	907.0 (65.2)	2042.1 (34.8)
Head literate0	0.113 (0.32)			−955.3 (76.5)	511.2 (88.0)	−966.2 (76.3)	470.4 (89.0)
Narrownet asset value$_1$	6668.224 (13472.56)		0.5 (0.0)	0.5 (0.0)	0.4 (4.2)	0.7 (5.9)	0.7 (4.3)
HHsize0	4.249 (1.43)			1703.7 (1.2)	1118.5 (10.4)	1682.1 (1.3)	1076.9 (11.4)
HadCattle × Upfront	0.166 (0.37)				14794.1 (10.9)		15193.8 (10.2)
HadCattle × Upfront × rd 3	0.057 (0.23)				8210.8 (25.2)		8183.8 (25.3)
HadCattle × Upfront × rd 4	0.052 (0.22)				−167.8 (98.9)		−65.2 (99.6)
HadCattle × WithGrace	0.098 (0.30)				−5226.5 (57.3)		−5715.6 (54.6)
HadCattle × WithGrace × rd 3	0.034 (0.18)				−14286.3 (11.5)		−14293.0 (11.5)
HadCattle × WithGrace × rd 4	0.030 (0.17)				−15593.4 (16.4)		−15611.1 (16.4)
HadCattle × InKind	0.046 (0.21)				−7013.3 (28.3)		−6926.8 (29.0)
HadCattle × InKind × rd 3	0.017 (0.13)				15089.1 (9.9)		15087.9 (9.9)
HadCattle × InKind × rd 4	0.013 (0.11)				24654.5 (2.2)		24476.7 (2.3)
cattle holding$_1$attle0	0.282 (0.64)					−3638.4 (67.9)	−7607.9 (48.5)
mean of dependent variable $T=2$		28534 16	28534 16	28534 16	28534 19	28534 16	28534 19
$T=3$ $T=4$		53 666	53 666	50 666	54 582	50 666	54 582
$\bar{R}^2$ N	1873	0.035 2120	0.081 2120	0.087 2114	0.078 1873	0.087 2114	0.078 1873

Source: Estimated with GUK administrative and survey data.

Notes: 1. ANCOVA estimates using administrative and survey data. Post treatment regressands are regressed on categorical variables, pre-treatment regressand and other covariates. FloodInRd1 and HeadLiterate0 are indicator variables for the presence of self reported damage by a flood at the baseline, and literacy of household head, respectively. HHsize0 is household size at the baseline. We annotate the number of periods that a household is observed with T. The total number of households is shown for each values of T. T=4 indicates the number of households with complete panel information, T=3 indicates number of households observed three times, T=2 indicates the number of households observed twice. N indicates total number of observations used in ANCOVA estimation, or N=1×(T=2)+2×(T=3)+3×(T=4). Upfront is an indicator variable of the arm with an upfront large disbursement, WithGrace is an indicator variable of the arm with a grace period, InKind is an indicator variable of the arm which lends a heifer. Narrow net assets = Narrow assets + net saving - debt to GUK - debts to relatives and money lenders. Narrow assets use only items observed for all 4 rounds for household assets. Household assets do not include livestock. Regressions (1)-(3), (5)-(6) use only arm and calendar information. (4) and (7) use previous six month repayment and saving information which is lacking in rd 1, hence starts from rd 2.

2. P values in percentages in parentheses. Standard errors are clustered at group (village) level.

Table D4: ANCOVA estimation of net assets by attrbutes and period

covariates	mean/std	(1)	(2)	(3)	(4)	(5)	(6)
(Intercept)		22352.8	18800.1	6738.8	12250.1	6570.6	11966.0
		(0.0)	(0.0)	(15.2)	(1.3)	(16.4)	(1.6)
Upfront	0.790	15943.6	14484.0	14780.0	15621.3	14716.6	15453.4
	(0.41)	(0.0)	(0.1)	(0.1)	(0.0)	(0.1)	(0.1)
WithGrace	0.518	−7030.1	−6433.3	−7255.1	−8161.6	−7324.0	−8183.8
	(0.50)	(14.3)	(15.2)	(10.7)	(7.5)	(10.7)	(7.7)
InKind	0.275	1516.2	2716.4	3388.9	1703.6	3618.9	1991.6
	(0.45)	(76.1)	(59.1)	(49.6)	(73.0)	(47.1)	(68.8)
rd 3	0.342	13627.2	13531.3	13695.4	14870.5	13700.5	14880.0
	(0.47)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Upfront × rd 3	0.268	1496.5	1566.3	2220.4	2109.1	2220.2	2099.9
	(0.44)	(72.7)	(71.5)	(60.1)	(62.9)	(60.1)	(63.1)
WithGrace × rd 3	0.177	2927.5	2980.2	2894.3	3069.4	2895.8	3056.8
	(0.38)	(53.0)	(52.9)	(53.4)	(53.3)	(53.5)	(53.5)
InKind × rd 3	0.093	−7407.1	−7309.2	−7515.6	−7784.8	−7514.9	−7775.0
	(0.29)	(11.6)	(12.3)	(10.5)	(11.7)	(10.6)	(11.7)
rd 4	0.316	17001.8	16984.5	17171.6	19482.3	17162.3	19464.5
	(0.47)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Upfront × rd 4	0.255	3164.7	3298.7	3536.6	2887.4	3501.8	2856.6
	(0.44)	(57.3)	(55.4)	(52.5)	(64.7)	(52.9)	(65.1)
WithGrace × rd 4	0.165	−974.5	−966.0	−678.7	163.4	−679.9	141.3
	(0.37)	(87.4)	(87.6)	(91.3)	(98.1)	(91.3)	(98.4)
InKind × rd 4	0.087	−5040.7	−4364.3	−4146.6	−5945.9	−4220.9	−6055.0
	(0.28)	(34.0)	(42.6)	(43.5)	(28.6)	(42.7)	(27.8)
HadCattle	0.206				−1210.3		1427.0
	(0.40)				(86.0)		(86.4)
HadCattle × rd 3	0.071				4824.7		4832.1
	(0.26)				(16.1)		(16.1)
HadCattle × rd 4	0.065				1994.7		1889.5
	(0.25)				(70.6)		(71.9)
FloodInRd1	0.484			−5064.2	−4363.5	−4838.0	−4048.7
	(0.50)			(6.3)	(12.5)	(7.1)	(15.2)
Head literate0	0.113			412.2	2829.4	315.2	2693.1
	(0.32)			(92.4)	(54.9)	(94.2)	(56.9)
net asset value$_1$	7306.291		0.6	0.6	0.5	1.0	1.0
	(13598.88)		(0.0)	(0.0)	(4.1)	(0.5)	(0.9)
HHsize0	4.249			3510.5	2803.1	3410.7	2682.8
	(1.43)			(0.0)	(0.4)	(0.0)	(0.4)
HadCattle × Upfront	0.166				14617.4		15196.4
	(0.37)				(12.5)		(11.7)
HadCattle × Upfront × rd 3	0.057				11555.9		11508.0
	(0.23)				(22.6)		(22.9)
HadCattle × Upfront × rd 4	0.052				3648.3		3823.1
	(0.22)				(83.0)		(82.2)
HadCattle × WithGrace	0.098				−10141.9		−10860.2
	(0.30)				(29.8)		(28.0)
HadCattle × WithGrace × rd 3	0.034				−25772.0		−25779.0
	(0.18)				(1.4)		(1.4)
HadCattle × WithGrace × rd 4	0.030				−25360.0		−25377.8
	(0.17)				(5.6)		(5.6)
HadCattle × InKind	0.046				−3785.4		−3687.1
	(0.21)				(66.2)		(67.0)
HadCattle × InKind × rd 3	0.017				20408.5		20406.1
	(0.13)				(4.3)		(4.3)
HadCattle × InKind × rd 4	0.013				35260.2		34925.3
	(0.11)				(0.4)		(0.4)
cattle holding$_1$attle0	0.282					−9359.5	−12320.6
	(0.64)					(24.8)	(25.1)
mean of dependent variable		41708	41708	41708	41708	41708	41708
$T = 2$		16	16	16	19	16	19
$T = 3$		53	53	50	54	50	54
$T = 4$		666	666	666	582	666	582
$\bar{R}^2$		0.047	0.083	0.102	0.096	0.103	0.097
N	1873	2120	2120	2114	1873	2114	1873

Source: Estimated with GUK administrative and survey data.

