Financial Diaries and Women's Money Management Behavior: Evidence from a Randomized Controlled Trial *

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Abstract

We conduct a randomized controlled trial among women in rural Bangladesh to compare the efficacy of teaching a standard financial curriculum with maintaining a financial diary. We find that keeping a financial diary to track spending is largely as effective as financial education in improving financial test scores and downstream financial behavior. Using incentivized experiments, we also show that participants who maintained a financial diary exhibited significantly higher household bargaining power. The findings suggest that maintaining a financial diary can be a cost-effective alternative to financial education in improving the financial wellbeing of women in developing countries.

Keywords: financial literacy, financial diary, randomized controlled trials, household finance

JEL Classification: D14, G51, G53, C93

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1 Introduction

Increasing women's access to economic resources and opportunities, including financial services, skills development and employment outside the home, is central to increasing female empowerment. Studies show that women have lower financial knowledge than men, which is typically measured by their understanding of financial concepts and risks (Lusardi & Mitchell 2008). In rural areas in developing countries, many women are not only poor, but they often have little knowledge of, and little capacity to manage, their household finances (Cull et al. 2012). Improving their knowledge of, and understanding about, household income and expenditure is important for facilitating financial empowerment and increasing their bargaining power within the home.

Traditional financial education has dominated attempts to improve financial literacy in both developed and developing countries, targeting groups with different demographic backgrounds (see Lusardi (2008), Lusardi & Mitchell (2011)). The results from existing studies in developing countries suggest mixed evidence of the impact of standard financial education on improving downstream financial behaviour (Fernandes et al. 2014, Kaiser et al. 2021). The findings suggest that the effectiveness of financial education intervention on improving financial literacy crucially depends on the form in which the training is provided. There is also very little evidence about the efficacy of alternative interventions to traditional financial education in improving financial well-being.

In this paper, we study the effectiveness of maintaining a financial diary, which potentially represents a simplified, more cost-effective alternative to traditional financial education, in improving the financial wellbeing of the rural poor. We conduct a randomized controlled trial (RCT) in order to compare the effectiveness of teaching a standard financial curriculum with maintaining a financial diary on improving overall financial wellbeing. We compare the cost effectiveness of the financial diary treatment to a standard financial education intervention. We also follow the participants one year after the intervention to get an understanding of how participants were coping with the shock caused by COVID-19.

We measure financial wellbeing by financial literacy, downstream financial behavior and female empowerment. To measure the latter, we employ both traditional survey measures and a lab-in-the-field experiment measure of bargaining power within the household. Our lab-in-the field experiment is based on a simple sequential move game between two players, which is designed to measure the female player's willingness to overrule the financial decision of either her spouse or a random male from her village (Ashraf 2009). We also use daily financial diary data on income and expenditure to analyze households' financial behavior. Finally, we gathered qualitative information in which we interviewed all survey

participants from each treatment in order to better understand their views of the perceived benefits and costs of the financial education and diary treatments.

Our results suggest that the financial diary and financial education treatments both improved awareness of financial concepts. Specifically, participants in the financial diary and financial education treatments experienced about a 0.28 standard deviation (SD) and 0.24 SD, respectively, improvement in the financial literacy index.[1] Overall, participants in the financial diary treatment performed as well as those in the financial education treatment for most of the topics that constitute the financial literacy index. Both treatments increased awareness of budgeting, risk, simple interest rates and awareness of inflation.

The financial diary treatment had similar effects on downstream financial behavior as the financial education treatment, where downstream financial behavior is measured by unbiased weighted indices of savings, debt and use of formal financial services. The financial education and financial diary treatments improved participants' saving index by 0.167 SD and 0.168 SD, respectively. The financial education improved the debt index by 0.06 SD, while the corresponding effect for the financial diary treatment was 0.066 SD.[2]

Our results show that the standard financial education intervention is also more expensive to offer. The cost of administering the traditional financial education treatment was more than double that of the financial diary treatment. We find that, in response to COVID-19 induced economic shocks, participants in both the financial diary and financial education treatments were generally coping better than participants in the control group and that the magnitude of the differences was economically more meaningful for participants in the financial diary treatment than the financial education treatment.

The results from our lab-in the field experiment show that the financial diary treatment increases female empowerment, while the effects of financial education are not statistically different from the control. Specifically, when given a choice, 33% of women in the financial diary treatment overruled their male partner's decision, compared to only 17% in the control group and around 24% of women in the financial education group. The magnitude of the amount by which participants in the financial diary treatment overruled the other player were also much larger. The results were similar for women in the financial diary treatment, irrespective of whether the other player was her spouse or a stranger. In contrast, using our survey data, we find that financial education improves female empowerment when female empowerment is defined in terms of self-reported joint

[1] Huston (2010) suggests that financial literacy has two components. The first is awareness of basic financial concepts, measured by financial test scores or a financial literacy index. The second is having the confidence to apply that knowledge, measured by financial self-efficacy.

[2] We also find that financial education improves financial self-efficacy, but the financial diary treatment has no significant effect on financial self-efficacy.

decision making between the participant and her husband. The financial diary treatment, though, has no effect on self-reported female empowerment measures. The contrasting results between the survey and the incentivized experiment suggest that social desirability bias might be an important factor to consider in eliciting information about financial behavior, especially among those participants who directly received the training.[3]

This paper is the first to use an RCT to measure the effectiveness of maintaining a financial diary in improving financial behavior and decision making and to compare the effectiveness of maintaining a financial diary with that of a financial training program. Studies that seek to improve financial literacy have focused on examining financial training programs (Lusardi 2008, Lusardi & Mitchell 2011). Existing studies that have examined alternatives to traditional financial education have mainly involved either altering the curriculum (Drexler et al. 2014), the teaching method (Kaiser & Menkhoff 2017) or adding personalized elements (Carpena et al. 2019) within the context of financial education.[4]

This paper shows that maintaining diaries can induce improvements in financial behavior and, in many respects, be as effective as the more expensive financial education alternative. Economists have proposed maintaining diaries as a measurement instrument to capture households' financial decision making and livelihoods via high-frequency data on income and expenditure (Collins et al. 2009, Morduch & Schneider 2017). Large-scale projects have been carried out by major Non-Government Organizations (NGOs), such as CGAP and BRAC (Anderson & Ahmed 2015), seeking insights into how the poor manage their money. A rapidly growing literature seeks to document the financial lives of poor people. These studies seek to draw implications about the need for financial tools based on the diary entries of the poor. However, to this point, we lack evidence on whether maintaining a diary alters financial attitudes and behavior.

We also contribute to the literature on the efficacy of traditional financial education programs in improving the financial wellbeing of the rural poor. Fernandes et al. (2014) conduct a meta-analysis of 168 papers covering 201 financial literacy studies, including 85 impact interventions, finding that financial education can only explain 0.1% of the change

[3]We tried to minimize bias by engaging a separate team of field staff for the baseline and endline surveys. The surveyors were not involved in conducting the financial education program or in assisting the women to maintain their financial diaries. We discuss this issue in more detail in sections 4.3.1 and 4.3.2.

[4]Drexler et al. (2014) experimented with two distinct training programs for micro-entrepreneurs and found that a much simplified, rule-of-thumb, intervention significantly improved performance outcomes, compared to a standard training program, which had no measurable impact. Kaiser & Menkhoff (2017) present a meta analysis of 126 studies across developing and developed countries. They find heterogeneous effects of financial education and that it is less effective among low-income households, particularly in poorer countries. Carpena et al. (2019) find that financial education alone does not change financial behavior; however, adding a financial counseling intervention increases the likelihood that participants open a formal savings account and maintain a household budget.

in financial behavior and that the effect is even smaller for low-income groups. However, a more recent study by Kaiser & Menkhoff (2017) synthesizes empirical findings from 124 impact evaluation studies. Those authors find that financial education does improve financial literacy and speculate that their results reflect that their meta-analysis contains a bigger sample of large-scale RCTs.[5] Our findings are consistent with this more recent meta-analysis and suggest that traditional financial education programs can be effective in improving financial literacy and other dimensions of financial wellbeing.

In most households, women are responsible for the day-to-day expenses. Investment in financial education has long been advocated as an important way to improve the financial wellbeing of women, including their bargaining power within the home, but it can also be relatively expensive to administer. Maintaining a financial diary potentially represents a less intensive, simplified, alternative to financial education in improving female financial wellbeing. Our paper shows that maintaining a financial diary can be a simple, cost-effective alternative to traditional financial education in improving financial wellbeing. This is incredibly important when NGOs and policy-makers are looking at alternative and simpler ways that can be scaled up easily to improve the economic and financial wellbeing of vulnerable populations.

2 Experimental design and data

The study took place in rural areas in two south-western districts, Khulna and Satkhira, in Bangladesh. We randomly selected 150 villages from five sub-districts in these two districts for the purpose of the intervention. We assigned 50 villages to the control group and 50 villages to each of the two treatment groups at random. The randomization was conducted at the village level, with each village either being assigned to the control group or to receive the financial education or financial diary interventions (see Figure 1). Married women who were aged 18 to 40, randomly selected from each of these villages, were invited to participate in the study. The final sample consisted of 2364 female participants from the 150 villages who were surveyed at baseline, with 14-22 participants from each village.[6]

The lower panel of Figure 1 illustrates the geographical distribution of the control and treated villages (Tala, Dumuria, Assasuni, and Paikgachha Upazila) in Khulna and Satkira.

[5] Yet, even so, Kaiser & Menkhoff (2017) still conclude that financial education has not been effective in helping low-income populations and improving downstream behaviour such as handling of debt.

[6] We exclude relatively atypical households, i.e., polygamous households, households in which there were divorcees and multiple family households, in order to ensure homogeneity within, and between, treatment arms. Women from atypical households, if eligible, still filled in the surveys and received the interventions. We only exclude these observations in the final analysis to ensure that our results are not being driven by extreme outliers. The results do not change qualitatively if we utilize the full sample.

Given the considerable distance between each control village and its nearest treatment village,[7] spillovers between participants in the treatment and control groups seem unlikely. At baseline, all participants completed a survey containing questions intended to elicit basic demographic and financial information. They also completed a test to measure ex-ante numeracy, financial literacy and risk preferences. The financial education and financial diary interventions were introduced following the survey. Approximately 12 months after the baseline survey, we conducted follow-up tests and administered surveys to participants in the control group and each of the two treatment groups to measure the post-treatment effect of each intervention on their savings behavior and level of financial literacy. Details of the timeline can be found in Appendix A.

[Figure 1 about here.]

2.1 Overview of the intervention

2.1.1 Financial diary/household budgeting

The first treatment group received financial diary/ household budgeting training. Participants self-recorded household daily income and expenditure over a 30-week period. The majority of financial diary interventions use regular (biweekly or monthly) visits to interview households on income and expenditure over the period. We, instead, had participants maintain a daily record to get a more accurate and detailed picture of household spending behavior. Having participants self-record their own daily transactions also has the advantage that they can learn to improve their money management skills and understand their family's financial situation better; thereby, potentially improving their confidence in their own financial ability and improving financial literacy.

Following the randomization process, we employed field workers to visit each household to brief participants about how to maintain a financial diary and respond to any questions participants had. Given the sensitivity of household financial matters, we ensured that all discussion took place in the presence of the participant's family members, including her husband and in-laws. The financial diary consisted of two main columns representing cash inflows (income/borrowing) and outflows (expenditure/lending). The cash inflow of the budget tracked all separate income sources, dividing them into five main categories: agricultural production, loans, casual income, savings withdrawals and self-employment. The expenses were divided into five categories: groceries, clothing, education, production

[7] There are about 2500 villages in Khulna and Satkhira districts and the road conditions in these districts were poor at the time of treatment, making it difficult for participants to commute long distances on a regular basis.

and services. To maintain an ongoing and regular relationship with the participants our field workers re-visited households every two weeks to collect, and cross-verify, the diary entries, as well as answer questions on, and provide guidance about, how to use the diary to record daily cash inflows and outflows.

One of the most important tasks during each of the fortnightly visits was to understand any discrepancies between the household's inflow and outflow of income. If expenses exceeded income by a significant amount, the field worker followed up to understand how the extra expenditure was being financed.[8] Overall, the gap between income and expenditure was below 10% over the course of the intervention. A critical factor pertaining to the recruitment for this treatment was to secure the willingness of the participant to maintain the financial diary throughout the 30-week period. To encourage participants to do so, we offered each household the opportunity to participate in a lottery round with a chance to win some prize if their diary was properly maintained. During each visit, our field worker reminded them about the upcoming lottery.[9]

For the first household visit, the enumerators spent about 30 minutes explaining the different components of the diary. Subsequent visits were generally very short, spanning five to 10 minutes, and declined in time once households became familiar with the record keeping needed to maintain the diary. No additional training on finance, such as interest rates or inflation, was provided and field workers did not encounter such questions from participants. None of the trainers and fieldworkers involved directly in the financial education training were involved in conducting the financial diary treatment.[10]

2.1.2 Financial education

We invited all eligible women in randomly selected villages to take part in a short course that was designed to improve their basic financial knowledge. The curriculum for the course was adapted from the Global Financial Education Program (Microfinance Opportunities, Freedom from Hunger). We employed standardized topics that have been adopted by a number of researchers (Brown et al. 2016). Specifically, the program consisted of six modules; namely, budgeting, savings, debt, informal and formal financial

[8] As a rule of thumb, the field staff followed up with the household when the discrepancy in their weekly income and expenditure was above 20%.

[9] There were 10 lotteries offered every four weeks, in which all the households in the financial diary treatment participated. Each lottery payment was BDT 5000 (USD 62). Each lottery draw was conducted in one of the treatment villages in front of all participants, with participants who completed their diaries in the previous four weeks eligible to be in the draw. The draw took place in a different treatment village each month so that participants could directly observe the outcome.

[10] Note that households were not told that we would ask questions at the end of the diary period to test their financial knowledge. All of these households participated in the baseline financial knowledge test, together with the control group and other treatment group.

services, dealing with financial emergencies and saving for old age.

The training was conducted in the local language and the course content was modified to suit regional specific characteristics and culture. The training was administered by local trainers from Khulna University and NGOs in the same district with experience in conducting similar training. Each session entailed one lecture and group discussion with graphical illustrations and field exercises -the curriculum can be found in Appendix B. The training commenced at 10:00 AM and concluded at 3:00 PM once a week for six consecutive weeks.[11] One of the authors of the paper directly participated in the fieldwork to maintain the quality and consistency of the training.

2.2 Data description

2.2.1 Baseline balance

Causal inference on the effect of financial interventions on intended outcomes rests on ensuring that the assignment of clusters to the treatment conditions is random. Table 1 contains descriptive statistics and balance checks for the 2364 participants at baseline for treatment and control groups. As shown in Panel B, participants' socioeconomic characteristics were balanced across the control group and financial education and financial diary treatments. The differences across treatment arms are not statistically significant. The control group has a slightly lower income than the treatment group, but the differences are not significant. Participants in the financial diary treatment have slightly higher loan repayment expenses, but again the differences are not significant at 10% using one-way ANOVA tests. In addition, since some of the pre-intervention variables are likely to be correlated with each other, we conduct joint tests to see whether groups of variables predict assignment to each of the treatment groups. We find that these observed characteristics do not jointly determine treatment status at the 5% level of significance. We find no evidence of an imbalance at baseline.