Notes: 1. ANCOVA estimates using administrative and survey data. Post treatment regressands are regressed on categorical variables, pre-treatment regressand and other covariates. FloodInRd1 and HeadLiterate0 are indicator variables for the presence of self reported damage by a flood at the baseline, and literacy of household head, respectively. HHsize0 is household size at the baseline. We annotate the number of periods that a household is observed with T. The total number of households is shown for each values of T. T=4 indicates the number of households with complete panel information, T=3 indicates number of households observed three times, T=2 indicates the number of households observed twice. N indicates total number of observations used in ANCOVA estimation, or N=1×(T=2)+2×(T=3)+3×(T=4). Upfront is an indicator variable of the arm with an upfront large disbursement, WithGrace is an indicator variable of the arm with a grace period, InKind is an indicator variable of the arm which lends a heifer. Household assets do not include livestock. Regressions (1)-(3), (5)-(6) use only arm and calendar information. (4) and (7) use previous six month repayment and saving information which is lacking in rd 1, hence starts from rd 2.

2. P values in percentages in parentheses. Standard errors are clustered at group (village) level.

Table D5: ANCOVA estimation of cattle holding by arm and period

covariates	mean/std	(1)	(2)	(3)	(4)
(Intercept)		1.48	1.37	1.13	1.14
		(0.0)	(0.0)	(0.0)	(0.0)
Large	0.273	0.39	0.37	0.35	0.30
	(0.45)	(0.6)	(0.4)	(0.8)	(0.7)
LargeGrace	0.248	0.01	0.02	0.02	−0.00
	(0.43)	(94.0)	(88.2)	(83.7)	(99.6)
Cattle	0.264	−0.05	−0.03	−0.03	−0.05
	(0.44)	(44.3)	(72.6)	(67.7)	(44.8)
rd 3	0.348	−0.03	−0.00	−0.00	−0.00
	(0.48)	(63.9)	(95.3)	(98.2)	(94.8)
Large × rd 3	0.094	−0.05	−0.05	−0.05	−0.02
	(0.29)	(74.9)	(75.5)	(77.9)	(91.3)
LargeGrace × rd 3	0.085	0.19	0.20	0.21	0.25
	(0.28)	(28.5)	(25.5)	(24.9)	(15.2)
Cattle × rd 3	0.091	0.17	0.16	0.16	0.18
	(0.29)	(18.0)	(23.6)	(24.6)	(15.7)
rd 4	0.326	0.15	0.17	0.17	0.17
	(0.47)	(1.4)	(0.7)	(0.7)	(0.5)
Large × rd 4	0.094	0.05	0.04	0.05	0.08
	(0.29)	(74.5)	(79.1)	(78.2)	(62.6)
LargeGrace × rd 4	0.081	0.40	0.39	0.40	0.45
	(0.27)	(3.3)	(3.6)	(3.0)	(1.2)
Cattle × rd 4	0.085	0.34	0.34	0.35	0.37
	(0.28)	(0.8)	(1.1)	(1.1)	(0.4)
HadCattle	0.195				0.16
	(0.40)				(40.9)
HadCattle × rd 3	0.067				0.05
	(0.25)				(69.7)
HadCattle × rd 4	0.061				−0.05
	(0.24)				(74.4)
FloodInRd1	0.491			0.05	0.05
	(0.50)			(57.2)	(50.6)
Head literate0	0.114			0.02	0.02
	(0.32)			(85.6)	(85.2)
cattle holding$_1$attle0	0.266		0.31	0.29	0.19
	(0.62)		(0.2)	(0.6)	(21.1)
HHsize0	4.219			0.05	0.05
	(1.43)			(3.7)	(4.2)
HadCattle × Large	0.063				0.70
	(0.24)				(4.4)
HadCattle × Large × rd 3	0.021				0.15
	(0.14)				(63.4)
HadCattle × Large × rd 4	0.021				0.10
	(0.14)				(81.6)
HadCattle × LargeGrace	0.049				0.49
	(0.22)				(1.3)
HadCattle × LargeGrace × rd 3	0.017				−0.17
	(0.13)				(62.4)
HadCattle × LargeGrace × rd 4	0.016				−0.61
	(0.13)				(10.4)
HadCattle × Cattle	0.045				0.27
	(0.21)				(18.3)
HadCattle × Cattle × rd 3	0.016				0.15
	(0.13)				(58.6)
HadCattle × Cattle × rd 4	0.013				0.07
	(0.11)				(82.8)
mean of dependent variable		1.62	1.62	1.62	1.62
$T = 2$		87	87	85	85
$T = 3$		168	168	168	168
$T = 4$		395	395	395	395
$\bar{R}^2$		0.04	0.086	0.089	0.099
N	1998	1608	1608	1606	1606

Source: Estimated with GUK administrative and survey data.

Notes: 1. ANCOVA estimates using administrative and survey data. Post treatment regressands are regressed on categorical variables, pre-treatment regressand and other covariates. FloodInRd1 and HeadLiterate0 are indicator variables for the presence of self reported damage by a flood at the baseline, and literacy of household head, respectively. HHsize0 is household size at the baseline. We annotate the number of periods that a household is observed with T. The total number of households is shown for each values of T. T=4 indicates the number of households with complete panel information, T=3 indicates number of households observed three times, T=2 indicates the number of households observed twice. N indicates total number of observations used in ANCOVA estimation, or N=1×(T=2)+2×(T=3)+3×(T=4). Large, LargeGrace, Cattle are indicator variables of the large, large grace, and cattle arms, respectively. The default arm category is traditional arm. rd2, rd3, rd4 are dummy variables for second, third, and fourth round of survey. Sample is continuing members and replacing members of early rejecters and received loans prior to 2015 Janunary. Regressand is NumCows, number of cattle holding.

2. P values in percentages in parenthesises. Standard errors are clustered at group (village) level.

Table D6: ANCOVA estimation of cattle holding by attributes and period

covariates	mean/std	(1)	(2)	(3)	(4)
(Intercept)		1.48 (0.0)	1.37 (0.0)	1.13 (0.0)	1.14 (0.0)
Upfront	0.785 (0.41)	0.39 (0.6)	0.37 (0.4)	0.35 (0.8)	0.30 (0.7)
WithGrace	0.512 (0.50)	−0.39 (2.5)	−0.35 (1.8)	−0.33 (3.7)	−0.30 (3.4)
InKind	0.264 (0.44)	−0.06 (60.5)	−0.04 (69.6)	−0.05 (62.1)	−0.05 (63.7)
rd 3	0.348 (0.48)	−0.03 (63.9)	−0.00 (95.3)	−0.00 (98.2)	−0.00 (94.8)
Upfront × rd 3	0.269 (0.44)	−0.05 (74.9)	−0.05 (75.5)	−0.05 (77.9)	−0.02 (91.3)
WithGrace × rd 3	0.176 (0.38)	0.24 (17.1)	0.25 (14.2)	0.25 (14.7)	0.27 (13.1)
InKind × rd 3	0.091 (0.29)	−0.02 (90.7)	−0.05 (74.9)	−0.05 (72.5)	−0.07 (64.2)
rd 4	0.326 (0.47)	0.15 (1.4)	0.17 (0.7)	0.17 (0.7)	0.17 (0.5)
Upfront × rd 4	0.260 (0.44)	0.05 (74.5)	0.04 (79.1)	0.05 (78.2)	0.08 (62.6)
WithGrace × rd 4	0.166 (0.37)	0.35 (9.6)	0.34 (9.5)	0.36 (8.4)	0.37 (6.9)
InKind × rd 4	0.085 (0.28)	−0.06 (75.5)	−0.04 (80.5)	−0.05 (76.1)	−0.08 (66.3)
HadCattle	0.195 (0.40)				0.16 (40.9)
HadCattle × rd 3	0.067 (0.25)				0.05 (69.7)
HadCattle × rd 4	0.061 (0.24)				−0.05 (74.4)
FloodInRd1	0.491 (0.50)			0.05 (57.2)	0.05 (50.6)
Head literate0	0.114 (0.32)			0.02 (85.6)	0.02 (85.2)
cattle holding attle0	0.266 (0.62)		0.31 (0.2)	0.29 (0.6)	0.19 (21.1)
HHsize0	4.219 (1.43)			0.05 (3.7)	0.05 (4.2)
HadCattle × Upfront	0.157 (0.36)				0.70 (4.4)
HadCattle × Upfront × rd 3	0.054 (0.23)				0.15 (63.4)
HadCattle × Upfront × rd 4	0.050 (0.22)				0.10 (81.6)
HadCattle × WithGrace	0.094 (0.29)				−0.21 (53.3)
HadCattle × WithGrace × rd 3	0.033 (0.18)				−0.33 (37.2)
HadCattle × WithGrace × rd 4	0.029 (0.17)				−0.71 (11.0)
HadCattle × InKind	0.045 (0.21)				−0.22 (22.0)
HadCattle × InKind × rd 3	0.016 (0.13)				0.32 (34.1)
HadCattle × InKind × rd 4	0.013 (0.11)				0.68 (6.1)
mean of dependent variable $T = 2$		1.62 87	1.62 87	1.62 85	1.62 85
$T = 3$ $T = 4$		168 395	168 395	168 395	168 395
$\bar{R}^2$ N	 1998	0.04 1608	0.086 1608	0.089 1606	0.099 1606

Notes : See footnotes of Table D5.

TABLE D7: ANCOVA ESTIMATION OF CONSUMPTION BY PERIOD

		Per capita consumption (Tk)			Total consumption (Tk)		
covariates	mean/std	(1)	(2)	(3)	(4)	(5)	(6)
(Intercept)		2662.3 (0.0)	2003.8 (0.0)	3136.4 (0.0)	10729.5 (0.0)	5290.0 (0.0)	3414.9 (0.0)
Large	0.273 (0.45)	42.6 (57.9)	65.6 (36.0)	97.4 (18.2)	669.3 (17.5)	549.4 (11.9)	356.1 (22.9)
LargeGrace	0.244 (0.43)	10.1 (89.5)	2.3 (97.3)	22.0 (77.7)	311.3 (58.6)	38.2 (91.3)	74.4 (80.2)
Cattle	0.261 (0.44)	71.2 (30.6)	93.0 (15.0)	59.0 (37.9)	199.9 (64.2)	446.1 (15.5)	271.5 (33.3)
rd 4	0.493 (0.50)	89.9 (3.0)	85.1 (4.1)	94.3 (2.2)	−42.0 (79.3)	−60.5 (70.7)	−12.9 (93.4)
Large × rd 4	0.005 (0.24)	28.9 (78.9)	22.6 (83.0)	24.2 (81.9)	1.1 (99.8)	41.2 (92.5)	90.7 (83.7)
LargeGrace × rd 4	0.004 (0.23)	74.8 (56.9)	67.0 (60.6)	59.5 (64.6)	52.0 (91.4)	144.6 (76.4)	207.3 (66.4)
Cattle × rd 4	0.001 (0.23)	−96.4 (38.1)	−116.7 (28.0)	−98.7 (34.9)	−660.3 (14.4)	−581.6 (19.5)	−419.9 (31.5)
FloodInRd1	0.489 (0.50)			−50.7 (18.8)			26.8 (87.3)
Head literate0	0.117 (0.32)			117.8 (1.5)			559.5 (2.8)
per capita consumption$_2$	2177.074 (646.33)		0.3 (0.0)	0.1 (0.1)			
HHsize0	4.354 (1.47)			−180.9 (0.0)			1154.2 (0.0)
household consumption$_2$	9065.617 (3143.64)					0.6 (0.0)	0.3 (0.0)
mean of dependent variable		2740	2740	2740	11019	11019	11019
$T = 2$		50	50	50	50	50	50
$T = 3$		668	668	665	668	668	665
$\bar{R}^2$		0.001	0.071	0.199	0.003	0.328	0.482
N	77	1386	1386	1380	1386	1386	1380

Source: Estimated with GUK administrative and survey data.

Notes: 1. ANCOVA estimates using administrative and survey data. Post treatment regressands are regressed on categorical variables, pre-treatment regressand and other covariates. FloodInRd1 and HeadLiterate0 are indicator variables for the presence of self reported damage by a flood at the baseline, and literacy of household head, respectively. HHsize0 is household size at the baseline. We annotate the number of periods that a household is observed with T. The total number of households is shown for each values of T. T=4 indicates the number of households with complete panel information, T=3 indicates number of households observed three times, T=2 indicates the number of households observed twice. N indicates total number of observations used in ANCOVA estimation, or N=1×(T=2)+2×(T=3)+3×(T=4). UltraPoor is an indicator variable if the household is classified as the ultra poor. Large, LargeGrace, Cattle are indicator variables of the large, large grace, and cattle arms, respectively. The default arm category is traditional arm. Consumption is annualised values.

2. P values in percentages in parenthesises. Standard errors are clustered at group (village) level.

Table D8: ANCOVA estimation of consumption by attributes and period

covariates	mean/std	Per capita consumption (Tk) (1)	(2)	(3)	Total consumption (Tk) (4)	(5)	(6)
(Intercept)		2662.3	2003.8	3136.4	10729.5	5290.0	3414.9
		(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Upfront	0.778	42.6	65.6	97.4	669.3	549.4	356.1
	(0.42)	(57.9)	(36.0)	(18.2)	(17.5)	(11.9)	(22.9)
WithGrace	0.505	−32.4	−63.3	−75.4	−358.0	−511.2	−281.7
	(0.50)	(70.1)	(41.3)	(32.1)	(53.7)	(17.4)	(39.5)
InKind	0.261	61.1	90.7	37.0	−111.3	407.9	197.1
	(0.44)	(43.3)	(20.0)	(59.9)	(83.3)	(24.0)	(53.4)
rd 4	0.493	89.9	85.1	94.3	−42.0	−60.5	−12.9
	(0.50)	(3.0)	(4.1)	(2.2)	(79.3)	(70.7)	(93.4)
Upfront × rd 4	0.010	28.9	22.6	24.2	1.1	41.2	90.7
	(0.22)	(78.9)	(83.0)	(81.9)	(99.8)	(92.5)	(83.7)
WithGrace × rd 4	0.006	45.9	44.4	35.4	50.9	103.4	116.6
	(0.26)	(71.6)	(72.6)	(78.0)	(91.2)	(82.3)	(80.0)
InKind × rd 4	0.001	−171.2	−183.7	−158.2	−712.3	−726.2	−627.2
	(0.23)	(18.1)	(15.4)	(21.0)	(13.2)	(12.2)	(15.4)
FloodInRd1	0.489			−50.7			26.8
	(0.50)			(18.8)			(87.3)
Head literate0	0.117			117.8			559.5
	(0.32)			(1.5)			(2.8)
per capita consumption$_2$	2177.074		0.3	0.1			
	(646.33)		(0.0)	(0.1)			
HHsize0	4.354			−180.9			1154.2
	(1.47)			(0.0)			(0.0)
household consumption$_2$	9065.617					0.6	0.3
	(3143.64)					(0.0)	(0.0)
mean of dependent variable		2740	2740	2740	11019	11019	11019
$T = 2$		50	50	50	50	50	50
$T = 3$		668	668	665	668	668	665
$\bar{R}^2$		0.001	0.071	0.199	0.003	0.328	0.482
N	77	1386	1386	1380	1386	1386	1380

Notes : See footnotes of Table D7.