The average household size among participants is four to five members, with each household having one to two children. Less than 15% of participants have a job outside of a home business (i.e. have an income-earning job) and approximately three-quarters of the households were saving money. By design, none of the participants were illiterate and the majority could perform basic calculations.[12] While approximately 80% of the par-

[11] We provided snacks and lunch and hard copies of the materials. Each participant received compensation for their time.

[12] Bangladesh has achieved a very high rate of primary and secondary schooling among females in the last few decades, with literacy rate among young females now more than 90%. Hence, we did not need to be too selective in recruiting our participants.

ticipants possessed at least some resources (such as jewelry and savings), only 6% were landowners. Approximately half of the sample were members of local NGOs or MFIs; however, less than 40% of the participants had an active bank account. The distribution of financial product ownership reflects the Bangladesh context: informal savings and loans, together with NGOs, remain dominant despite the increasing penetration of formal credit institutions. Banking options in the rural areas of Bangladesh are still limited and large commercial financial institutions are only located in the town centers.

[Table 1 about here.]

2.2.2 Attrition and take-up rate

The attrition between baseline and endline surveys was 8.08% for the full sample, with some variation across treatment arms. There were also some non-compliant participants, defined as treated participants who did not complete all modules of the course or did not maintain the diary. The completion rate for each treatment is provided in the lower two rows of panel B in Table 2.[13] The completion rate varies by experimental condition: 83.2% (669 out of 804 women surveyed in the baseline) of the financial education group took part in all the training sessions. By comparison, 84.4% (683 out of 809 individuals) of those who participated in the financial diary treatment maintained their diaries for two weeks or more during the 30 weeks period.[14] There were 599 or 74.5% of all women surveyed in the baseline who kept the diary for the entire 30 weeks. Only 3.8% of women decided not to keep the diary after the first week. Every diary participant who completed the endline survey (N=683) had kept the diary for more than one week. Our analysis in the results section is based on the full sample of participants in the endline- including those who did not turn up for the financial education training or did not complete the diary. In particular, we report the intent-to-treat (ITT) effect.

[Table 2 about here.]

According to panel B of Table 2, the attrition rate from the sample is similar across the control, financial education and financial diary groups. The potential effects of attrition were identified by using a dummy variable to identify participants who withdrew or become unreachable throughout the evaluation. The attrition group was analyzed using baseline data to examine selection bias due to attrition. We check if the attritors and

[13] All eligible women selected randomly for the baseline were offered the respective treatments

[14] In total, there were 709 women or 87.6% of all women (809) surveyed in the baseline who agreed initially to maintain a diary. Thus, 84.5% (599 out of 709) of them kept the diary for the entire 30 weeks.

non-attritors differ in terms of observable characteristics. We also check if attritors across treatment groups are different. We find no significant difference between attritors and non-attritors, and among attritors across treatment groups. These attrition results are reported in the Appendix Tables D.1 and D.2. Overall, our final results are unlikely to be affected by attrition.[15]

3 Outcomes measurement and estimation strategy

Financial literacy and financial wellbeing include several dimensions that are often overlooked in the literature. For example, the majority of research uses book knowledge and numeracy tests to measure financial literacy, but these may not fully capture downstream financial behavior and level of financial inclusion of participants. There is no universally accepted meaning of financial literacy. We follow the definition proposed by Huston (2010). Financial literacy is conceptualized as having two components - financial knowledge (the understanding of financial topics) and application (the ability and confidence to apply the knowledge to financial activities).

3.1 Financial literacy - financial test score and financial self-efficacy

The financial knowledge questions are composed of three parts. The first set of questions seek to assess basic financial literacy, similar to those used in Lusardi & Mitchell (2008). These questions cover three main topics (i) understanding of compound interest rates, (ii) understanding of inflation, and (iii) understanding of risk diversification. We also include questions on general awareness of practices associated with positive financial behavior: (iv) understanding of income-generated loans; (v) understanding of budgeting; (vi) understanding of simple interest rates;[16] and (viii) understanding of formal financial institutions (formal saving methods). For each of the questions, we re-code the answer to one if the answer is correct, and 0 otherwise.

The second component of the Huston (2010) definition of financial literacy is having the context-specific confidence to apply the acquired knowledge. Women are generally

[15]We also conducted a formal attrition analysis to understand if attrition was based on selection on unobservables. In particular, we use inverse probability weighting (IPW) to estimate the treatment effects. We use weights from the predicted probability of being in the endline sample based on baseline characteristics. These attrition-adjusted estimates are almost identical to unadjusted estimates. We also estimate lower and upper bounds following (Lee 2009), and our conclusions remain the same. The results are available upon request.

[16]The widely-used three questions proposed by Lusardi & Mitchell (2011) only include the compound interest rate. However, considering our participants' educational background and the context of a developing country, we include both types of interest rates.

believed to be less confident in their financial capacity than men, and the difference is especially large in developing countries (Lusardi & Mitchell 2008). We examine if the interventions improve the financial confidence of participants using the financial self-efficacy scale (FSES), developed and validated by Lown (2011). We employed six statements from Lown (2011), measuring participants' self-confidence in their own capabilities with respect to saving and debt management.[17] Participants were asked to respond to the FSES statements on a 4-point Likert-type scale: exactly true, moderately true, hardly true or not true at all. The exact wording of the six statements are:

- (Item 1) It is hard to stick to my spending when unexpected expenses arise.
- (Item 2) It is challenging to make progress towards my financial goals.
- (Item 3) When unexpected expenses occur, I usually have to use credit.
- (Item 4) When faced with a financial challenge, I have a hard time figuring out a solution.
- (Item 5) I lack confidence in my ability to manage my finances.
- (Item 6) I worry about running out of money in retirement.

3.1.1 Downstream financial behavior

While there is a strong correlation between financial literacy and prudent financial decisions Xu & Zia (2012), an improvement in financial literacy may not result in positive financial behavior due to other factors having an impact on financial behavior. Similarly, financial interventions, with or without directly affecting the level of literacy, may lead to positive behavioral change. Therefore, we also examine the program's impact on downstream financial behavior, which we measure using three domains:

- **Savings index** consists of the following items: whether the participant has any type of savings (including a savings account or cash at home); the amount of the household's monthly savings; whether she is a regular saver, whether she has a deposit account; and whether she has expressly saved some money for old age.

[17] We test if participants were confident in their answers in the knowledge test. They were informed that each question only has one correct answer and is worth one point each and that we deduct half a point for every wrong answer. Thus, participants have the incentive to answer "I do not know" rather than attempt to select the answer randomly. However, we find no significant pattern among women who choose not to answer.

- **Debt** consists of the following items: whether the participant plans to borrow from a money lender in the future; the sources of her most recent loan, and her monthly loan repayment as a percentage of household expenditure.
- Exposure to **Financial Institutions** consists of the following items: whether the participant has a bank account, if she had ever been to a bank; and if she knew the location of her local bank.

3.1.2 Bargaining power - survey-based and experiment measures

Bargaining power is central to the link between female empowerment and economic well-being. However, bargaining power is not directly measurable, and the existing literature often relies on self-reported participation in household decisions as a proxy (Doss (2013)). An alternative is to use experimental games to understand female autonomy in intra-household decisions. We employ both measures of female empowerment.

Surveys: The dominant definition of bargaining power is exercising control over resources (Kabeer 1999). We asked participants who was the main decision-maker when deciding on: major household purchases, food, livestock and children's education. Possible responses were "yourself", "your husband," or a "joint decision between you and your husband". The answers for these questions were used to construct a household decision making power index (HDMI). Employing the HDMI, we define autonomy in one of two ways. First, similar to the approach used in Ashraf et al. (2010), we define having autonomy in decision making as the participant either being the sole decision-maker or having joint decision-making authority over household spending (HDMI2). Peterman et al. (2015) find that including joint decisions in the HDMI may result in substantially different conclusions about female empowerment than just focusing on sole decision making by women. Thus, alternatively, we define autonomy as the participant being the sole decision-maker in relation to household spending (HDMI1).

Experimental game: Experimental measures have advantages over survey measures in our context. Experimental games likely provide a more reliable estimate of bargaining power since responses to surveys often vary across different cultural contexts (Banerjee et al. 2015). Hypothetical survey questions carry no real incentives for women to reflect their true preferences. In the cultural context of developing countries, existing disempowerment may make it particularly challenging to collect data about women's opinions and desires. Experiment neutrality in the lab setting allows one to control certain factors that can affect intra-household interactions, making it possible to get meaningful insights

that cannot be obtained from survey data. Experimental decision tasks also allow us to directly test the classic bargaining power concept - when women choose their own preferences, even when the man's preference is clearly stated in Dahl (1957).

Following the endline survey in December 2019, we invited a randomly selected sub-sample of our participants, along with their husbands, to participate in a household decision-making experiment. We randomly selected 63 out of the 150 villages to participate in our experiment, comprising 17 control villages, 22 villages from the financial education treatment and 24 villages from the financial diary treatment (see Figure 1).

On average, there were eight couples (8x2=16 players) per session.[18] Once the participants consented to participate in the experiment, the rules for the first task were explained. In this task, the participant received an endowment of 100 takas (1.25 USD) and had to decide how much to invest in a lottery. The amount could be any value between 0 and 100 takas, which was doubled with a probability of two-thirds and lost with a probability of one-third.[19]

After the participant recorded the amount that they wished to invest in the first task, the enumerator explained the second task. The second task entailed a sequential move game between a pair of two players. The pairing was either between spouses or between the female participant and a random man in the same session.[20] The final payoff was split equally between each pair, and the endowment was increased to 200 takas, so that each individual had the same expected payoff as in Task 1. We randomly assigned the woman to the role of being either the first or second mover. The first mover decided and recorded how much of the 200 takas that they would invest in the same risky lottery as in task 1. After being informed about the first mover's investment choice, the second mover had the option to either accept or overrule the decision. If the second mover chose to overrule, he or she recorded a new amount to invest.

[Figure 2 about here.]

We use this experiment to test whether the financial intervention empowers the female

[18]The participants were similar in terms of demographic characteristics to the whole sample. The sample size varies between villages due to differences in village size and the availability and willingness of couples in villages from the two treatments to participate. The game takes the form of a risk elicitation task, first played as an individual one-off decision, then as a sequential move game between two players.

[19]The probabilities of winning and losing were demonstrated using a box of two white balls (denoting winning) and one blue ball (denoting losing).

[20]All participants were informed that a coin toss would determine whether the first or second task would be selected for the final payment. If the first task was chosen, each individual took a ball from the box to determine if their investment was doubled or lost. If the second task was chosen, then the second mover selected the ball.

participant to choose her investment level in preference to her male partner. To do so, we observe the female participant's behavior as the second mover and test three hypotheses:

- Hypothesis 1 - Participants in the treatment groups are more likely to overrule than participants in the control group.
- Hypothesis 2 - Conditional on overruling, participants in the treatment groups are more likely to overrule their spouse than a random male.
- Hypothesis 3 - Conditional on overruling, participants in the treatment group will choose their preferred investment rather than compromising with their partner.

3.2 Estimation strategy

We estimate the intent-to-treat (ITT) effects of the interventions on three domains of financial wellbeing: financial literacy, downstream financial behavior and financial empowerment by comparing the treatment groups to the control group at the time of the follow-up (endline) survey. To avoid type-I-error inflation due to multiple hypothesis testing, we aggregate all the related outcomes into summary generalized least squares (GLS)-weighted indices of each outcome domain (Anderson 2008). A complete list and description of each outcome variable can be found in appendix C. Following Anderson (2008), first, we re-code the variables, so that a positive sign on the coefficient indicates an improvement in wellbeing, i.e., positive treatment effect. All individual outcomes y are demeaned and converted to the size of the effect by the control group standard deviation. The index, constructed by an efficient GLS estimator, weights outcomes using the inverse of their variance-covariance matrix. As noted in Anderson (2008) and Kling et al. (2007), the analysis using the summary index has three advantages over individual outcomes: (1) it is robust to over-testing because each index represents a single test, instead of multiple hypothesis testing; (2) it provides a statistical test for the overall effect of a program on the domain of outcomes; and (3) it is potentially more powerful than individual-level tests. The GLS weighting procedure assigns less weight to outcomes that are highly correlated with each other and a higher weight for uncorrelated outcomes that may contain new information.

Since the treatment and control groups are chosen at random and their characteristics are balanced at baseline, the ITT effect is estimated using the following equation:

$$y_{ij} = \alpha + \beta_1 FE_j + \beta_2 FD_j + \Gamma' X_{ij} + \varepsilon ij$$

where Y_{ij} denotes the outcome index for individual i in village/cluster j. FE_j and FD_j

are dummy variables denoting if the participant lives in a village in the financial education or financial diary treatments, respectively. β_1 and β_2 capture the ITT effect of the two treatments. X_{ij} is the vector of controls, including household type, household size, age, participant education and household income. We also control for interviewer fixed effects. We cluster standard errors at the village level.

We provide three main robustness checks to address the different null hypotheses that arise due to multiple treatment arms, through multiple outcome variables of interest and multiple sub-group analyses. We report the adjusted p-value generated by randomization inference (Young 2019) to address the different null hypotheses that arise due to multiple outcome variables. The procedure follows a nonparametric permutation test, controlling for the family-wise error rate.

We estimate the intent-to-treat (ITT) effect on individual outcomes within each index with the following ANCOVA framework:

$$y_{ij(t)} = \alpha + \beta_1 FE_j + \beta_2 FD_j + \theta_1 y_{ij(t-1)} + \varepsilon ij(t)$$

in which:

- $y_{ij(t)}$ denotes the outcome variable for individual i in village/cluster j at the time of follow-up (t).
- $y_{ij(t-1)}$ controls for the lagged value of the outcome variable at baseline.

For individual binary outcomes, we apply linear probability models. However, the qualitative results are not sensitive to using non-linear (logit) models for binary outcomes (the results employing a logit model are not reported, but are available on request).

4 Results

Table 3 presents the ITT effects for the financial education and financial diary treatments on financial literacy, downstream financial behavior and female empowerment.

4.1 Financial literacy

The results in Column (1) of Table 3 show that participants in the financial education and financial diary treatments experienced a 0.283 SD and 0.242 SD improvement in the

financial literacy index, respectively. The effect size for financial education is consistent with previous studies that have examined the effect of financial education on financial knowledge using rigorous RCT designs (effect size of 0.209 SD) and other designs (effect size of 0.394 SD).[21]

[Table 3 about here.]

Table 4 shows the results for each of the financial topics that constitute the financial literacy index; namely, the three items in the Lusardi and Mitchell (2011) three-part questionnaire - compound interest rates (compound), inflation and risk - as well as simple interest rates (simple), loan repayment strategy (loan), budget management (budget) and methods of saving (saving). On the whole, participants in the financial diary treatment performed as well as those in the financial education treatment for most topics. Both treatments increased individual awareness on risk diversification by approximately 0.3 SD, awareness of budgeting by 0.18-0.21 SD and awareness of simple interest rates by 0.17-0.18 SD. The one item on which participants in the financial education treatment outperformed those in the financial diary treatment is knowledge of inflation, though the difference is not statistically significant. Neither treatment increased awareness of compound interest rates, loan repayment strategy or methods of savings, relative to the control group. As reported in the last row (FE=FD) of Table 4, we do not find any statistically significant difference between financial diary and financial education treatments in improving financial literacy of the participants.