Table D9: ANCOVA estimation of household labour incomes and farm incomes by period

covariates	mean/std	(1)	(2)	(3)
(Intercept)		57.75 (0.0)	52.13 (0.0)	−1.80 (73.3)
Large	0.278 (0.45)	0.06 (99.3)	−0.42 (95.4)	−4.12 (52.1)
LargeGrace	0.248 (0.43)	−1.64 (83.4)	−6.06 (39.3)	−5.71 (28.6)
Cattle	0.254 (0.44)	−2.65 (72.3)	−3.74 (60.2)	−3.78 (52.0)
rd 3	0.343 (0.47)	13.00 (0.0)	12.89 (0.0)	12.62 (0.0)
Large × rd 3	0.094 (0.29)	−5.83 (35.6)	−5.63 (36.7)	−3.20 (57.7)
LargeGrace × rd 3	0.085 (0.28)	0.94 (88.8)	0.24 (97.1)	2.48 (67.3)
Cattle × rd 3	0.086 (0.28)	−8.80 (27.0)	−8.04 (29.7)	−4.73 (49.8)
rd 4	0.326 (0.47)	23.36 (0.0)	23.12 (0.0)	23.15 (0.0)
Large × rd 4	0.095 (0.29)	10.21 (43.8)	10.32 (43.3)	12.24 (34.5)
LargeGrace × rd 4	0.082 (0.27)	−0.03 (99.7)	−1.00 (89.4)	1.42 (83.7)
Cattle × rd 4	0.081 (0.27)	−6.84 (49.5)	−6.70 (50.2)	−2.22 (81.2)
FloodInRd1	0.488 (0.50)			6.93 (15.4)
Head literate0	0.113 (0.32)			−6.78 (21.3)
household labour income$_1$	68.994 (172.39)		0.11 (0.0)	0.09 (0.0)
HHsize0	4.405 (1.53)			12.18 (0.0)
mean of dependent variable		69	69	69
$T = 2$		106	106	105
$T = 3$		83	83	83
$T = 4$		660	660	658
$\bar{R}^2$		0.013	0.065	0.119
N	2557	2566	2566	2557

Source: Estimated with GUK administrative and survey data.

Notes: 1. ANCOVA estimates using administrative and survey data. Post treatment regressands are regressed on categorical variables, pre-treatment regressand and other covariates. FloodInRd1 and HeadLiterate0 are indicator variables for the presence of self reported damage by a flood at the baseline, and literacy of household head, respectively. HHsize0 is household size at the baseline. We annotate the number of periods that a household is observed with T. The total number of households is shown for each values of T. T=4 indicates the number of households with complete panel information, T=3 indicates number of households observed three times, T=2 indicates the number of households observed twice. N indicates total number of observations used in ANCOVA estimation, or N=1×(T=2)+2×(T=3)+3×(T=4). Large, LargeGrace, Cattle are indicator variables of the large, large grace, and cattle arms, respectively. The default arm category is traditional arm. rd2, rd3, rd4 are dummy variables for second, third, and fourth round of survey. Labour incomes are in 1000 Tk units and are a sum of all earned labour incomes of household members. Farm revenues are in 1000 Tk units and are a total of agricultural produce sales.

2. P values in percentages in parenthesises. Standard errors are clustered at group (village) level.

Table D10: ANCOVA estimation of household labour incomes and farm incomes by attributes and period

covariates	mean/std	(1)	(2)	(3)
(Intercept)		57.75	52.13	−1.80
		(0.0)	(0.0)	(73.3)
Upfront	0.779	0.06	−0.42	−4.12
	(0.41)	(99.3)	(95.4)	(52.1)
WithGrace	0.502	−1.70	−5.64	−1.59
	(0.50)	(81.5)	(37.3)	(75.8)
InKind	0.254	−1.01	2.32	1.93
	(0.44)	(89.0)	(71.3)	(67.9)
rd 3	0.343	13.00	12.89	12.62
	(0.47)	(0.0)	(0.0)	(0.0)
Upfront × rd 3	0.266	−5.83	−5.63	−3.20
	(0.44)	(35.6)	(36.7)	(57.7)
WithGrace × rd 3	0.172	6.77	5.87	5.68
	(0.38)	(20.2)	(25.0)	(23.9)
InKind × rd 3	0.086	−9.74	−8.28	−7.21
	(0.28)	(17.7)	(22.6)	(24.6)
rd 4	0.326	23.36	23.12	23.15
	(0.47)	(0.0)	(0.0)	(0.0)
Upfront × rd 4	0.258	10.21	10.32	12.24
	(0.44)	(43.8)	(43.3)	(34.5)
WithGrace × rd 4	0.163	−10.24	−11.31	−10.82
	(0.37)	(41.8)	(36.4)	(38.6)
InKind × rd 4	0.081	−6.81	−5.70	−3.64
	(0.27)	(46.4)	(53.0)	(67.2)
FloodInRd1	0.488			6.93
	(0.50)			(15.4)
Head literate0	0.113			−6.78
	(0.32)			(21.3)
household labour income$_1$	68.994		0.11	0.09
	(172.39)		(0.0)	(0.0)
HHsize0	4.405			12.18
	(1.53)			(0.0)
mean of dependent variable		69	69	69
$T = 2$		106	106	105
$T = 3$		83	83	83
$T = 4$		660	660	658
$\bar{R}^2$		0.013	0.065	0.119
N	2557	2566	2566	2557

Notes : See footnotes of Table D9.

Table D11: ANCOVA estimation of school enrollment by time

covariates	mean/std	(1)	(2)	(3)	(4)	(5)	(6)
(Intercept)		0.92 (0.0)	0.70 (0.0)	0.70 (0.0)	0.81 (0.0)	0.69 (0.0)	0.78 (0.0)
Secondary	0.338 (0.47)	−0.08 (0.1)	−0.15 (0.0)	−0.15 (0.0)	−0.12 (0.0)	−0.14 (0.0)	−0.12 (0.0)
College	0.172 (0.38)	−0.21 (0.0)	−0.24 (0.0)	−0.24 (0.0)	−0.21 (0.0)	−0.22 (0.0)	−0.20 (0.0)
Large	0.272 (0.44)	−0.03 (43.5)	−0.04 (18.4)	−0.04 (18.4)	−0.04 (20.4)	−0.04 (25.1)	−0.03 (36.5)
LargeGrace	0.247 (0.43)	−0.04 (31.7)	−0.05 (14.7)	−0.05 (14.7)	−0.04 (12.7)	−0.04 (22.2)	−0.03 (24.3)
Cattle	0.257 (0.44)	−0.06 (13.6)	−0.07 (2.2)	−0.07 (2.2)	−0.06 (4.0)	−0.06 (4.1)	−0.05 (8.0)
Large × Secondary	0.085 (0.28)	0.06 (36.5)	0.03 (62.5)	0.03 (62.5)	0.05 (42.5)	0.04 (54.5)	0.06 (34.3)
LargeGrace × Secondary	0.083 (0.28)	−0.08 (27.6)	−0.08 (22.9)	−0.08 (22.9)	−0.07 (29.5)	−0.05 (45.4)	−0.05 (43.3)
Cattle × Secondary	0.088 (0.28)	−0.03 (67.5)	−0.02 (77.5)	−0.02 (77.5)	−0.01 (91.4)	−0.01 (87.1)	0.00 (98.8)
Large × College	0.049 (0.22)	0.05 (53.7)	0.04 (60.1)	0.04 (60.1)	0.06 (41.4)	0.07 (39.9)	0.15 (5.9)
LargeGrace × College	0.049 (0.22)	−0.00 (98.4)	0.00 (99.7)	0.00 (99.7)	−0.01 (91.5)	0.00 (99.2)	0.02 (83.9)
Cattle × College	0.035 (0.18)	−0.16 (17.4)	−0.09 (26.3)	−0.09 (26.3)	−0.11 (16.0)	−0.05 (57.5)	−0.05 (59.5)
Female	0.450 (0.50)					0.04 (5.3)	0.05 (5.1)
Secondary × Female	0.152 (0.36)					0.11 (0.4)	0.10 (0.6)
College × Female	0.059 (0.24)					0.07 (18.9)	0.08 (19.3)
Large × Female	0.121 (0.33)					0.02 (76.4)	0.04 (44.3)
LargeGrace × Female	0.114 (0.32)					0.10 (5.6)	0.08 (11.6)
Cattle × Female	0.114 (0.32)					0.06 (20.3)	0.07 (13.9)
Large × Secondary × Female	0.041 (0.20)					−0.14 (18.1)	−0.18 (4.9)
LargeGrace × Secondary × Female	0.036 (0.19)					0.09 (38.0)	0.09 (35.5)
Cattle × Secondary × Female	0.037 (0.19)					−0.05 (67.9)	−0.04 (75.9)
Large × College × Female	0.016 (0.12)					0.10 (58.1)	0.26 (15.8)
LargeGrace × College × Female	0.018 (0.13)					−0.04 (85.4)	0.06 (78.5)
Cattle × College × Female	0.010 (0.10)					0.23 (21.8)	0.25 (22.4)

Table D11: ANCOVA estimation of school enrollment by time (continued)

covariates	mean/std	(1)	(2)	(3)	(4)	(5)	(6)
rd 3	0.344	0.06	0.06	0.06	0.04	0.06	0.04
	(0.48)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.1)
Secondary × rd 3	0.117	0.01	−0.02	−0.02	−0.04	−0.03	−0.05
	(0.32)	(86.0)	(47.1)	(47.1)	(21.8)	(35.9)	(15.2)
College × rd 3	0.055	0.04	−0.02	−0.02	−0.03	−0.01	−0.04
	(0.23)	(34.6)	(69.2)	(69.2)	(43.1)	(73.0)	(36.9)
Large × rd 3	0.091	−0.06	−0.05	−0.05	−0.06	−0.05	−0.07
	(0.29)	(8.6)	(9.8)	(9.8)	(6.7)	(13.7)	(2.1)
LargeGrace × rd 3	0.086	−0.04	−0.05	−0.05	−0.07	−0.07	−0.08
	(0.28)	(34.1)	(18.8)	(18.8)	(6.6)	(8.5)	(1.8)
Cattle × rd 3	0.090	−0.02	−0.03	−0.03	−0.04	−0.04	−0.06
	(0.29)	(54.9)	(34.6)	(34.6)	(24.8)	(26.7)	(15.9)
Large × Secondary × rd 3	0.028	−0.05	−0.04	−0.04	−0.07	−0.04	−0.08
	(0.16)	(52.8)	(63.4)	(63.4)	(36.0)	(61.0)	(32.9)
LargeGrace × Secondary × rd 3	0.028	0.08	0.08	0.08	0.04	0.02	−0.01
	(0.16)	(34.4)	(31.6)	(31.6)	(65.3)	(80.4)	(90.9)
Cattle × Secondary × rd 3	0.032	0.08	0.08	0.08	0.04	0.08	0.05
	(0.17)	(45.6)	(42.0)	(42.0)	(64.8)	(39.9)	(61.9)
Large × College × rd 3	0.015	0.02	−0.01	−0.01	−0.07	0.01	−0.13
	(0.12)	(84.8)	(92.4)	(92.4)	(56.1)	(95.3)	(22.3)
LargeGrace × College × rd 3	0.017	−0.01	−0.00	−0.00	−0.02	−0.00	−0.05
	(0.13)	(89.8)	(96.9)	(96.9)	(88.6)	(98.8)	(65.9)
Cattle × College × rd 3	0.012	0.11	0.02	0.02	−0.00	−0.04	−0.09
	(0.11)	(41.0)	(85.0)	(85.0)	(96.9)	(73.2)	(50.3)
Female × rd 3	0.156					−0.01	−0.00
	(0.36)					(67.2)	(85.0)
Large × Female × rd 3	0.041					0.03	0.02
	(0.20)					(60.9)	(64.2)
LargeGrace × Female × rd 3	0.040					−0.02	0.01
	(0.20)					(77.8)	(86.9)
Cattle × Female × rd 3	0.040					0.05	0.06
	(0.20)					(44.9)	(39.3)
Large × Secondary × Female × rd 3	0.014					0.08	0.10
	(0.12)					(64.2)	(51.1)
LargeGrace × Secondary × Female ×	0.012					0.10	0.14
	(0.11)					(50.9)	(37.2)
Cattle × Secondary × Female × rd 3	0.012					0.31	0.24
	(0.11)					(8.4)	(13.2)
Large × College × Female × rd 3	0.003					0.17	−0.06
	(0.06)					(38.3)	(75.2)
LargeGrace × College × Female × rd 3	0.005					0.17	0.09
	(0.07)					(37.1)	(67.6)
Cattle × College × Female × rd 3	0.003					−0.22	−0.27
	(0.06)					(36.4)	(33.9)
Secondary × Female × rd 3	0.052					−0.05	−0.02
	(0.22)					(42.7)	(74.4)
College × Female × rd 3	0.016					0.03	0.00
	(0.13)					(69.1)	(99.3)

Table D11: ANCOVA estimation of school enrollment by time (continued 2)