The most challenging topic for participants was compound interest rates. About 40% of participants answered this question correctly. The relatively poor performance on this topic is in line with the literature (Lusardi & Mitchell 2008).[22] The treatments also did not improve participants' awareness of the benefit of formal banking services, such as saving accounts. One possible explanation is that most of the participants tend to be non-banked and do not hold other sophisticated financial instruments. Financial inclusion enables women to access credit, to make transactions and to familiarize themselves with financial activities (Hung et al. 2012, Ashraf et al. 2010). Therefore, the lack of access to formal institutions may mean that participants lack the situational context in which to understand formal banking services or to be able to understand and apply compound interest rates as a concept.

[21] The range of treatment effects of RCT and other designs are reported in a meta-analysis by Kaiser & Menkhoff (2017).

[22] Lusardi & Mitchell (2008) found that in the Health and Retirement Study in the United States, of 1264 respondents aged 50 or above, that only 60% of female respondents answered this question correctly. Considering that those respondents were much better educated and were likely to have encountered compound interest rates throughout their life, it is expected that their performance on this topic would be better than participants in our study.

[Table 4 about here.]

The second component of the Huston (2010) definition of financial literacy is having the confidence to apply awareness of financial topics to money management. The third column in Table 3 shows that participating in the financial training program improves the level of financial self-efficacy by 0.290 SD, while the financial diary treatment has an insignificant effect on the FSES score. The mean and distribution of FSES scores among participants do not differ significantly from existing studies, such as Farrell et al. (2016). As illustrated in Figure 3, the distribution of FSES is quite similar for participants in the control and diary treatments, while more than 50% of participants in the financial education treatment score above the standard FSES.

[Figure 3 about here.]

In Table 5, we examine the effect of the financial diary and financial education treatments on the individual items of the FSES scale. Relative to the control group, participants in the financial education treatment have statistically higher financial self-efficacy on topics that are related to realizing one's financial goals; namely, sticking to planned spending when unexpected expenses arise, making progress toward personal financial goals and confidence in managing personal finances as well as maintaining sufficient money for retirement (items 1, 2, 5 and 6). Meanwhile, participants in the financial diary treatment exhibit higher self-efficacy than the control group on progressing towards realizing their financial goals (item 2) and maintaining sufficient money for retirement (item 6). Being in either one of the interventions lowers participants' self-belief in their capabilities to handle retirement by 0.180 points for the financial education group and 0.226 points for the financial diary group. These results may reflect how retirement is generally perceived in Bangladesh. The cultural norm is that elders in Bangladesh generally expect to rely financially on their children. Our interventions may have raised awareness of participants' financial situation and the financial risk that retirement and old age pose. This finding matches our survey responses in Section 4.2, below in which our treatment groups reported that they were more focused on saving for retirement following the interventions.

[Table 5 about here.]

4.2 Downstream financial behavior

Columns (4), (5), and (6) in Table 3 provide the main results for downstream financial behavior. As discussed in section 3, each index represents positive behavior in the specific financial domain. The financial education treatment improves participants' savings

index by 0.157 SD and debt index by 0.107 SD. Noticeably, participants in the financial diary treatment exhibit a similar and sizable improvement in saving (0.161 SD) and debt behavior (0.120 SD). The results suggest that a simplified intervention that targets positive financial behavior reinforcement can be just as effective as teaching that behavior in those two domains. The p-values testing the difference between the coefficients of financial education and financial diary treatments (FE=FD row) in Table 3 are not significantly different statistically.

We do not find any significant effect of either treatment on improving awareness of financial institutions, as measured by exposure to formal financial services. This result is consistent with previous findings on the effect of financial education. For example, Shawn et al. (2011) analyze results from a large scale RCT in Indonesia and find that while literacy is positively correlated with higher savings, financial education does not increase demand for bank savings accounts. In our context, the main presence of formal financial institutions in Khulna and Satkhira is in the form of commercial banks, in which the majority of the transactions are conducted in person, and outside their own villages. In addition to financial literacy, women face other constraints restricting their mobility outside the home, which likely impedes their ability to visit a bank, open a bank account or even know where their local bank branch is located. Therefore, improvement in financial literacy may not translate to greater awareness of formal financial services until there is a significant improvement on the supply side of formal institutions or the development of digital finance.

We now turn to examine selected individual components within each of the behavioral indices to ascertain the specific positive behaviors that the women have exhibited. Table 6 provides the treatment impacts on selected individual components of saving and debt behavior. Our intervention's main impact on the debt index comes from the increase in the usage of a formal channel. Our treatment groups save more, and are more likely to apply for a loan via a formal institution such as a bank or local microfinance institution - the difference is 0.0527 for the training and 0.0591 for the diary group. We find no significant effect on the allocation of loan repayments. The result from column (5) of Table 6 is suggestive that the intervention may have led our participants, regardless of which treatment, to improve their debt behavior through expanding their formal credit channel. Our analysis is limited to how well the participants have been able to utilize formal credit channels, and a further study is needed to analyze the household's ability to make timely payments for new loan applications. As for the saving behavior, we observe increase in saving among those who were saving for their retirement. The effects are 0.17 SD for both treatment groups. The result is particularly encouraging, given that a major financial risk that women incur is financial insecurity in old age (Huston 2010). On average, households in both treatment groups save more, which account for 5-6% of

their household income, compared to the households in control group . The difference between financial education and financial diary treatments are generally not statistically significant in terms of the effects on saving and debt behavior.

Overall, we find mixed results for the effect of the treatments on downstream behavior. The findings are mostly consistent with the modest, yet significant, improvement found in financial education interventions (Fernandes et al. 2014, Brown et al. 2016). As noted in Huston (2010), other influences such as cognitive biases, self control problems, as well as economic and institutional background can affect financial behavior. Therefore, in order to achieve a larger effect on downstream behavior, financial training and/or financial diary treatments could be combined with other types of interventions, such as the graduation program discussed in Banerjee et al. (2015).

[Table 6 about here.]

4.3 Financial empowerment - surveys and experimental measures

4.3.1 Survey measures

Columns (7) and (8) of Table 3 show the effect of the treatments on whether the participant reports having sole autonomy (HDMI1 in Column (7)) or joint autonomy (HDMI2 in Column (8)). Neither treatment increases the likelihood that the participant is the sole decision-maker. The financial education treatment, but not the financial diary treatment, increases the likelihood that the participant is a joint decision-maker, relative to the control.

Table 7 shows the effect of the treatments on whether the participant reported having either sole or joint autonomy to decide on specific household expenditure decisions. Participants in the financial education treatment were statistically more likely than participants in the control to report having some say regarding decisions relating to major expenses, food, children's education and farming. However, the treatment effects for the financial diary were consistently small and insignificant. Taken together, the findings suggest that participation in the financial education treatment results in the financial empowerment of women, as reflected by their self-reported responses about joint decision making on household expenditure.

[Table 7 about here.]

The survey results suggest that access to financial education had a much larger impact

on financial empowerment than the financial diary treatment. However, such a strong effect may have been the result of either: (1) a placebo effect from being in actual classroom training; (2) an effect from socializing in a small group with other women; or (3) reflect that self-reported surveys may contain social desirability bias or, in this case, the desire to over-evaluate to compete with other participants in the same class. We address these potential biases by employing preference-elicit artefactual games, focusing on household bargaining power, as an alternative to survey-based measures of empowerment, and compare the differences between them.

4.3.2 Experimental measures using incentivized tasks

As outlined in Section 3, the experiment involved performing two tasks. The first task, which was designed to elicit investment and level of risk preferences, focused on individual decision making, while the second task entailed a coordination game between each participant and either her spouse or a random male from the village. The participants were only made aware of the second set of tasks after making their decisions in the first set; hence, latter decisions are not expected to confound the decisions made beforehand. In the second task, the roles of first and second mover were assigned randomly within each pair. In this task, the second mover can exert power by changing the investment decision after their partner's preference is clearly stated. The female participant's decision as the second mover can be used to ascertain whether she overrules (1) her husband or (2) a random male on spending/investment decisions.

[Figure 4 about here.]

A total of 570 individuals participated in our lab-in-the-field experimental games. These participants were randomly selected from each treatment group. We conducted a balance check to show that baseline characteristics were balanced between the full sample and game sample. The results are shown in Table D.3. We can see that the baseline characteristics are balanced between the non-game and game subsamples, which supports the conclusion that randomization was successful.

Panel A of Table 8 presents the results when the woman is the second player in the game. In Column (2), we show that women who participated in the financial diary treatment were 14.3% more likely to overrule their partner's decision. We define the compromise level by the absolute difference between the woman's final decision and the initial amount proposed by her partner. As shown in Column (3) of Table 8, on average, participants in the financial diary treatment chose to deviate from their partner's investment level by

14.24 units, which is almost twice the magnitude of participants in the control group.[23] Given that we find that financial education increases joint autonomy based on the survey responses, one might expect a similar impact of training on empowerment measured in the game. However, using these incentivized tasks, we find that participants in the financial education treatment do not respond significantly different from those in the control group. We report the results when the man makes the decision in Panel B of Table 8. There is no significant difference between the control and each of the two treatment groups, indicating no spill-over effect to male partners within the treated households.

Figure 4 shows the extent to which women overruled their male partner within and across households. The first panel shows the overall percentage of women who overrule their partners regardless of whether their partners are spouses or random peers. Overall, 33.5% of the women in the financial diary treatment overruled their male counterpart's decision, compared to only 24% of participants in the financial education treatment and 17% of participants in the control group. Comparing the results in the second and third panels, we find that participants in the financial diary treatment exhibited a similar proclivity to overrule, irrespective of whether their partner in the game was their spouse or a random male. Participants in the financial education group, though, were much more likely to overrule their partner if he was a random male than their spouse. If we think of overruling in these two contexts as a matter of intra-household decisions and outside work/business decisions, then it appears that the financial diary treatment improves empowerment in both contexts. The effect of financial education is only significant, though, for the non-spousal pairing, indicating that financial education did not improve their intra-household power.

We used a focus group approach with women who did not overrule their husband's decision at the end of our experimental session to understand the main reasons why they did not choose to overrule. Based on our in-depth discussion with them, we can rule out two possible channels: (1) women have more trust in their husband's judgment and, thus, are less likely to overrule or (2) women share the same risk preference as their husbands and, thus, do not need to overrule. The remaining plausible explanation is that women tend to overrule less to avoid marital conflict.[24]

[Table 8 about here.]

When the participant chooses to overrule her partner's decision, she must also decide

[23] Conditional on overruling, the net difference between the final amount and the initial amount proposed is 21.49 units in the financial diary group and 11.13 in the control group.

[24] We did not discuss this last point with participants to avoid any unintended consequences from the exercise. Note, that these observations are based on informal group discussion between the researchers and the game participants and the results are merely indicative and should be taken as such.

how much of their joint-endowment to invest in the lottery. We analyze the difference between the revised amount selected by the woman and the initial amount proposed by her partner. The magnitude of the amount was largest for women who participated in the financial diary treatment. As shown in column (3) of Table 8, the average net difference for the control group is 12.72 units. Being in the financial diary treatment increases the net difference by 14.24 units, while the corresponding difference for the financial education treatment is 1.57 units, and the latter is also not statistically significant. Finally, we check to see if the woman selects an overrule amount that solely reflects her preferences or selects a number that represents a compromise between her preference and those of her husband. We find no significant difference between the level of compromise between the three RCT arms, both conditional and unconditional, on overruling.

We proposed three hypotheses that we tested with the game (see Section 3). All three hypotheses are supported for the financial diary treatment. Specifically, participants in the financial diary treatment were more likely to overrule their male partners than participants in the control (hypothesis 1). Conditional on overruling, participants in the financial diary treatment are more likely to overrule their spouse than a random male (hypothesis 2) and more likely to select their preferred investment than compromising with their partner (hypothesis 3). None of the three hypotheses, however, were supported for the financial education treatment.

Our results for the effectiveness of the two treatments in increasing female empowerment differ between the experiment and survey measures. The lack of correlation between the two measures is consistent with other findings in the literature. Almås et al. (2018) also use an incentivized task to elicit the level of female empowerment and, similarly, find little correlation between their experimental and individual survey measures.

4.4 Heterogeneity in treatment effects

We examine the heterogeneity in treatment effects based on the age and education of the participants. We classify an individual as less-well–educated if she has not completed secondary school and older if her age is above the median (more than 26 years old at the baseline). Tables D.4 and D.5 in Appendix D present the results using interactions with treatment dummies. Overall, we do not observe significant heterogeneous treatment effects based on education. The only notable difference is that for the financial diary treatment, lower educated participants tend to benefit more than their educated counterparts in financial self-efficacy, which reflects that they had lower FSES pre-intervention.[25]

[25] At baseline, participants who had completed less than secondary education scored approximately 10% lower in FSES; however, the difference is not significant.

As shown in Table D.5, the effect of financial interventions on behavior appears to be independent of age. The older cohort tends to improve more in terms of access to financial institutions and joint decision making in household spending. However, we find no differential treatment effect based on older or younger groups of participants.

Table D.6 provides evidence that among participants in the financial diary treatment, program beneficiaries who did not have an active bank account at baseline were more likely to improve their savings behavior, and improve their financial self-efficacy compared to their counterparts in the diary treatment who have an active bank account. One possible explanation is that non-banked households often have more limited capacity to manage their day-to-day personal finance circumstances, and that women from these households might benefit more from an informal book-keeping method such as maintaining a financial diary. Similarly, as shown in Table D.7, women who did not have any savings at baseline tend to benefit more from a financial diary program.[26] Overall, we find that replications targeting the poorest individuals with weak financial market opportunities or educational background may help to improve the program impact and lower mistargeting risks.

4.5 Insights from the field: Understanding the participants' perspectives

We interviewed survey participants from both financial diary and financial education treatments to better understand how they felt about the intervention and what could be done to improve future interventions. The interview was conducted at the end of the endline survey and each participant was only asked only about the treatment in which she participated. Figure D.1 in the Appendix suggests that one-third of participants strongly agreed that the program was beneficial. Participants believed that maintaining a diary assisted them to keep track of their debt and their spending, improve savings and reduce unnecessary expenses. The most challenging factor in maintaining the diary was the time that it entailed, with 39% of participants reporting that it was time consuming to keep track of the diary. This suggests the need to reduce the opportunity cost of filling in the diary if the program is to be replicated.[27] Finally, half of the participants reported that they intended to maintain a diary after the program finished, with 14% of participants strongly agreeing that they intended to use a diary in the long-term. We cannot rule out survey desirability or experimental demand biases here; however, these evaluations are promising. Moreover, about one third of participants in the financial education treatment strongly agreed that the training classes helped them manage their

[26] Among participants in the financial diary treatment, approximately 11% kept some form of income and expenditure records on their own. This group tends to perform better on the saving index than those who had no experience with keeping a financial diary prior to the treatment.

[27] One possible suggestion is to make the diary available digitally. However, this creates a barrier for people without a smartphone.

debt and improve savings. More than one-third (36%) of the participants indicated that they would participate in more classes if the opportunity arises (see Figure D.2).