covariates	mean/std	(1)	(2)	(3)	(4)	(5)	(6)
rd 4	0.294	0.10	0.13	0.13	0.12	0.13	0.12
	(0.46)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Secondary × rd 4	0.150	0.07	−0.03	−0.03	−0.05	−0.05	−0.06
	(0.36)	(11.6)	(41.3)	(41.3)	(26.8)	(26.4)	(17.8)
College × rd 4	0.062	0.12	−0.02	−0.02	−0.03	−0.02	−0.04
	(0.24)	(0.8)	(71.0)	(71.0)	(48.0)	(57.6)	(33.0)
WithGrace × rd 4	0.147	0.01	0.01	0.01	0.01	−0.00	0.02
	(0.35)	(75.9)	(76.2)	(76.2)	(73.3)	(94.1)	(62.8)
Upfront × rd 4	0.232	−0.05	−0.06	−0.06	−0.07	−0.07	−0.09
	(0.42)	(19.3)	(16.2)	(16.2)	(11.1)	(11.1)	(2.2)
InKind × rd 4	0.073	0.04	0.02	0.02	0.02	0.02	0.02
	(0.26)	(37.8)	(67.8)	(67.8)	(69.2)	(49.6)	(58.2)
WithGrace × Secondary × rd 4	0.076	0.18	0.15	0.15	0.15	0.10	0.11
	(0.27)	(9.1)	(10.3)	(10.3)	(11.9)	(28.7)	(24.3)
Upfront × Secondary × rd 4	0.114	−0.04	−0.03	−0.03	−0.09	−0.03	−0.09
	(0.32)	(69.7)	(74.4)	(74.4)	(38.5)	(71.3)	(33.5)
InKind × Secondary × rd 4	0.040	−0.09	−0.05	−0.05	−0.05	−0.01	−0.01
	(0.20)	(46.8)	(60.8)	(60.8)	(67.4)	(93.7)	(93.5)
WithGrace × College × rd 4	0.029	−0.09	−0.05	−0.05	−0.01	−0.02	0.07
	(0.17)	(33.7)	(59.9)	(59.9)	(87.8)	(83.4)	(41.4)
Upfront × College × rd 4	0.049	−0.05	−0.05	−0.05	−0.08	−0.09	−0.22
	(0.22)	(72.9)	(70.1)	(70.1)	(49.6)	(46.1)	(5.7)
InKind × College × rd 4	0.012	0.08	0.02	0.02	0.03	−0.02	0.01
	(0.11)	(50.1)	(83.1)	(83.1)	(79.2)	(84.1)	(94.7)
Female × rd 4	0.142					−0.04	−0.04
	(0.35)					(6.1)	(3.3)
WithGrace × Female × rd 4	0.071					−0.06	−0.07
	(0.26)					(20.5)	(15.8)
Upfront × Female × rd 4	0.112					0.13	0.12
	(0.32)					(1.3)	(2.6)
InKind × Female × rd 4	0.034					0.08	0.10
	(0.18)					(26.4)	(14.9)
WithGrace × Secondary × Female × rd 4	0.037					−0.17	−0.14
	(0.19)					(33.2)	(37.3)
Upfront × Secondary × Female × rc	0.054					−0.10	−0.00
	(0.23)					(56.6)	(99.5)
InKind × Secondary × Female × rd 4	0.019					0.31	0.17
	(0.14)					(10.3)	(33.5)
WithGrace × College × Female × rc	0.012					0.35	0.55
	(0.11)					(5.4)	(0.1)
Upfront × College × Female × rd 4	0.023					−0.19	−0.50
	(0.15)					(40.3)	(4.0)
InKind × College × Female × rd 4	0.004					−0.19	−0.15
	(0.07)					(46.6)	(57.6)
Secondary × Female × rd 4	0.070					−0.04	−0.02
	(0.26)					(47.7)	(69.5)
College × Female × rd 4	0.032					0.14	0.13
	(0.17)					(11.0)	(15.6)
FloodInRd1	0.464				−0.05		−0.05
	(0.50)				(4.2)		(2.8)
EldestSon	0.267				0.02		0.04
	(0.44)				(62.9)		(22.2)
EldestDaughter	0.188				0.04		0.01
	(0.39)				(28.3)		(84.8)
Head literate0	0.108				0.06		0.05
	(0.31)				(2.7)		(2.9)
Head age0	39.153				−0.00		−0.00
	(7.38)				(26.3)		(21.8)
Enrolled0	0.760		0.33	0.33	0.30	0.32	0.30
	(0.43)		(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
ChildAgeOrderAtRd1	1.826				0.02		0.02
	(0.98)				(23.0)		(25.3)
HHsize0	4.974				−0.01		−0.01
	(1.15)				(25.6)		(39.6)
mean of dependent variable		0.88	0.88	0.88	0.88	0.88	0.88
$T = 2$		75	75	75	63	75	63
$T = 3$		112	112	112	103	112	103
$T = 4$		539	539	539	500	539	500
$\bar{R}^2$		0.056	0.226	0.226	0.215	0.235	0.221
N	1841	1976	1976	1976	1841	1976	1841

Source: Estimated with GUK administrative and survey data.

Notes: 1. ANCOVA estimates using administrative and survey data. Post treatment regressands are regressed on categorical variables, pre-treatment regressand and other covariates. FloodInRd1 and HeadLiterate0 are indicator variables for the presence of self reported damage by a flood at the baseline, and literacy of household head, respectively. HHsize0 is household size at the baseline. We annotate the number of periods that a household is observed with T. The total number of households is shown for each values of T. T=4 indicates the number of households with complete panel information, T=3 indicates number of households observed three times, T=2 indicates the number of households observed twice. N indicates total number of observations used in ANCOVA estimation, or N=1×(T=2)+2×(T=3)+3×(T=4). Large, LargeGrace, Cattle are indicator variables of the large, large grace, and cattle arms, respectively. The default arm category is traditional arm. Secondary and College are indicator variables of secondary schooling (ages 13-15) and tertiary schooling (ages 16-18), both at the time of baseline. Default category is primary (ages 05-12). rd2, rd3, rd4 are dummy variables for second, third, and fourth round of survey. Interaction terms of dummy variables are demeaned before interacting. The first column gives

Table D12: ANCOVA estimation of school enrollment by attributes and time

covariates	mean/std	(1)	(2)	(3)	(4)	(5)	(6)
(Intercept)		0.92 (0.0)	0.70 (0.0)	0.70 (0.0)	0.81 (0.0)	0.69 (0.0)	0.78 (0.0)
Secondary	0.338 (0.47)	−0.08 (0.1)	−0.15 (0.0)	−0.15 (0.0)	−0.12 (0.0)	−0.14 (0.0)	−0.12 (0.0)
College	0.172 (0.38)	−0.21 (0.0)	−0.24 (0.0)	−0.24 (0.0)	−0.21 (0.0)	−0.22 (0.0)	−0.20 (0.0)
Upfront	0.776 (0.42)	−0.03 (43.5)	−0.04 (18.4)	−0.04 (18.4)	−0.04 (20.4)	−0.04 (25.1)	−0.03 (36.5)
WithGrace	0.504 (0.50)	−0.01 (88.2)	−0.00 (91.3)	−0.00 (91.3)	−0.00 (90.4)	−0.00 (97.8)	−0.01 (87.4)
InKind	0.257 (0.44)	−0.02 (64.8)	−0.02 (55.5)	−0.02 (55.5)	−0.01 (63.7)	−0.02 (55.2)	−0.01 (60.9)
WithGrace × Secondary	0.171 (0.38)	−0.14 (3.2)	−0.11 (5.4)	−0.11 (5.4)	−0.13 (4.5)	−0.08 (13.6)	−0.11 (6.9)
Upfront × Secondary	0.255 (0.44)	0.06 (36.5)	0.03 (62.5)	0.03 (62.5)	0.05 (42.5)	0.04 (54.5)	0.06 (34.3)
InKind × Secondary	0.088 (0.28)	0.05 (50.8)	0.06 (31.6)	0.06 (31.6)	0.07 (31.8)	0.04 (54.6)	0.05 (41.8)
WithGrace × College	0.084 (0.28)	−0.06 (46.5)	−0.04 (53.7)	−0.04 (53.7)	−0.07 (31.0)	−0.06 (34.1)	−0.13 (4.6)
Upfront × College	0.134 (0.34)	0.05 (53.7)	0.04 (60.1)	0.04 (60.1)	0.06 (41.4)	0.07 (39.9)	0.15 (5.9)
InKind × College	0.035 (0.18)	−0.15 (14.9)	−0.09 (19.9)	−0.09 (19.9)	−0.10 (16.5)	−0.05 (51.8)	−0.06 (40.2)
Female	0.450 (0.50)					0.04 (5.3)	0.05 (5.1)
Secondary × Female	0.152 (0.36)					0.11 (0.4)	0.10 (0.6)
College × Female	0.059 (0.24)					0.07 (18.9)	0.08 (19.3)
WithGrace × Female	0.228 (0.42)					0.09 (19.5)	0.04 (58.3)
Upfront × Female	0.349 (0.48)					0.02 (76.4)	0.04 (44.3)
InKind × Female	0.114 (0.32)					−0.04 (57.7)	−0.01 (93.1)
WithGrace × Secondary × Female	0.074 (0.26)					0.23 (0.7)	0.28 (0.1)
Upfront × Secondary × Female	0.115 (0.32)					−0.14 (18.1)	−0.18 (4.9)
InKind × Secondary × Female	0.037 (0.19)					−0.14 (19.0)	−0.13 (21.6)
WithGrace × College × Female	0.028 (0.17)					−0.13 (36.5)	−0.20 (16.8)
Upfront × College × Female	0.044 (0.21)					0.10 (58.1)	0.26 (15.8)
InKind × College × Female	0.010 (0.10)					0.27 (10.0)	0.19 (26.7)

Table D12: ANCOVA estimation of school enrollment by attributes and time (continued)

covariates	mean/std	(1)	(2)	(3)	(4)	(5)	(6)
rd 3	0.344 (0.48)	0.06 (0.0)	0.06 (0.0)	0.06 (0.0)	0.04 (0.0)	0.06 (0.0)	0.04 (0.1)
Secondary × rd 3	0.117 (0.32)	0.01 (86.0)	−0.02 (47.1)	−0.02 (47.1)	−0.04 (21.8)	−0.03 (35.9)	−0.05 (15.2)
College × rd 3	0.055 (0.23)	0.04 (34.6)	−0.02 (69.2)	−0.02 (69.2)	−0.03 (43.1)	−0.01 (73.0)	−0.04 (36.9)
WithGrace × rd 3	0.175 (0.38)	0.01 (75.8)	0.00 (99.6)	0.00 (99.6)	−0.01 (80.2)	−0.02 (65.6)	−0.01 (68.9)
Upfront × rd 3	0.267 (0.44)	−0.06 (8.6)	−0.05 (9.8)	−0.05 (9.8)	−0.06 (6.7)	−0.05 (13.7)	−0.07 (2.1)
InKind × rd 3	0.090 (0.29)	0.02 (68.5)	0.02 (67.0)	0.02 (67.0)	0.03 (51.9)	0.02 (59.6)	0.03 (50.4)
WithGrace × Secondary × rd 3	0.059 (0.24)	0.13 (17.0)	0.11 (18.7)	0.11 (18.7)	0.11 (23.5)	0.06 (50.7)	0.07 (45.8)
Upfront × Secondary × rd 3	0.087 (0.28)	−0.05 (52.8)	−0.04 (63.4)	−0.04 (63.4)	−0.07 (36.0)	−0.04 (61.0)	−0.08 (32.9)
InKind × Secondary × rd 3	0.032 (0.17)	−0.00 (96.8)	−0.00 (98.7)	−0.00 (98.7)	0.01 (94.0)	0.06 (55.9)	0.06 (58.8)
WithGrace × College × rd 3	0.029 (0.17)	−0.04 (71.4)	0.01 (94.7)	0.01 (94.7)	0.06 (59.2)	−0.01 (93.6)	0.08 (31.6)
Upfront × College × rd 3	0.044 (0.21)	0.02 (84.8)	−0.01 (92.4)	−0.01 (92.4)	−0.07 (56.1)	0.01 (95.3)	−0.13 (22.3)
InKind × College × rd 3	0.012 (0.11)	0.12 (29.5)	0.03 (80.3)	0.03 (80.3)	0.01 (91.6)	−0.04 (72.6)	−0.04 (71.9)
Female × rd 3	0.156 (0.36)					−0.01 (67.2)	−0.00 (85.0)
WithGrace × Female × rd 3	0.080 (0.27)					−0.04 (45.8)	−0.01 (78.4)
Upfront × Female × rd 3	0.121 (0.33)					0.03 (60.9)	0.02 (64.2)
InKind × Female × rd 3	0.040 (0.20)					0.07 (35.2)	0.05 (47.7)
WithGrace × Secondary × Female × rd 3	0.025 (0.16)					0.02 (88.5)	0.05 (76.8)
Upfront × Secondary × Female × rd	0.039 (0.19)					0.08 (64.2)	0.10 (51.1)
InKind × Secondary × Female × rd 3	0.012 (0.11)					0.21 (23.0)	0.10 (57.4)
WithGrace × College × Female × rd	0.009 (0.09)					0.00 (97.9)	0.16 (33.2)
Upfront × College × Female × rd 3	0.012 (0.11)					0.17 (38.3)	−0.06 (75.2)
InKind × College × Female × rd 3	0.003 (0.06)					−0.39 (8.3)	−0.36 (14.7)
Secondary × Female × rd 3	0.052 (0.22)					−0.05 (42.7)	−0.02 (74.4)
College × Female × rd 3	0.016 (0.13)					0.03 (69.1)	0.00 (99.3)

Table D12: ANCOVA estimation of school enrollment by attributes and time (continued 2)

covariates	mean/std	(1)	(2)	(3)	(4)	(5)	(6)
rd 4	0.294 (0.46)	0.10 (0.0)	0.13 (0.0)	0.13 (0.0)	0.12 (0.0)	0.13 (0.0)	0.12 (0.0)
Secondary × rd 4	0.150 (0.36)	0.07 (11.6)	−0.03 (41.3)	−0.03 (41.3)	−0.05 (26.8)	−0.05 (26.4)	−0.06 (17.8)
College × rd 4	0.062 (0.24)	0.12 (0.8)	−0.02 (71.0)	−0.02 (71.0)	−0.03 (48.0)	−0.02 (57.6)	−0.04 (33.0)
WithGrace × rd 4	0.147 (0.35)	0.01 (75.9)	0.01 (76.2)	0.01 (76.2)	0.01 (73.3)	−0.00 (94.1)	0.02 (62.8)
Upfront × rd 4	0.232 (0.42)	−0.05 (19.3)	−0.06 (16.2)	−0.06 (16.2)	−0.07 (11.1)	−0.07 (11.1)	−0.09 (2.2)
InKind × rd 4	0.073 (0.26)	0.04 (37.8)	0.02 (67.8)	0.02 (67.8)	0.02 (69.2)	0.02 (49.6)	0.02 (58.2)
WithGrace × Secondary × rd 4	0.076 (0.27)	0.18 (9.1)	0.15 (10.3)	0.15 (10.3)	0.15 (11.9)	0.10 (28.7)	0.11 (24.3)
Upfront × Secondary × rd 4	0.114 (0.32)	−0.04 (69.7)	−0.03 (74.4)	−0.03 (74.4)	−0.09 (38.5)	−0.03 (71.3)	−0.09 (33.5)
InKind × Secondary × rd 4	0.040 (0.20)	−0.09 (46.8)	−0.05 (60.8)	−0.05 (60.8)	−0.05 (67.4)	−0.01 (93.7)	−0.01 (93.5)
WithGrace × College × rd 4	0.029 (0.17)	−0.09 (33.7)	−0.05 (59.9)	−0.05 (59.9)	−0.01 (87.8)	−0.02 (83.4)	0.07 (41.4)
Upfront × College × rd 4	0.049 (0.22)	−0.05 (72.9)	−0.05 (70.1)	−0.05 (70.1)	−0.08 (49.6)	−0.09 (46.1)	−0.22 (5.7)
InKind × College × rd 4	0.012 (0.11)	0.08 (50.1)	0.02 (83.1)	0.02 (83.1)	0.03 (79.2)	−0.02 (84.1)	0.01 (94.7)
Female × rd 4	0.142 (0.35)					−0.04 (6.1)	−0.04 (3.3)
WithGrace × Female × rd 4	0.071 (0.26)					−0.06 (20.5)	−0.07 (15.8)
Upfront × Female × rd 4	0.112 (0.32)					0.13 (1.3)	0.12 (2.6)
InKind × Female × rd 4	0.034 (0.18)					0.08 (26.4)	0.10 (14.9)
WithGrace × Secondary × Female × rd 4	0.037 (0.19)					−0.17 (33.2)	−0.14 (37.3)
Upfront × Secondary × Female × rd	0.054 (0.23)					−0.10 (56.6)	−0.00 (99.5)
InKind × Secondary × Female × rd 4	0.019 (0.14)					0.31 (10.3)	0.17 (33.5)
WithGrace × College × Female × rd	0.012 (0.11)					0.35 (5.4)	0.55 (0.1)
Upfront × College × Female × rd 4	0.023 (0.15)					−0.19 (40.3)	−0.50 (4.0)
InKind × College × Female × rd 4	0.004 (0.07)					−0.19 (46.6)	−0.15 (57.6)
Secondary × Female × rd 4	0.070 (0.26)					−0.04 (47.7)	−0.02 (69.5)
College × Female × rd 4	0.032 (0.17)					0.14 (11.0)	0.13 (15.6)
FloodInRd1	0.464 (0.50)				−0.05 (4.2)		−0.05 (2.8)
EldestSon	0.267 (0.44)				0.02 (62.9)		0.04 (22.2)
EldestDaughter	0.188 (0.39)				0.04 (28.3)		0.01 (84.8)
Head literate0	0.108 (0.31)				0.06 (2.7)		0.05 (2.9)
Head age0	39.153 (7.38)				−0.00 (26.3)		−0.00 (21.8)
Enrolled0	0.760 (0.43)		0.33 (0.0)	0.33 (0.0)	0.30 (0.0)	0.32 (0.0)	0.30 (0.0)
ChildAgeOrderAtRd1	1.826 (0.98)				0.02 (23.0)		0.02 (25.3)
HHsize0	4.974 (1.15)				−0.01 (25.6)		−0.01 (39.6)
mean of dependent variable		0.88	0.88	0.88	0.88	0.88	0.88
$T = 2$		75	75	75	63	75	63
$T = 3$		112	112	112	103	112	103
$T = 4$		539	539	539	500	539	500
$\bar{R}^2$		0.056	0.226	0.226	0.215	0.235	0.221
N	1841	1976	1976	1976	1841	1976	1841

Notes: See footnotes of Table D11 .