4.6 Findings from financial diary data

We seek to understand household subsequent financial behavior based on their income and expenditure pattern as revealed in their financial diary entries. In the financial diary treatment, participants tracked their spending by recording itemized entries for each purchase. To facilitate the process, we grouped the spending data into eight distinct budgetary categories: food, education, health, clothing/entertainment, housing, children, household care, and agriculture expenditures.

In total, 709 households agreed initially to keep a diary; of whom, about 85% or 599 maintained a daily financial diary for the entire period. Approximately 60 % of this diary group (N=709) had at least one outstanding loan at the beginning of the treatment. The average outstanding loan amount was 15686 taka ($200) during the period (Panel A Table 9). The loan amount was 21373 taka in the first week of the treatment, which was reduced to an average of 9326 taka at the end of the treatment. Weekly income over the period reduced, but the reduction in income was less than that of expenditure (see Figure D.3 and D.4 in Appendix D). While weekly income and expenditure exhibits a downward trend, there were jumps in both income and expenditure at specific points, suggesting a seasonal spike. Table 9 also shows that there is a net saving (column 5: Income-expenditure) even though households spend less during this period as the decline in income is less than the decline in expenditure. Income (and expenditure) volatility likely reflects agricultural business cycles and crop risk in Bangladesh.[28] The negative shock to household income also stems from the decrease in small business owner income - approximately 30% of the sample had a microfinance business set up. We do not, however, have a record of household business performance, relative to income and expenditure, in order to draw a definitive conclusion as to the connection between maintaining a financial diary and the decrease in business profit. We reach a similar conclusion when we consider only those women who maintained the diary for the entire period.

[Table 9 about here.]

The degree to which households decreased their expenses varies significantly across categories of expenditure. As reported in Panel A in Table 10, every week, households in

[28]Bangladesh has three main harvest seasons: The aus season rice crop is planted during March-April and harvested during June-July. The aman season rice is planted in June-July and harvested during November-December. The boro season rice is planted in December-January and harvested during May-June.

the financial diary treatment reduced their food and entertainment expenditure by an average of 37.3 taka and 16.6 taka, respectively, but there was no significant change over time in rigid expenses, such as education. This suggests the possibility that households decrease their outlays on major, yet flexible, expenses such as food and entertainment in order to repay the outstanding loan amount, as seen in Table 9. We also observe a decline in expenditure on health, household bills, expenditure on children and personal care. Results are very similar when we consider the sample who kept the diary for all 30 weeks.

[Table 10 about here.]

5 Resilience during COVID-19: Post-intervention follow-up

Are people who have received financial training or maintained financial diaries better able to cope during a crisis? Our intervention offered a unique opportunity to document the financial circumstances of participants during the COVID-19 crisis and examine long-term effects of the intervention- particularly with respect to improving the coping capacity of participants in the treatments. To do so, we conducted a short phone survey in November-December 2020, which was one year after the endline survey in 2019 and eight months after the start of the COVID-19 pandemic. This exercise enabled us to examine whether the financial interventions (financial education and financial diary) assisted participants to better cope with economic and health shocks, as well as their ability to mitigate, adapt to, and recover from, the shocks caused by COVID-19. We were able to survey 2084 or 97 percent of the households we surveyed in the endline in November 2019.[29]

Table 11 provides the results from the short phone survey during COVID-19. We observe that participants in both the financial diary and financial education treatments were less likely to skip meals, miss out on medical care, fail to pay utility bills, sell assets or require outside help, relative to households in the control. These results are economically stronger for participants in the financial diary treatment than those in the financial literacy treatment, although the differences between these two groups are statistically indistinguishable. We also observe a higher willingness to save for old age or for the future among participants in the financial diary treatment. In terms of activities during COVID-19, all households faced similar circumstances such as job loss, business closures and disruption in farming activities. However, households in the financial diary

[29]This reasonably high number was possible because we had the phone number of participants collected at the time of the endline survey. Each participant in the follow-up survey answered only a few questions over the phone which took no longer than 10 minutes of their time.

treatment reported having significantly more access to financial institutions such as banks and NGOs. Overall, the results in table 11 suggest that our intervention has longer-term effects and that participants in both the financial diary and financial literacy interventions were better able to cope against the economic fallout due to COVID-19 than participants in the control.

[Table 11 about here.]

6 Cost-Effectiveness

In this section, we examine the relative cost of these two interventions in our context. The total cost of administering the financial diary treatment, which includes the cost of supplying the diaries and stationery, the salaries of the field workers who checked the diaries, travel allowances for the field workers and payoffs for the lottery (used as incentives to encourage participants to properly maintain their diaries) was USD 11,500.[30] With about 750 targeted participants initially, and the take-up rate of about 93%, this amounts to USD 15 per participant for maintaining 30 weeks of diaries. The total training cost for the financial education intervention, consists of the cost for venue hire, developing the training modules, the trainers' salaries and their travel allowance and the cost of snacks and lunch provided to participants. We estimate the total cost of the financial education treatment was USD 24,250 or USD 32 per participant.[31] Thus, the cost of the financial education treatment was more than double that of the financial diary treatment in our case. While the effect size is roughly similar considering the range of the outcome variables we examine, these estimates suggest that maintaining a financial diary is most cost-effective in improving the financial management of participants in our setting.

[30] For the 50 villages, we recruited 10 field workers to check the diary entries for 30 weeks (seven months) who were paid for five days in each month. Each field worker spent half a day in each village to check diaries as outlined in section 2.1.1. As discussed above, we administered a lottery every four weeks, meaning the lottery was conducted seven times altogether, and 10 participants received the lottery prize (taka 5000 (USD 62)) each time.

[31] We targeted about 750 participants in each of these interventions and the per-person cost estimate is based on the planned number of beneficiaries. The actual numbers differ as mentioned in the experimental design and data section. We exclude costs to develop and adapt the financial education curriculum as this was a one-off cost (about USD 5000), and scaling up of the intervention would not require further cost to develop the content of the training modules.

7 Conclusions

Financial interventions to improve financial literacy are at the forefront of policy dialogue in many countries around the world. The strong association between having a low level of financial literacy and poor financial wellbeing and behavior is well-documented in the literature (Van Rooij et al. 2012, Carpena et al. 2019). In the context of developing countries, it has been argued that the standard approach of financial literacy education is both too complex and rigid to be effective in assisting less educated individuals in making better financial decisions. It can also be relatively expensive. The challenges suggest that the effectiveness of financial interventions crucially depends on the form in which the training is provided.

We contribute to the literature on which form of financial intervention - simplified or traditional- is most appropriate and cost-effective, in improving financial outcomes, especially for less-educated low-income populations. Overall, we find that maintaining a financial diary can be just as effective as financial training in improving financial test scores, downstream behavior and female empowerment. The results presented in our study complement recent evidence on the impact of financial training interventions, which often present mixed results. We find that both treatment arms in our intervention improve financial test scores by a large margin. We elicit the bargaining power of women using a sequential investment game, in which women are given the opportunity to overrule their partner's decision. We find that while financial education may improve participants' self-reported joint autonomy over expenditure decisions, only participants in the financial diary treatment change their behavior in an incentivized setting. Overall, we find that participants in both the financial diary and financial education treatments are better able to cope with the economic shock due to COVID-19 than participants in the control. This finding suggests that our interventions had persistent effects in helping participants to deal with a financial crisis 12 months following the administration of the endline survey.

While maintaining a financial diary may have the same effect as a formal training class in some respects, we believe that these approaches are complementary and may simultaneously address the overlapping set of constraints that women may face in the financial market. Maintaining a financial diary could possibly be bundled, at relatively low cost, with existing financial education programs. However, the comparison between traditional and alternative financial interventions raises the important issue of cost-benefit considerations, which to date have rarely been undertaken in the field. Given the budget limitations of conducting field experiments, the findings of this study have the potential to assist educators and policymakers in designing appropriate and effective programs to improve the level of financial literacy among women in developing countries.

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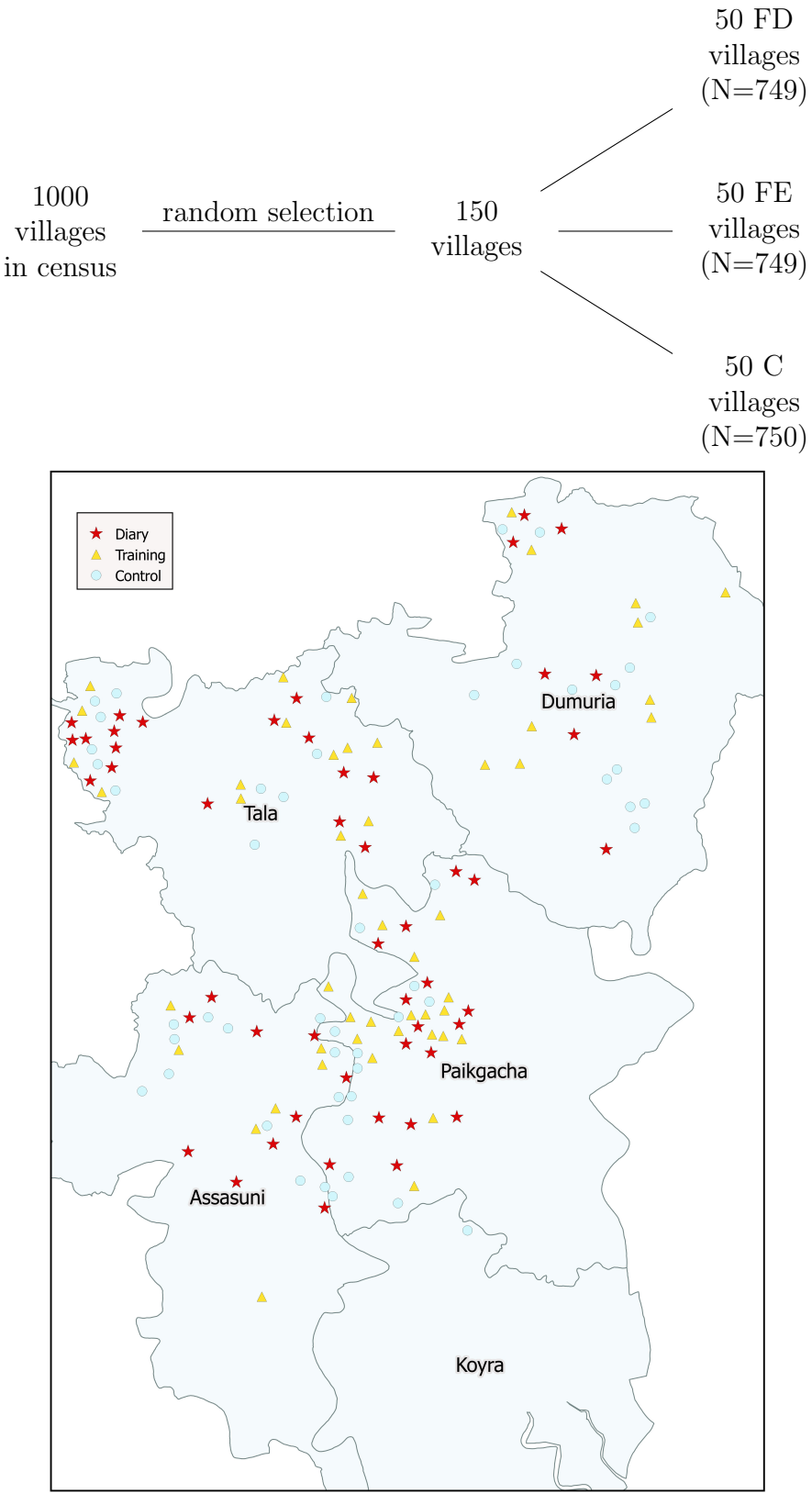


Figure 1: Randomization Process and Treatment distribution map

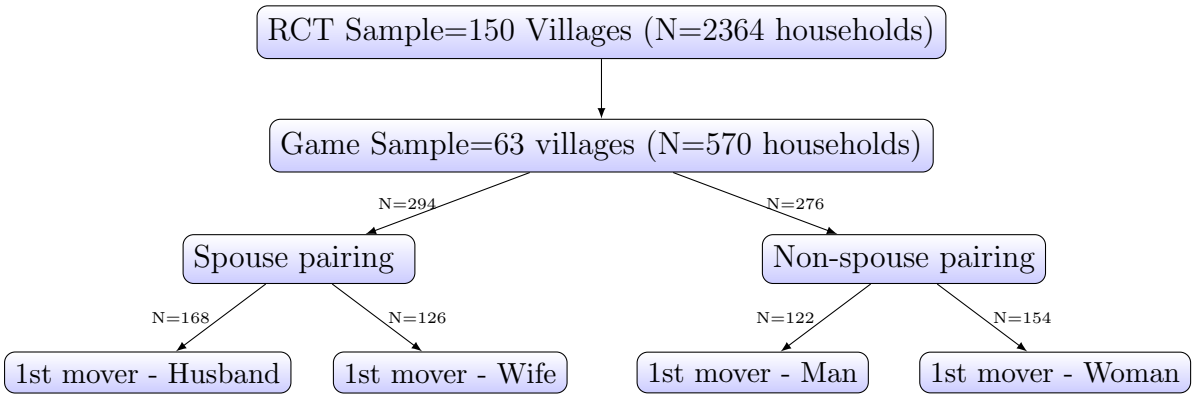


Figure 2: Game Distribution

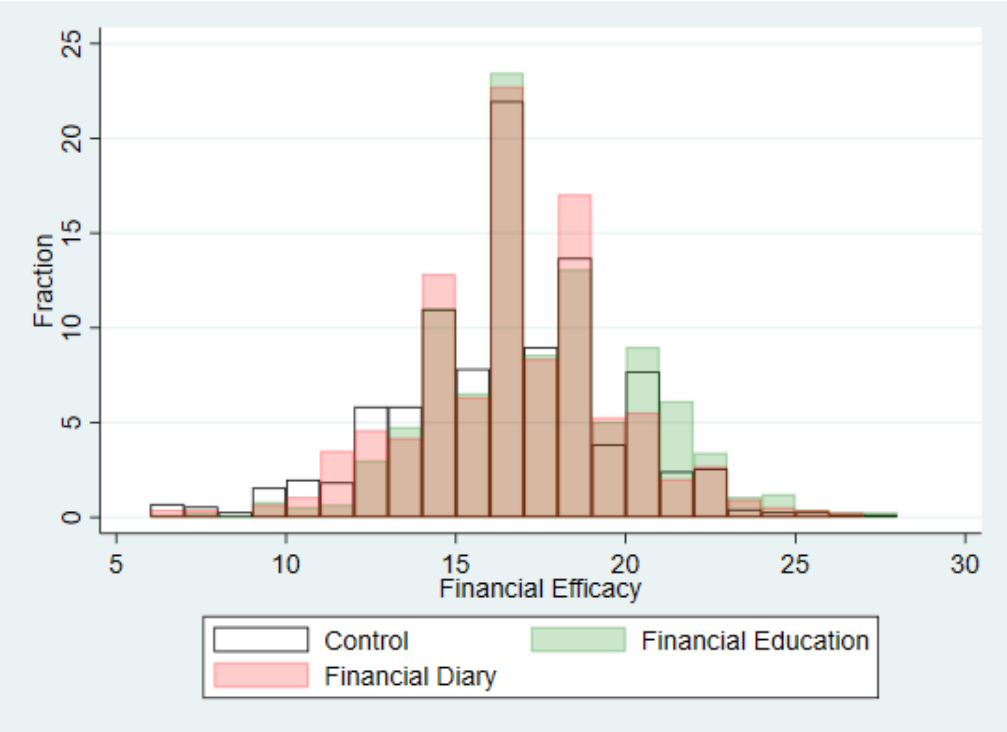


Figure 3: Observed Financial Self-Efficacy Scale Score, by Treatment Groups

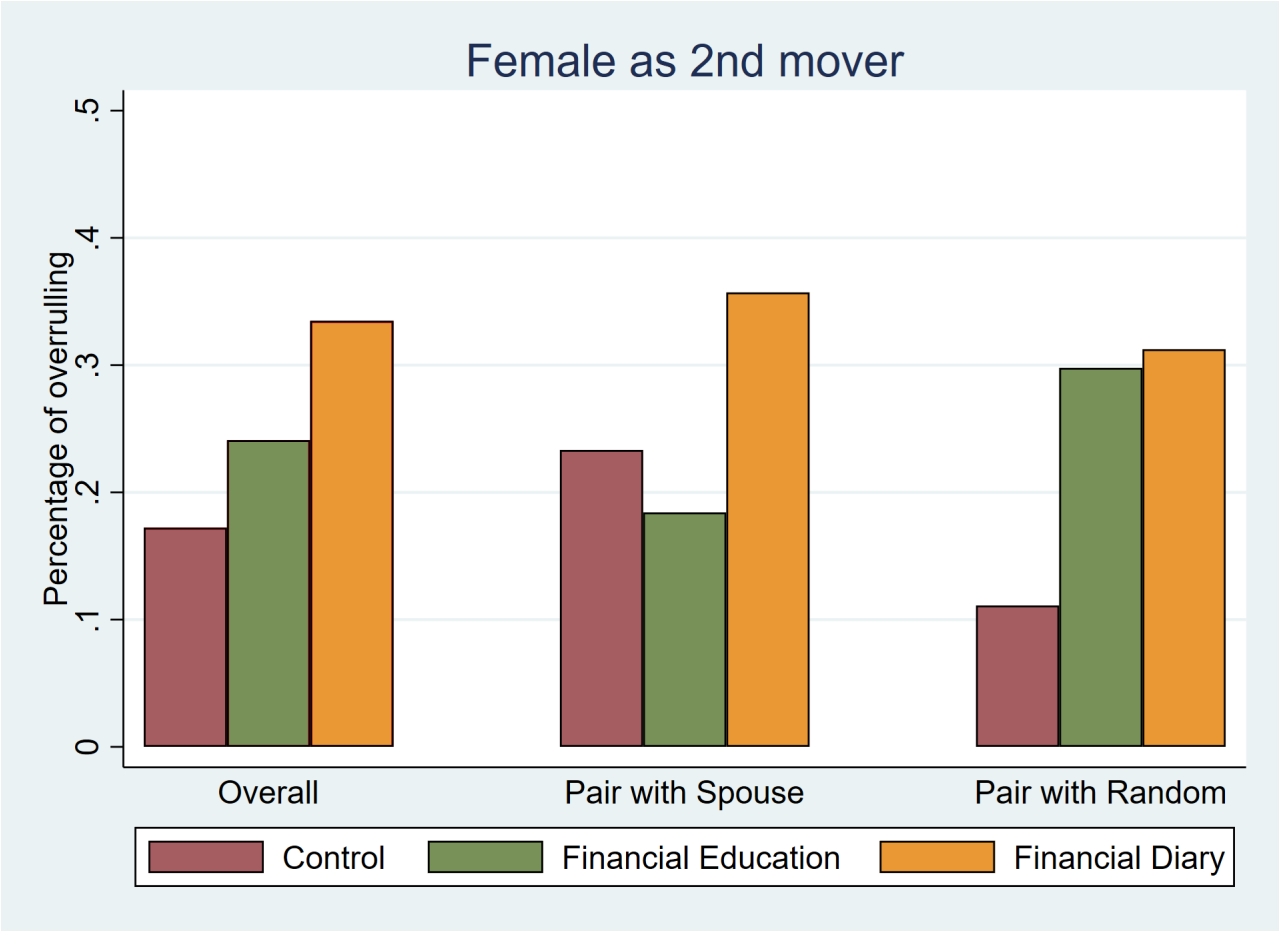


Figure 4: Overruling Decision - Within and Across Households

Table 1: Summary Statistics and Randomization- Balance Test at Baseline

	Panel A - Descriptive Statistics						Panel B - Balance Check
	Control (C)		Education (FE)		Diary (FD)		p-value (Difference)
Variable	Mean	SD	Mean	SD	Mean	SD	FE=FD=C
Household size	4.60	1.22	4.62	1.23	4.60	1.12	0.89
Number of sons	0.86	0.79	0.92	0.94	0.89	0.73	0.34
Number of daughters	0.97	0.83	0.92	0.83	0.89	0.89	0.22
Income-earning job (%)	0.13	0.34	0.13	0.33	0.10	0.30	0.11
Household Income (taka)	11431	13644	11695	11483	10886	13463	0.43
Land owner (%)	0.06	0.23	0.07	0.26	0.06	0.25	0.39
Own resources (%)	0.80	0.40	0.81	0.39	0.81	0.39	0.88
Active bank account (%)	0.25	0.43	0.34	0.47	0.30	0.46	0.15
MFI members (%)	0.52	0.50	0.51	0.50	0.52	0.50	0.76
Household structure (%)	0.52	0.50	0.48	0.50	0.51	0.50	0.21
Currently saving money (%)	0.78	0.42	0.74	0.44	0.73	0.44	0.16
Regular save (%)	0.34	0.47	0.35	0.48	0.35	0.48	0.97
Expense: food (taka)	4929	2518	4908	1682	4905	1502	0.97
Expense: shelter (taka)	254	1389	642	7068	684	6102	0.24
Expense: bills (taka)	294	272	295	221	304	280	0.70
Expense: loan repayment (taka)	2084	4577	2177	4226	2150	4558	0.91
Total expenditure (taka)	7561	5716	8023	8390	8043	7962	0.36
Saving (taka)	3870	14416	3673	14302	2843	15894	0.35
Financial test scores (Out of 10)	5.28	1.47	5.23	1.62	5.23	1.41	0.71
Numeracy test scores (Out of 10)	5.80	2.42	5.85	2.16	5.73	2.43	0.61
Observations	751		804		809		

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

Notes: This table provides descriptive statistics across the three intervention arms at baseline. Panel A presents the statistics for the control group (C) and treatment groups (FE) and (FD), respectively. Panel B provides the p-value of one way ANOVA or Chi square tests for whether the difference of coefficients across control, financial education and financial diary group is different than zero. Pairwise tests were also conducted to test whether the financial education treatment coefficient is different than zero, the financial diary treatment coefficient is different than zero and the difference between these two coefficients, and we find no significant differences. Definition of variables are given in Table C.2 in the Appendix.

Table 2: Sample Distribution, Attrition and Program Take-up

Panel A - Sample Distribution				
	Treatment Arms			Total
	Control	Financial Education	Financial Diary	
Baseline	751	804	809	2,364
% of Total	31.77%	34.01%	34.22%	
Endline	701	733	739	2,173
% of Total	32.26%	33.73%	34.01%	
Panel B - Attrition and Participation Rate				
	Control	Financial Education	Financial Diary	p-value
Attrition (N)	50	71	70	
Attrition Rate	6.66%	8.83%	8.65%	0.222
Completion (N)	N/A	669	683	
Completion Rate		83.20%	84.43%	0.553

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

Notes: This table provides the sample distribution and response/attrition rate by treatments. The fully reproducible randomization was done using Stata. Randomization was first used to select 150 villages from the list of 1000 villages. Then, the selected 150 villages were randomly assigned into either control, financial education or financial diary groups. Panel A provides the final distribution of the sample during baseline and post-treatment surveys. Panel B shows the attrition rate between baseline and endline survey and the final completion rate of the interventions. The completion rate is defined as the participant having finished all sessions in the financial education treatment, and at least one week of financial diary completion in that treatment arm.

Table 3: Main Results - Treatment Effects on Main Outcome Indices

	Literacy			Behavior			Bargaining Power	
	(1) Full	(2) Standard	(3) FSES	(4) Saving	(5) Debt	(6) Institution	(7) HDMI1	(8) HDMI2
Financial Education	0.283***	0.317***	0.290***	0.167**	0.120*	-0.00231	0.110*	0.225***
	(0.0926)	(0.0863)	(0.0875)	(0.0810)	(0.0688)	(0.0755)	(0.0589)	(0.0846)
	[0.0025]	[0.0002]	[0.0008]	[0.0479]	[0.0820]	[0.5583]	[0.0650]	[0.0090]
Financial Diary	0.242***	0.303***	0.0836	0.168*	0.134**	-0.0285	0.105	0.0983
	(0.0860)	(0.0831)	(0.0937)	(0.0873)	(0.0664)	(0.0760)	(0.0662)	(0.0979)
	[0.0672]	[0.0003]	[0.3902]	[0.0614]	[0.0460]	[0.7165]	[0.1150]	[0.3717]
FE = FD	0.619	0.858	0.023	0.989	0.822	0.755	0.944	0.176
Baseline	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,173	2,173	2,173	2,173	2,173	2,173	2,173	2,173

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

Notes: This table shows an ITT effect from an OLS regression. Standard errors are clustered at the village level and reported in parentheses. Dependent variables are summary indices of all measures, normalized to be mean 0 and SD 1 in the control group. The index weights individual outcomes using the inverse of their variance-covariance matrix, as proposed by Anderson (2008). For each index, positive values correspond to more favorable outcomes. Standard errors (in parentheses) are clustered at the village level (level of randomization). The adjusted Randomization Inference (RI) p-value using Young (2019) is given in brackets.
Full: This index is constructed using answers to all the seven financial questions; Standard: This index is constructed using the original three questions on compound interest, inflation and risk as in Lusardi & Mitchell (2008); FSES: The Financial Self-Efficacy Score is adapted from the validated measure in Farrell et al. (2016); Saving: The saving index is constructed using the related individual saving behavior items; Debt: The debt index is constructed using the related individual debt behavior items. Higher values mean better outcomes; Institution: Institutions is constructed using the related items on formal financial institutions (commercial banks); HDMI1: The household decision making index is constructed based on the participant being the sole decision maker with respect to the four main intra-household expenditure items; HDMI2: The household decision making index is constructed based on the participant being the sole or joint decision maker with respect to the four main intra-household expenditure items. Details on the index construction are described in section 3 and in appendix C.

Table 4: Treatment Effects on Financial Literacy Individual Outcomes

	Lursadi 3-part questionaire			Extended questions			
	(1) Compound	(2) Inflation	(3) Risk	(4) Simple	(5) Budget	(6) Loan	(7) Saving
Financial Education	0.0463	0.128**	0.312***	0.172***	0.213***	-0.0868	0.131
	(0.0931)	(0.0499)	(0.0882)	(0.0639)	(0.0787)	(0.107)	(0.0901)
	[0.6042]	[0.0060]	[0.0005]	[0.0068]	[0.0097]	[0.3972]	[0.1492]
Financial Diary	0.0357	0.0939*	0.306***	0.182***	0.182**	-0.0761	0.0621
	(0.0915)	(0.0497)	(0.0896)	(0.0632)	(0.0869)	(0.0975)	(0.0827)
	[0.7009]	[0.2455]	[0.0007]	[0.0039]	[0.0519]	[0.4168]	[0.4980]
FE = FD	0.900	0.484	0.948	0.841	0.604	0.914	0.335
Baseline	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,173	2,173	2,173	2,173	2,173	2,173	2,173

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

Notes: This table shows ITT of a linear probability model. Standard errors are clustered at the village level and reported in parentheses. All models include the lagged outcome at baseline, except for column (7), in which the baseline test is not available. The adjusted RI p-value using Young (2019) is given in brackets. The dependent variables are dummy variables that take the value 1 if the participant correctly answers the questions for each of the topics. The variables measure a participant's understanding of compound interest rates (Column 1), inflation (Column 2), risk diversification (Column 3), simple interest rate (Column 4), budgeting (Column 5), income-generated loans (Column 6), and understanding of savings using formal financial institutions (Column 7). More details can be found in the appendix C. The row (FE=FD) reports the P-values of the difference between FE and FD coefficients. All models include a set of mean-centered baseline covariates, including the participant's age, education, household size, household structure, (active) bank account ownership and MFI membership.

Table 5: Treatment Effects on FSES individual items

	FSES Individual Item					
	(1) Item 1	(2) Item 2	(3) Item 3	(4) Item 4	(5) Item 5	(6) Item 6
Financial Education	0.231***	0.429***	-0.0462	-0.0343	0.152*	0.180
	(0.0670)	(0.0903)	(0.0825)	(0.0729)	(0.0923)	(0.111)
	[0.0005]	[0.0000]	[0.5957]	[0.6702]	[0.0927]	[0.1163]
Financial Diary	0.00611	0.268***	-0.123	-0.0935	-0.0287	0.226**
	(0.0676)	(0.1000)	(0.0874)	(0.0746)	(0.100)	(0.108)
	[0.9944]	[0.0088]	[0.1624]	[0.3482]	[0.7434]	[0.0458]
FE = FD	0.001	0.127	0.372	0.447	0.061	0.664
Baseline	Yes	Yes	Yes	Yes	Yes	Yes
Control	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,173	2,173	2,173	2,173	2,173	2,173

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

Notes: Standard errors are clustered at the village level and reported in parentheses. This table shows the effect of the financial diary and financial education treatments on individual items in the FSES scale. A higher score for each item corresponds to higher self-efficacy. Standard errors are clustered at the village level and reported in parentheses. All models include the lagged outcome at baseline and control covariates. Adjusted RI p-value using Young (2019) is given in the brackets. The row (FE=FD) reports the P-values of the difference between FE and FD coefficients.

Item 1: It is hard to stick to my spending when unexpected expenses arise; Item 2: It is challenging to make progress towards my financial goals; Item 3: When unexpected expenses occur, I usually have to borrow money; Item 4: When faced with financial challenges, I have a hard time figuring out a solution; Item 5: I lack confidence in my ability to manage my finances; Item 6: I worry about running out of money in retirement.

Table 6: Treatment Effects on Saving and Debt Behavior - Individual Outcomes

	Saving Behavior				Debt behavior		
	(1) Regular Saver	(2) Deposit	(3) Retirement	(4) Saving($)	(5) Not in debt	(6) Formal lender	(7) Loan repayment
Financial Education	-0.0115	-0.0305	0.167**	600.3**	-0.0189	0.0595**	0.00802
	(0.0595)	(0.0682)	(0.0810)	(278.9)	(0.0356)	(0.0235)	(0.0111)
	[0.8273]	[0.5114]	[0.0479]	[0.0330]	[0.5898]	[0.0110]	[0.5858]
Financial Diary	0.0310	0.0452	0.168*	717.7***	0.00469	0.0661***	0.0127
	(0.0551)	(0.0666)	(0.0873)	(262.0)	(0.0349)	(0.0235)	(0.0111)
	[0.7269]	[0.4016]	[0.0614]	[0.0070]	[0.9229]	[0.0050]	[0.3219]
FE = FD	0.485	0.270	0.989	0.6284	0.510	0.775	0.690
Baseline	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,173	2,173	2,173	2,173	2,173	2,173	2,173

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

Notes: This table shows ITT of linear probability models. Standard errors are clustered at the village level and reported in parentheses. All models include the lagged outcome at baseline. Standard errors are clustered at the village level and reported in parentheses. Adjusted RI p-value using Young (2019). The row (FE=FD) reports the P-values of the difference between FE and FD coefficients. All models include a set of mean-centered baseline covariates, including the participant's age, education, household size, household structure, (active) bank account ownership and MFI membership.