E Correlates of repayment shortfall

Table E13: Individual level effects of repayment shortfall

covariates	(1)	(2)	(3)	(4)	(5)	(6)
(Intercept)	3.11 (3.9)	14.20 (12.6)	31.23 (0.8)	131.82 (0.0)	51.21 (0.0)	51.21 (0.0)
Large	−1.13 (53.2)	−4.99 (9.9)	23.71 (9.6)		21.65 (18.2)	
LargeGrace	−1.21 (53.5)	−6.71 (3.6)	−138.02 (0.0)		−148.27 (0.0)	
Cattle	−1.37 (46.8)	−6.65 (5.0)	−140.01 (0.0)		−152.05 (0.0)	
Upfront				−16.99 (9.6)		21.65 (18.2)
WithGrace				−75.48 (0.0)		−169.92 (0.0)
InKind				2.08 (75.4)		−3.78 (80.0)
UltraPoor					−0.07 (99.5)	−0.07 (99.5)
Large × UltraPoor					−4.07 (75.7)	
LargeGrace × UltraPoor					7.80 (49.0)	
Cattle × UltraPoor					10.38 (37.3)	
Upfront × UltraPoor						−4.07 (75.7)
WithGrace × UltraPoor						11.87 (14.1)
InKind × UltraPoor						2.57 (64.3)
LY2			21.94 (7.6)	86.56 (0.0)	53.91 (0.2)	53.91 (0.2)
Large × LY2			−20.54 (1.5)		−47.15 (1.7)	
LargeGrace × LY2			202.85 (0.0)		166.12 (0.0)	
Cattle × LY2			216.04 (0.0)		182.78 (0.0)	
Upfront × LY2				−1.51 (91.5)		−47.15 (1.7)
WithGrace × LY2				54.29 (0.1)		213.27 (0.0)
InKind × LY2				−15.18 (36.8)		16.65 (46.7)
UltraPoor × LY2					−7.27 (54.8)	−7.27 (54.8)
Large × UltraPoor × LY2					5.27 (70.3)	
LargeGrace × UltraPoor × LY2					6.76 (63.9)	
Cattle × UltraPoor × LY2					−1.32 (93.3)	
Upfront × UltraPoor × LY2						5.27 (70.3)
WithGrace × UltraPoor × LY2						1.49 (88.5)
InKind × UltraPoor × LY2						−8.09 (53.6)

Table E13: Individual level effects of repayment shortfall (continued)

covariates	(1)	(2)	(3)	(4)	(5)	(6)
LY3			43.46 (0.4)	70.77 (0.0)	76.73 (0.0)	76.73 (0.0)
Large × LY3			−17.04 (17.2)		−83.16 (0.1)	
LargeGrace × LY3			242.61 (0.0)		184.25 (0.0)	
Cattle × LY3			260.48 (0.0)		225.16 (0.0)	
Upfront × LY3				−89.08 (0.0)		−83.16 (0.1)
WithGrace × LY3				140.00 (0.0)		267.41 (0.0)
InKind × LY3				−9.03 (68.9)		40.91 (23.6)
UltraPoor × LY3					−10.02 (26.8)	−10.02 (26.8)
Large × UltraPoor × LY3					17.87 (33.4)	
LargeGrace × UltraPoor × LY3					7.12 (60.8)	
Cattle × UltraPoor × LY3					−29.52 (20.0)	
Upfront × UltraPoor × LY3						17.87 (33.4)
WithGrace × UltraPoor × LY3						−10.75 (58.1)
InKind × UltraPoor × LY3						−36.64 (12.3)
LY4			−283.74 (0.0)	−168.44 (0.0)	−269.18 (0.0)	−269.18 (0.0)
Large × LY4			−264.49 (0.0)		−7.66 (87.4)	
LargeGrace × LY4			−91.78 (0.2)		155.19 (0.1)	
Cattle × LY4			−136.17 (0.1)		141.55 (2.3)	
Upfront × LY4				−125.24 (0.8)		−7.66 (87.4)
WithGrace × LY4				227.68 (0.0)		162.85 (0.2)
InKind × LY4				−13.03 (83.0)		−13.63 (83.2)
UltraPoor × LY4					−13.10 (69.5)	−13.10 (69.5)
Large × UltraPoor × LY4					17.81 (67.1)	
LargeGrace × UltraPoor × LY4					43.79 (27.6)	
Cattle × UltraPoor × LY4					13.61 (73.8)	
Upfront × UltraPoor × LY4						17.81 (67.1)
WithGrace × UltraPoor × LY4						25.98 (44.8)
InKind × UltraPoor × LY4						−30.18 (36.6)

Table E13: Individual level effects of repayment shortfall (continued)

covariates	(1)	(2)	(3)	(4)	(5)	(6)
Group shortfall$_{t-1}$		-0.07			-0.22	-0.22
		(23.6)			(0.0)	(0.0)
shortfall$_{t-1}$		0.45	0.27	-0.05	0.30	0.30
		(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Per member group net saving$_{t-1}$					-0.11	-0.11
					(0.0)	(0.0)
Per member cumulative group net saving (BDT1000)$_{t-1}$					-0.03	-0.03
					(41.0)	(41.0)
number of clusters	69	69	69	69	69	69
$\bar{R}^2$	0	0.102	0.172	0.121	0.179	0.179
N	41901	41722	41722	41722	41722	41722

Source: Estimated with GUK administrative data.

Notes: 1. Estimates of repayment shortfall controlling for group/village and year-month fixed effects using 48 month administrative records. The estimated model is $\tilde{y}_{it} = b_1 + \boldsymbol{b}_1'\mathbf{d}_i + b_2\mathsf{LY2} + \boldsymbol{b}_2'\mathbf{d}_i\mathsf{LY2} + b_3\mathsf{LY3} + \boldsymbol{b}_3'\mathbf{d}_i\mathsf{LY3} + b_4\mathsf{LY4} + \boldsymbol{b}_4'\mathbf{d}_i\mathsf{LY4} + \tilde{e}_{it}$, where $\tilde{x}_{it}$ is group and time demeaned value of variable x, $t = 1, \dots, 48$ is an ellapsed month index, $\mathbf{d}_i$ is a three element vector of arms or functional attributes, $\mathsf{LY2}, \mathsf{LY3}, \mathsf{LY4}$ are indicator variables of loan years 2, 3, 4. Loan years are defined with the ellapsed months since the first disbursement date, 13-24 for LY2, 25-36 for LY3, and 37-48 for LY4. Fixed effects are controlled by differencing out respecive means from the data matrix. Shortfall y_{it} is (planned installment) - (actual repayment). Group shortfall$_{t-1}$ indicates a one month lagged mean shortfall amount of a group. Per member group net saving$_{t-1}$ and Per member cumulative group net saving (BDT1000)$_{t-1}$ give one month lagged average net saving in a group and their accumulated sums, respectively. Median group repayent shortfall rate is -1.42. 69 groups participated in the lending program.

2. P values in percentages in parenthesises. Standard errors are clustered at group (village) level.