Regular saver is a dummy variable that equals 1 if the participant saves daily, weekly or monthly; Deposit is a dummy variable that equals 1 if the participant has a deposit account; Retirement is a dummy variable that equals 1 if the participant has started saving for old-age; Saving($) is the difference between monthly earning and monthly spending of a household. Not in debt is a dummy variable that equals 1 if the participant does not currently owe any significant amount of money; Formal lender indicates the participant's most recent loan is not from a local money lender; Loan repayment represents the total percentage of household savings set aside to pay back the loan.

Table 7: Treatment Effects on Female Autonomy in Household Expenditure

	Panel A: Can solely decide on:			
	(1) Household	(2) Food	(3) Children	(4) Farming
Financial Education	0.0409	0.0653	0.154**	-0.00536
	(0.0541)	(0.0620)	(0.0774)	(0.0504)
	[0.4184]	[0.4441]	[0.0621]	[0.9410]
Financial Diary	0.0315	0.0828	0.148*	-0.0460
	[0.7716]	[0.5157]	[0.1175]	[0.2762]
FE = FD	0.888	0.795	0.944	0.384
	Panel B: Can jointly decide on:			
	(1) Household	(2) Food	(3) Children	(4) Farming
Financial Education	0.0983	0.222**	0.160**	0.139
	(0.0711)	(0.0864)	(0.0790)	(0.0964)
	[0.1454]	[0.0125]	[0.0460]	[0.1512]
Financial Diary	-0.00794	0.0974	0.00831	0.162
	(0.0787)	(0.0908)	(0.0904)	(0.111)
	[0.8959]	[0.3449]	[0.9571]	[0.1566]
FE = FD	0.119	0.173	0.054	0.840
Baseline	Yes	Yes	Yes	Yes
Control	Yes	Yes	Yes	Yes
Observations	2,173	2,173	2,173	2,173

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

Notes: This table presents the results from a linear probability model of the estimated impact of the financial interventions on the participant's expense autonomy in her household. Outcomes are dummy variables that take the value one if the participant can solely or jointly decide on certain categories of expenditure in the household. Standard errors are clustered at the village level and reported in parentheses. The row (FE=FD) reports the P-values of the difference between FE and FD coefficients. All models include the lagged outcome at baseline.

Household is a dummy variable that equals 1 if the participant can solely decide/jointly decide on major household item expenditure; Food is a dummy variable that equals 1 if the participant can solely decide/jointly decide on food expenditure; Children is a dummy variable that equals 1 if the participant can solely decide/jointly decide on children's education expenditure; Farming is a dummy variable that equals 1 if the participant can solely decide/jointly decide on farming expenditure.

Table 8: Results from the Artefactual Experiment

	Panel A: Analysis when Player 2 is Female		
	(1)	(2)	(3)
	Initial Investment	Overrule	Net Overrule Amount
Financial Education	10.33	0.0525	1.569
	(6.892)	(0.0690)	(4.606)
Financial Diary	-3.686	0.143**	14.24***
	(6.424)	(0.0633)	(4.225)
Pairing version[a]		-0.0253	-15.03**
		(0.0544)	(3.633)
Initial preference		0.000646	0.0142
		(0.000506)	(0.0338)
FE = FD	0.031	0.159	0.003
Constant	93.73***	0.144**	12.72***
	(4.862)	(0.0670)	(4.471)
Observations	290	290	290
	Panel B: Analysis when Player 2 is Male		
	(1)	(2)	(3)
	Initial Investment	Overrule	Net Overrule Amount
Financial Education	-3.062	-0.0250	-4.104
	(7.530)	(0.0686)	(4.295)
Financial Diary	-11.22	-0.0320	5.620
	(7.497)	(0.0688)	(4.309)
Pairing version[a]		0.0509	-2.561
		(0.0528)	(3.305)
Initial preference		-0.000669	-0.0470
		(0.000457)	(0.0286)
FE = FD	0.220	0.908	0.011
Constant	102.7***	0.287***	19.41***
	(5.806)	(0.0750)	(4.696)
Observations	280	280	280

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

Notes: This table reports the treatment effects of the financial education and financial diary treatments on various decisions made by the participants in the artefactual game. Standard errors are clustered at the village level and reported in parentheses. The row (FE=FD) reports the P-values of the difference between FE and FD coefficients. The total game sample is 570 couples. Panel A presents the results when the participant is Player 2. Panel B presents the result when the participant is Player 1. In this game, Player 1 proposes an initial investment amount, which Player 2 can overrule and substitute an alternative amount.

Initial preference is the investment choice the participant records in Task 1 (individual game); Overrule decision is a dummy variable that equals one if Player 2 decides to overrule the decision made by Player 1; Net overrule amount is defined as the net difference between the initial investment amount proposed by Player 1 and the revised amount substituted by Player 2.

[a]Pairing version is a dummy variable equal to one if the players are spouses, and it is zero if the players are random peers.

Table 9: Household Debt, Savings, Income, and Expenditure from the Financial Diary

	Panel A: All diary keepers				
	(1) Outstanding loan	(2) Active Savings	(3) Total Income	(4) Total Expenditure	(5) Difference
Week	-208.6***	-101.2***	-137.4***	-281.8***	144.4***
	(41.99)	(8.599)	(29.83)	(40.90)	(40.62)
Constant	15,686***	5,056***	12,690***	13,869***	-1,179
	(946.7)	(199.2)	(757.2)	(1,045)	(1,093)
Individual fixed effects	Yes	Yes	Yes	Yes	Yes
Number of Diary keepers	709	709	709	709	709
Observations	18,917	18,917	18,917	18,917	18,917
	Panel B: Diary keepers who wrote all 30 week's diaries				
	(1) Outstanding loan	(2) Active Savings	(3) Total Income	(4) Total Expenditure	(5) Difference
Week	-217.0***	-101.8***	-130.5***	-283.3***	152.7***
	(43.57)	(8.269)	(30.67)	(43.19)	(43.11)
Constant	15,818***	5,025***	12,524***	13,984***	-1,460
	(1,013)	(221.0)	(800.2)	(1,137)	(1,179)
Individual fixed effects	Yes	Yes	Yes	Yes	Yes
Number of Diary keepers	599	599	599	599	599
Observations	17,970	17,970	17,970	17,970	17,970

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

Notes: This table reports the weekly change in household expenditure/consumption over the 30-week period using a fixed effect model with clustered standard errors at the individual level. All amounts are reported in taka. The number of participants who completed a diary is 709. All diary keeper is defined as people who at least record one week's diary.Outstanding loan is defined as the total amount of money currently owed. Active savings is defined as the total available amount of money held in a deposit account, held as emergency savings or savings held in cash at home. Income is defined as total income of a household. Expenditure is defined as total expenditure of a household consisting of household and agriculture expenditure. Difference is defined as total income less of total expenditure (total saving)

Table 10: Household Expenditure from the Financial Diary

	Panel A: All diary keepers							
	(1) Food	(2) Education	(3) Health	(4) Entertain	(5) Bills	(6) Children	(7) Care	(8) Agriculture
Week	-37.31***	0.0645	-26.03***	-16.64***	-57.04***	-26.39***	-20.39***	-159.8***
	(2.340)	(0.377)	(4.131)	(1.266)	(12.49)	(2.153)	(2.183)	(28.45)
Constant	3,142***	61.87***	932.0***	604.4***	2,009***	1,079***	709.8***	7,185***
	(53.38)	(3.921)	(118.5)	(33.28)	(370.1)	(57.90)	(61.08)	(676.1)
Individual fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Diary keepers	709	709	709	709	709	709	709	709
Observations	18,917	18,917	18,917	18,917	1,8917	18,917	18,917	18,917
	Panel B: Diary keepers who wrote all 30 weeks diaries							
	(1) Food	(2) Education	(3) Health	(4) Entertain	(5) Bills	(6) Children	(7) Care	(8) Agriculture
Week	-37.90***	0.0884	-24.27***	-16.64***	-58.01***	-26.75***	-20.15***	-160.4***
	(2.416)	(0.380)	(4.237)	(1.184)	(13.72)	(2.253)	(2.325)	(29.20)
Constant	3,166***	61.37***	882.4***	599.2***	2,045***	1,088***	702.1***	7,265***
	(56.84)	(4.174)	(122.3)	(31.22)	(409.3)	(61.32)	(65.90)	(726.9)
Individual fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Diary keepers	599	599	599	599	599	599	599	599
Observations	17,970	17,970	17,970	17,970	17,970	17,970	17,970	17,970

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

Notes: This table reports the weekly change in household expenditure/consumption as well as agricultural expenditure over the 30-week period using a fixed effect model with clustered standard errors at the individual level. All amounts are reported in taka. Household expenditure consists of expenditure on food, education, health, entertainment, bills, children and personal care. Agriculture expenditure consists of expenditure on livestock, poultry, fish, trees, fruit and other non-labour expenses. All diary keeper is defined as people who at least record one week's diary.

Table 11: Post-intervention follow up during COVID-19

	(1)	(2)	(3)	(4)	(5)	(6)
	Financial Education		Financial Diary		p-value	control mean
Work						
Doing work outside	0.0718*	(0.0412)	-0.0142	(0.0422)	0.0411	0.7781
Doing work at home	-0.109*	(0.0615)	0.0247	(0.0595)	0.0255	0.5485
Job loss	-0.00296	(0.00535)	0.00847	(0.00639)	0.111	0.0077
Business closure	-0.00127	(0.0141)	0.0170	(0.0163)	0.2302	0.0401
Disruption of farming	-0.00714	(0.0192)	0.0263	(0.0243)	0.1255	0.0678
Saving behavior						
Saving for emergency	0.00682	(0.0234)	0.0462**	(0.0214)	0.1073	0.8752
Saving for own future	0.0521	(0.0324)	0.0809**	(0.0343)	0.4236	0.1171
Have saving plan for old age	0.0251	(0.0153)	0.0342*	(0.0174)	0.5863	0.0524
Coping Mechanism						
Skip usual meals	-0.0403***	(0.0106)	-0.0444***	(0.0104)	0.6383	0.0616
Miss loan repayment	-0.0237	(0.0427)	-0.0268	(0.0445)	0.9444	0.3683
Missed paying utility	-0.00456	(0.0364)	-0.0705**	(0.0345)	0.0556	0.2434
Missed out on medical care	-0.0405*	(0.0224)	-0.0635***	(0.0197)	0.2124	0.1171
Borrow money to cope with shock	-0.0523	(0.0505)	0.0258	(0.0444)	0.1056	0.6512
Sell assets cope with shock	-0.0647**	(0.0309)	-0.0868***	(0.0310)	0.4028	0.2373
Rely on external help to cope with shock	-0.00699	(0.0141)	-0.0213*	(0.0112)	0.2415	0.0416
Access to Financial Institution						
Access local bank	0.0522**	(0.0254)	0.144***	(0.0283)	0.0003	0.1022
Access local NGO	0.0570	(0.0454)	0.152***	(0.0439)	0.0109	0.2972

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

Notes: This table presents the results using OLS to estimate the treatment effects. Outcomes are dummy variables that take the value =1 if Yes, and 0= otherwise Standard errors are clustered at the village level and reported in parentheses. All models include control variables reported in notes in Table 4. P-values report the difference between FE and FD coefficients. Standard errors are clustered at the village level and reported in parentheses.

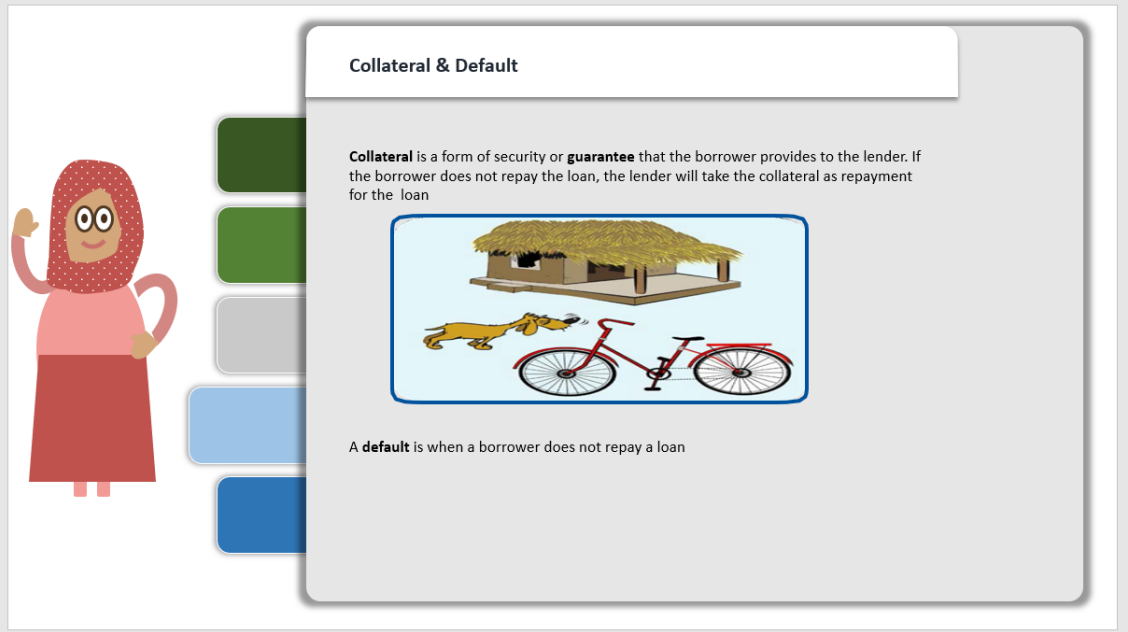
Appendix A Timeline

ACTIVITY	START	END
Preparation		
Final version of the curriculum	Apr-18	
Materials for diary+counselling	Apr-18	
Materials for trainers	Apr-18	
Translation	Apr-18	May-18
Pilot	May-18	May-18
Revise	Jul-18	Aug-18
Project Start		
Information Session	Jul-18	
Pre-treatment test	Aug-18	
Household Survey	Aug-18	
Randomization	Sep-18	Sep-18
Financial Training Sessions	Oct-18	Nov-18
Financial Diary-Initial visit	Oct-18	
Financial Diary	Oct-18	Mar-19
Second Randomization	Apr-19	
Financial Counselling-First visit	May-19	
Financial Counselling	May-19	Nov-19
Post-treatment	Nov-19	
Games (Artefactual Experiment)	Dec-19	Feb-20
Follow-up survey (COVID 19)	Dec-20	

Appendix B Financial Education Curriculum

The detailed programs covered the six modules as follows:

- Module 1: Planning and budgeting
  - Session 1- Establishing financial goals
  - Session 2- Understanding income and expenses
  - Session 3- Preparing a budget
- Module 2: Savings:
  - Session 5- Elements of choosing where to save
  - Session 6- Informal saving services
  - Session 7- Formal saving services
- Module 3: Borrowing
  - Session 8- Purposes of borrowing
  - Session 9- Borrowing concepts
- Module 4: Responsible borrowing
  - Session 8- The cost of borrowing
  - Session 9- Borrowing concepts revised
  - Session 10- Good and Bad loans
- Module 5: Comparing financial services
  - Session 11- Informal financial services
  - Session 12- Formal financial services
  - Session 13- How lenders evaluate your loans
- Module 6: Emergencies and other financial crisis
  - Session 14 - Debt liability
  - Session 15 - Violation to your right on money
  - Session 16 - Violation to your property rights
- Final session - Review



A graphical illustration as an Example of the Financial Education Content

Appendix C Variables Description

Table C.1: Summary of variable definition

	Variables	Description
Main Index		
	Financial Test - Full	Index constructed from 7 questions financial test. Higher value means better outcome.
	Financial Test - Standard	Index constructed from the three standard financial knowledge test. Higher value means better outcome.
	FSES	Financial Self-Efficacy Score. Higher value means better outcome.
	Saving	Index constructed from saving behaviour related questions. Higher value means better outcome.
	Debt	Index constructed from debt behaviour related questions. Higher value means better outcome.
	Institution	Index constructed from questions related to formal banking institution. Higher value means better outcome.
	HDMI1	Index constructed based on woman being the sole decision maker.
	HDMI2	Index constructed based on woman being the sole or joint decision maker.
Individual Outcome		
Financial Test	Compound	Dummy variable equals one if the participant answer question L1 (compound interest rate) correctly.
	Inflation	Dummy variable equals one if the participant answer question L2 (inflation) correctly.
	Risk	Dummy variable equals one if the participant answer question L3 (risk diversification) correctly.
	Interest	Dummy variable equals one if the participant answer question L4 (simple interest rate) correctly.
	Budget	Dummy variable equals one if the participant answer question L5 (budgeting method) correctly.
	Loan	Dummy variable equals one if the participant answer question L6 (effective loan) correctly.
	Saving	Dummy variable equals one if the participant answer question L7 (safe saving method) correctly.
Financial Self-Efficacy Scale	FSES - Item 1	Response (4-point Likert Scale) to "It is hard to stick to my spending when unexpected expenses arise"
	FSES - Item 2	Response (4-point Likert Scale) to"It is challenging to make progress towards my financial goals"
	FSES - Item 3	Response (4-point Likert Scale) to "When unexpected expenses occur, I usually have to borrow money"
	FSES - Item 4	Response (4-point Likert Scale) to "When faced with financial challenges, I have a hard time figuring out a solution"
	FSES - Item 5	Response (4-point Likert Scale) to "I lack confidence in my ability to manage my finances"
	FSES - Item 6	Response (4-point Likert Scale) to "I worry about running out of money in retirement"
Saving Index	Regular Saver	Regular saver is a dummy variable equals 1 if the participant saves daily, weekly or monthly, it is zero if the pariticpant saves yearly or never.
	Deposit	Regular saver is a dummy variable equals 1 if the participant has a saving account
	Retirement	Retirement is a dummy that equals 1 if the participant made savings for retirement.
Debt Index	In debt	In debt is a dummy that equals 1 if the participant plan to borrow from a institution in the future.
	Formal Lender	Formal lender is a dummy that equals 1 if the participant takes loan from a formal institution.
	Repayment	Repayment is the percentage of loan repayment relative to total expense of a participant.
HDMI	Household	Dummy variable equals 1 if the participant can solely decide/jointly decide on major household item expenditure.
	Food	Dummy variable equals 1 if the participant can solely decide/jointly decide on food expenditure.
	Children	Dummy variable equals 1 if the participant can solely decide/jointly decide on children education expenditure.
	Farming	Dummy variable equals 1 if the participant can solely decide/jointly decide on farming expenditure.
Experimental outcome		
	Overrule	Dummy variable that equals one if Player 2 decides to overrule the decision made by Player 1.
	Net overrule amount	Net difference between the final amount by and the initial proposed amount.

Table C.2: Summary of variable definition

Variable	Description
Household size	Total number of family members in a household
Number of sons	Total number of sons in a household
Number of daughters	Total number of sons in a household
Income-earning job	Dummy variable equals to one if the participants has an income-earning job
Household Income	Total household income of wife and husband earned last month (taka)
Land owner	Dummy variable equals to one if the participant owns land
Own resources	Dummy variable equals to one if the participant owns resources
Active bank account	Dummy variable equals to one if the participant has an active bank account
MFI members	Dummy variable equals to one if the participant is a member of a NGO or MFI
Household structure	Dummy variable equals to one if the household is nuclear family
Currently saving money	Dummy variable equals to one if the participant has a positive saving
Regular save	Dummy variable equals to one if the participant saves daily, weekly, or monthly
Expense: food	Monthly expense on food (taka)
Expense: shelter	Monthly expense on shelter (taka)
Expense: bills	Monthly expense on bills (taka)
Expense: loan repayment	Monthly expense on loan repayment (taka)
Total expenditure	The sum of monthly food, shelter, bills and loan repayment expenses (taka)
Saving	Total household income minus total expenditure (taka)
Financial test scores	Number of correct answers in financial test
Numeracy test scores	Number of correct answers in numeracy test

Notes: Household production income is defined as the monthly household income generated from production activities only, production income is the main source of income but it excludes other non-farming income. Total expenditure captures the main monthly expenditure including food, utilities, shelter and loans only, there are other expenditures that are not included in this calculation. Total monthly saving is defined as monthly production income minus monthly expenditure.

Appendix D Tables and Figures

Table D.1: Balance check between non-attrition and attrition group

	Non-attrition (NA)		Attrition (A)		p-value (Difference)
	Mean	SD	Mean	SD	NA=A
Age	26.53	4.578	26.15	5.16	0.37
Household structure	0.50	0.50	0.50	0.50	0.99
Household size	4.61	1.19	4.63	1.18	0.82
Household Income	11284.8	13085.4	11903.1	10335.1	0.48
Education	4.14	1.28	4.05	1.29	0.31
MFI members	0.51	0.50	0.54	0.50	0.49
Active bank account	0.28	0.45	0.28	0.45	0.84
Observations	2,173		191		

Notes: This table provides descriptive statistics between non-attrition and attrition group in the baseline. P-values test for whether the difference of coefficients between non-attrition and attrition group is significantly different than zero. Definition of variables are given Table C.2 in the Appendix.

Table D.2: Balance check within attrition group

	Panel A - Descriptive Statistics						Panel B - Balance Check
	Control (C)		Education (FE)		Diary (FD)		p-value (Difference)
Variable	Mean	SD	Mean	SD	Mean	SD	FE=FD=C
Age group	0.38	0.49	0.41	0.49	0.40	0.49	0.95
Household structure	0.60	0.50	0.45	0.50	0.49	0.50	0.25
Household size	4.52	1.21	4.62	1.20	4.71	1.15	0.92
Household Income	11192.0	8701.6	11297.2	7180.9	13025.7	13639.0	0.52
Education	3.86	1.21	4.05	1.52	4.18	1.07	0.25
MFI members	0.60	0.49	0.46	0.50	0.57	0.50	0.28
Active bank account	0.30	0.46	0.27	0.44	0.29	0.45	0.93
Observations	50		71		70		

Notes: This table provides descriptive statistics across the three intervention arms of attrition group at baseline. Panel A presents the statistics for the control group (C) and treatment groups (FE) and (FD), respectively. Panel B provides the p-value of one way ANOVA or Chi square tests for whether the differences of coefficients across control, financial education and financial diary group are significantly different than zero within attrition group. Definition of variables are given Table C.2 in the Appendix.

Table D.3: Balance check of game sample

	Financial education			Financial diary			Control		
	Non-game	Game	p-value	Non-game	Game	p-value	Non-game	Game	p-value
Age	26.73	26.121	0.13	26.68	26.25	0.21	26.38	26.17	0.62
	(4.84)	(4.94)		(4.52)	(4.04)		(4.54)	(0.37)	
Household structure	0.47	0.50	0.41	0.50	0.52	0.49	0.52	0.53	0.79
	(0.49)	(0.50)		(0.50)	(0.50)		(0.50)	(0.50)	
Household size	4.65	4.53	0.26	4.63	4.50	0.14	4.61	4.55	0.60
	(1.19)	(1.35)		(1.13)	(1.10)		(1.26)	(1.09)	
Household Income	12024.59	10617.02	0.14	10956.68	10704.22	0.81	11137.39	12518.13	0.25
	(11462.79)	(11517.39)		(13849.17)	(12435.55)		(13017.99)	(15741.29)	
Education	4.17	4.10	0.59	4.10	4.13	0.79	4.17	4.06	0.32
	(1.46)	(1.47)		(1.15)	(1.127)		(1.20)	(1.25)	
MFI members	0.49	0.54	0.26	0.51	0.53	0.69	0.52	0.54	0.59
	(0.50)	(0.50)		(0.50)	(0.50)		(0.50)	(0.50)	
Active bank account	0.28	0.29	0.76	0.31	0.276	0.25	0.25	0.28	0.35
	(0.45)	(0.45)		(0.46)	(0.44)		(0.43)	(0.45)	
Observations	616	188		584	225		591	160	

Notes: This table provides descriptive statistics between non-game sample and game sample separately for financial education and financial diary group. P-values test whether the difference between non-game sample and game sample are significantly different than zero. Definition of variables are given Table C.2 in the Appendix.

Table D.4: Sub-group Analysis - Education

	Coefficients				
	(1)	(2)	(3)	(4)	(5)
	Education	FE	FD	FE*Education	FD*Education
Financial Test-Full	0.172*	0.260**	0.245***	0.0525	-0.0505
	(0.089)	(0.104)	(0.0921)	(0.125)	(0.123)
Financial Test-Lursadi Questionaire	0.187*	0.309***	0.301***	0.00453	0.000696
	(0.0956)	(0.0945)	(0.087)	(0.133)	(0.126)
FSES	0.313***	0.268***	0.136	0.0376	-0.296*
	(0.108)	(0.0898)	(0.0964)	(0.14)	(0.154)
Saving Behavior	-0.0682	0.156*	0.170*	0.03	-0.0331
	(0.11)	(0.086)	(0.0922)	(0.147)	(0.136)
Debt Behavior	-0.142	0.0896	0.125*	0.0629	-0.148
	(0.112)	(0.0777)	(0.0753)	(0.146)	(0.147)
Financial Institution	0.444***	-0.00463	-0.0012	0.14	-0.141
	(0.0879)	(0.0884)	(0.0875)	(0.122)	(0.144)
Sole Decision on Household Spending	0.193	0.111*	0.0485	-0.15	0.046
	(0.146)	(0.0614)	(0.0601)	(0.185)	(0.192)
Joint Decision on Household Spending	0.0281	0.185*	0.0922	0.166	0.00543
	(0.0965)	(0.0971)	(0.105)	(0.126)	(0.155)
Observations	2,173	2,173	2,173	2,173	2,173

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

Notes: This table reports the sub-group analysis based on the participant's cohort education. Column (1) presents the coefficient of the education group. Columns (2) and (3) present the estimated treatment coefficients for FE (Financial Education) and FD (Financial Diary). Columns (4) and (5) provide the interaction effects. Education is a dummy variable that equals one if the participant finished secondary school (the median value of education in our sample). Standard errors are clustered at the village level and reported in parentheses. Outcome variables are indices discussed in Section 3 and Appendix C.

Table D.5: Sub-group Analysis -Age

	Coefficients				
	(1)	(2)	(3)	(4)	(5)
	Age	FE	FD	FE*Age	FD*Age
Financial Test-Full	0.0464	0.296***	0.233**	-0.0351	0.00680
	(0.0758)	(0.105)	(0.0961)	(0.102)	(0.0950)
Financial Test-Lursadi Questionaire	-0.0517	0.287***	0.272***	0.0742	0.0665
	(0.0699)	(0.101)	(0.0934)	(0.108)	(0.101)
FSES	-0.0204	0.290***	0.0870	0.000748	-0.0215
	(0.0803)	(0.108)	(0.107)	(0.111)	(0.111)
Saving Behavior	0.0333	0.137	0.207**	0.0594	-0.104
	(0.062)	(0.0910)	(0.0975)	(0.112)	(0.0989)
Debt Behavior	0.014	0.0464	0.0520	0.130	0.117
	(0.0804)	(0.0855)	(0.0852)	(0.104)	(0.111)
Financial Institution	0.204***	0.0718	0.0231	-0.0377	-0.114
	(0.0775)	(0.0956)	(0.0868)	(0.100)	(0.117)
Sole Decision on Household Spending	-0.0335	0.103	-0.0246	-0.0496	0.197
	(0.0703)	(0.0810)	(0.0667)	(0.117)	(0.124)
Joint Decision on Household Spending	0.128*	0.219**	0.0871	0.0288	0.0264
	(0.0767)	(0.108)	(0.117)	(0.113)	(0.120)
Observation	2,173	2,173	2,173	2,173	2,173

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

Notes: This table reports the sub-group analysis based on the participant's cohort age group. Column (1) presents the coefficient of the age group. Columns (2) and (3) present the estimated treatment coefficients for FE (Financial Education) and FD (Financial Diary). Columns (4) and (5) provide the interaction effects. Age group is defined as those who were 26 or above at the time of baseline. The median age at baseline is 26. Standard errors are clustered at the village level and reported in parentheses. Outcomes variables are all indices discussed in Section 3 and Appendix C.

Table D.6: Sub-group Analysis - Active Bank Account Owner

	Coefficients				
	(1)	(2)	(3)	(4)	(5)
	Bank	FE	FD	FE*Bank	FD*Bank
Financial Test-Full	0.00115	0.0598***	0.0405**	-0.0131	0.00434
	(0.0109)	(0.0175)	(0.0173)	(0.0141)	(0.0141)
Financial Test-Lursadi Questionaire	0.00924	0.0897***	0.0690***	-0.00513	0.0193
	(0.0164)	(0.0249)	(0.0253)	(0.0246)	(0.0242)
FSES	0.113*	0.259***	-0.0719	0.0476	-0.228**
	(0.0573)	(0.0958)	(0.117)	(0.0850)	(0.103)
Saving Behavior	-0.0219	0.113**	0.0593	-0.0587	-0.0321
	(0.0321)	(0.0520)	(0.0628)	(0.0474)	(0.0567)
Debt Behavior	0.0269	0.103**	0.128***	-0.0919**	-0.126***
	(0.0318)	(0.0515)	(0.0469)	(0.0425)	(0.0386)
Financial Institution	0.257***	0.245**	0.181*	-0.335***	-0.350***
	(0.0685)	(0.0991)	(0.0986)	(0.0953)	(0.101)
Sole Decision on Household Spending	-0.00234	0.0399	0.139	0.0728	-0.130
	(0.0654)	(0.0871)	(0.104)	(0.117)	(0.0997)
Joint Decision on Household Spending	0.00199	0.222**	0.0118	0.00523	0.127
	(0.0751)	(0.103)	(0.126)	(0.0957)	(0.114)
Observation	2,173	2,173	2,173	2,173	2,173

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

Notes: This table reports the sub-group analysis based on the participant's cohort bank account ownership. Column (1) presents the coefficient of the Age group. Columns (2) and (3) present the estimated treatment coefficients for FE (Financial Education) and FD (Financial Diary) and Columns (4) and (5) provide the interaction effects. Bank is a dummy variable that equals 1 if the participant had an active bank account at baseline. Standard errors are clustered at the village level and reported in parentheses. Outcomes variables are all indices discussed in Section 3 and Appendix C.

Table D.7: Sub-group Analysis - Personal Saving

	Coefficients				
	(1)	(2)	(3)	(4)	(5)
	D2	FE	FD	FE*D2	FD*D2
Financial Test-Full	0.142	-0.00763	-0.024	0.0207	0.0396
	(0.0972)	(0.111)	(0.108)	(0.144)	(0.127)
Financial Test-Lursadi Questionaire	0.132	0.0604	0.0678	-0.0419	-0.036
	(0.0875)	(0.102)	(0.112)	(0.115)	(0.116)
FSES	-0.0684	-0.174	-0.17	0.196	0.0768
	(0.0936)	(0.113)	(0.114)	(0.131)	(0.112)
Saving Behavior	-0.0762	0.0718	0.233**	-0.0652	-0.0871
	(0.0797)	(0.0976)	(0.102)	(0.105)	(0.112)
Debt Behavior	-0.0544	-0.0985	-0.321***	0.00594	0.105
	(0.0754)	(0.0945)	(0.0937)	(0.11)	(0.0978)
Financial Institution	0.471***	0.186*	0.0735	0.119	-0.013
	(0.0706)	(0.0941)	(0.108)	(0.116)	(0.11)
Sole Decision on Household Spending	-0.0163	-0.13	-0.117	0.063	-0.0374
	(0.0517)	(0.0846)	(0.0823)	(0.0791)	(0.0788)
Joint Decision on Household Spending	0.119	0.168*	0.275**	-0.0962	-0.206*
	(0.0749)	(0.101)	(0.11)	(0.115)	(0.116)
Observation	2,173	2,173	2,173	2,173	2,173

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

Notes: This table reports the sub-group analysis based on the participant's cohort age group. Column (1) presents the coefficient for saving. Columns (2) and (3) present the estimated treatment coefficients for FE (Financial Education) and FD (Financial Diary). Columns (4) and (5) provide the interaction effects. D2 is a dummy variable that equals 1 if the participant had saved some money for herself at baseline. Standard errors are clustered at the village level and reported in parentheses. Outcomes variables are all indices discussed in Section 3 and Appendix C.

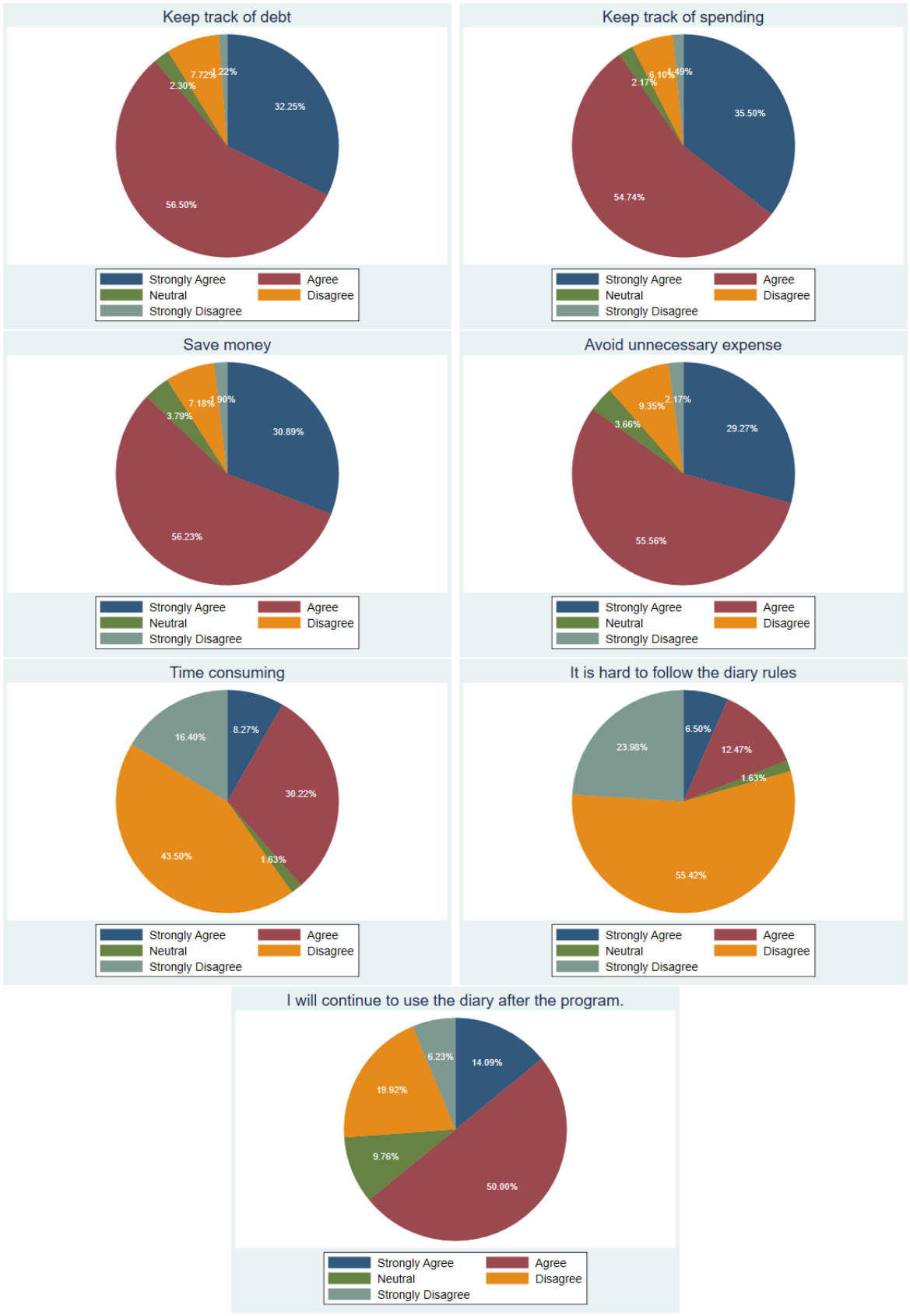


Figure D.1: Participants' Evaluation of the Financial Diary Treatment

Notes: Respondents (N=738) include all, except one, participants in the endline survey in the financial diary treatment group.

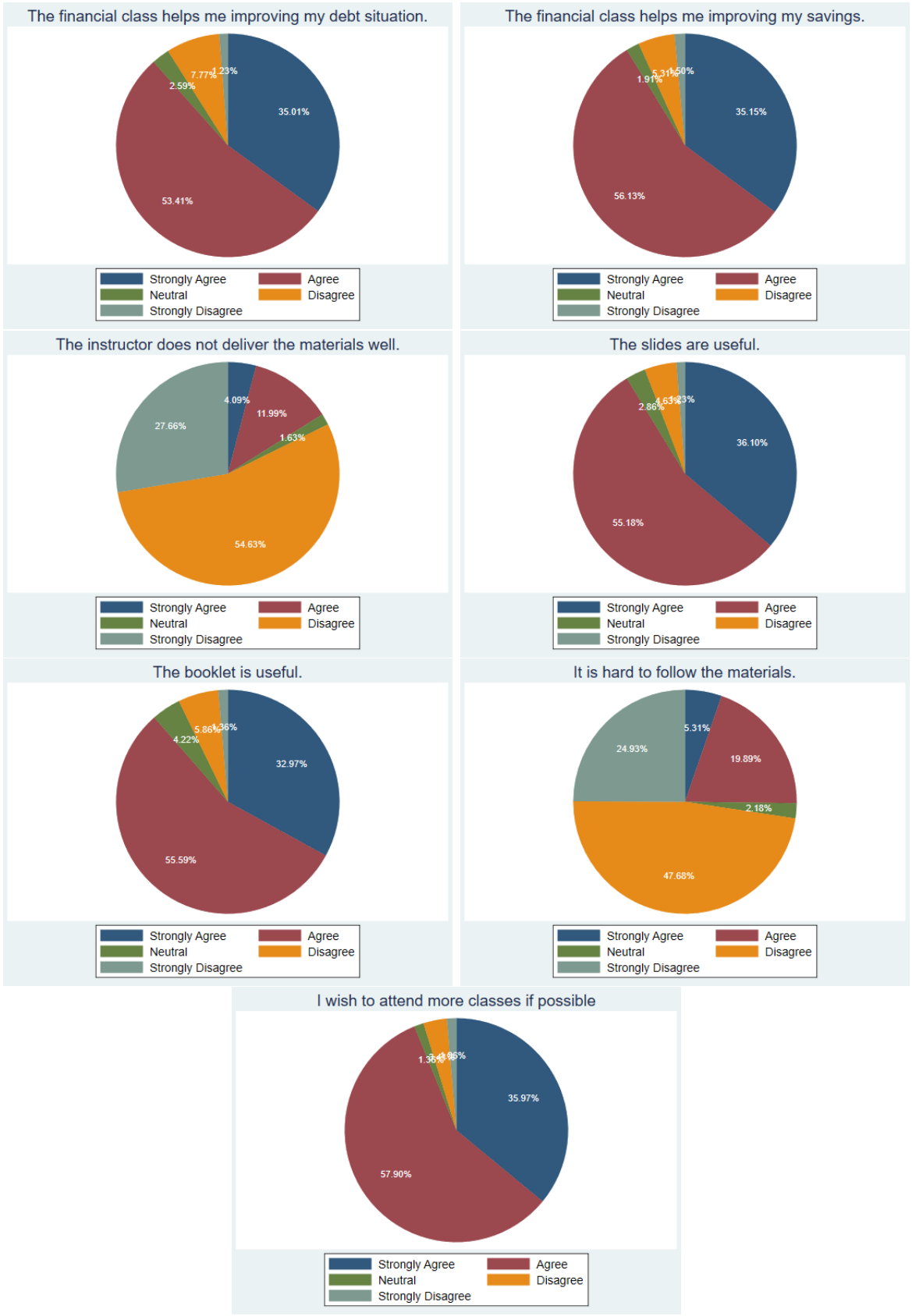


Figure D.2: Participants' Evaluation of the Financial Education Treatment

Notes: Respondents (N=733) include all participants in the endline survey in the financial education treatment group.

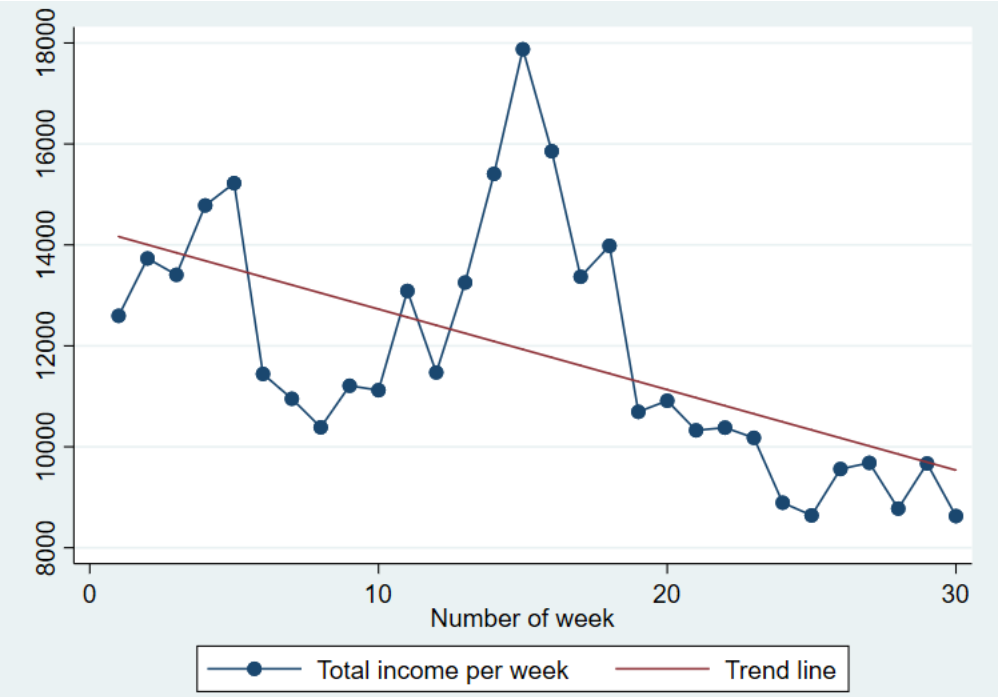


Figure D.3: The distribution of total income per week

Notes: Sample includes 709 respondents who kept the diary throughout 30 weeks.

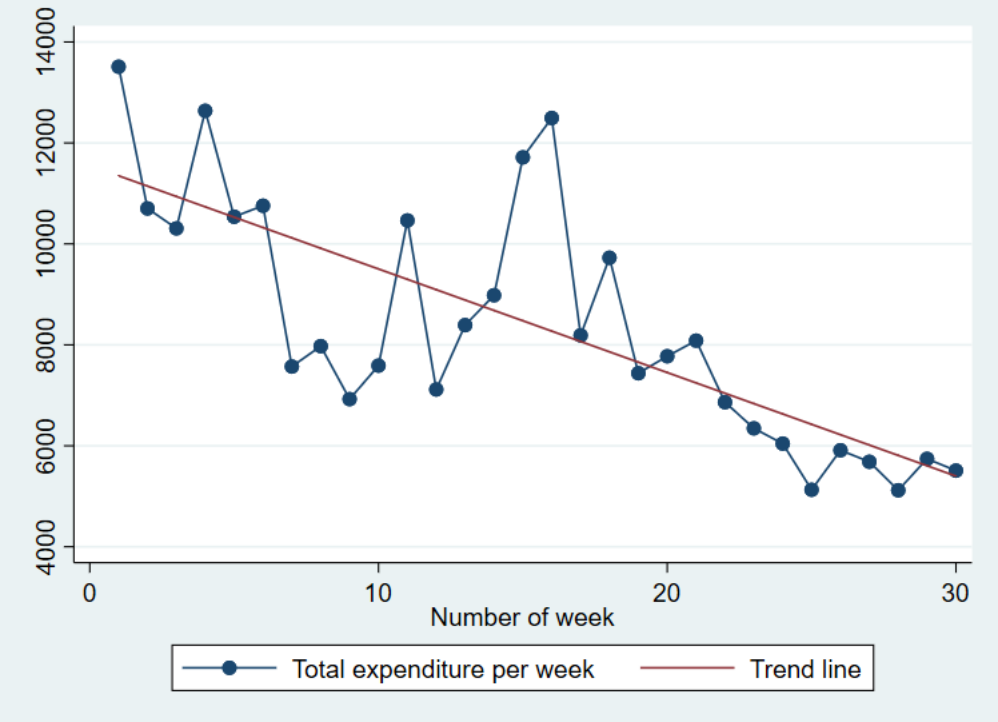


Figure D.4: The distribution of total expenditure per week

Notes: Sample includes 709 respondents who kept the diary throughout 30 weeks.