

**Active Learning Improves
Financial Education:
Experimental Evidence
from Uganda**

Tim Kaiser, Lukas Menkhoff

Impressum:

CESifo Working Papers

ISSN 2364-1428 (electronic version)

Publisher and distributor: Munich Society for the Promotion of Economic Research - CESifo GmbH

The international platform of Ludwigs-Maximilians University's Center for Economic Studies and the ifo Institute

Poschingerstr. 5, 81679 Munich, Germany

Telephone +49 (0)89 2180-2740, Telefax +49 (0)89 2180-17845, email office@cesifo.de

Editor: Clemens Fuest

<https://www.cesifo.org/en/wp>

An electronic version of the paper may be downloaded

- from the SSRN website: www.SSRN.com
- from the RePEc website: www.RePEc.org
- from the CESifo website: <https://www.cesifo.org/en/wp>

Active Learning Improves Financial Education: Experimental Evidence from Uganda

Abstract

We conduct a randomized field experiment to study the effects of two financial education interventions offered to small-scale retailers in rural western Uganda. The treatments contrast “active learning” with traditional “lecturing” within standardized lesson-plans. After six months, active learning has a positive effect on savings and investment outcomes, in contrast to small or zero effects for lecturing. After four years, estimates come with substantial uncertainty but are generally larger for the active learning group, such as a 60 percent increase in investments. As an adverse outcome, reported late payment on loans increases by about 30 percent for both treatments. The findings suggest that teaching methods can play an important role in affecting how financial education programs impact financial behavior and outcomes.

JEL-Codes: O160, I210, G530.

Keywords: financial behaviour, financial literacy, active learning, lecturing, training method, field experiment.

Tim Kaiser
University of Koblenz-Landau
Germany – 76829 Landau
kaiser@uni-landau.de

Lukas Menkhoff
German Institute for Economic Research
Germany – 10117 Berlin
lmenkhoff@diw.de

March 22, 2022. We thank the vendors in western Uganda for participating in our study as well as all the project members at *Mountains of the Moon University*, Fort Portal (Uganda). We greatly appreciate the Agricultural and Rural Finance Program (AGRUFIN) of the *Gesellschaft für internationale Zusammenarbeit (GIZ)* in Uganda for funding the treatments and data collection. Special thanks go to Oliver Schmidt, Dirk Steinwand, Julia Kirya, and Esther Nanjovu. Finally, we appreciate comments from seminar and conference participants in Arlington, Berlin, Dresden, Fort Portal, Freiburg, Glasgow, Hamburg, Honolulu, Kampala, Kassel, Kiel, Luxembourg, St. Gallen, Vienna, Washington D.C., and Zürich, in particular Toman Barsbai, Christian Biener, Christine Binzel, Martin Brown, Dimitros Christelis, Shawn Cole, Stefan Eichler, Nathan Fiala, Thomas Gehrig, Xavier Giné, Ralph Hertwig, Rajshri Jayaraman, Georgios Panos, Katharina Lehmann-USchner, Annamaria Lusardi, William Skimmyhorn, Lore Vandewalle, Bilal Zia, two anonymous referees, and the editor (Dean Karlan). Financial support by DFG through CRC TRR 190 is gratefully acknowledged. Declaration of interest: none. This field-experiment was pre-registered at the AEA RCT Registry on October 10, 2015 (ID: AEARCTR-0000906); see: <https://www.socialscisceregistry.org/trials/906/history/6694>.

Active learning improves financial education: Experimental evidence from Uganda

1 Introduction

Financial education is a high priority for policymakers globally. Many developing economies have implemented national financial education strategies that aim to promote financial inclusion and to contribute to financial stability (OECD, 2015). As enormous resources are being invested into financial education, the effectiveness of financial education programs is an exigent issue.

Accordingly, the issue of effectiveness is intensively debated (see Hastings et al., 2013; Lusardi and Mitchell, 2014), albeit with a change in focus. Some years ago, studies raised concerns about the general effectiveness of financial education (e.g., Cole et al., 2011; Fernandes et al., 2014), but with a rapidly increasing number of field experiments, new meta-analyses show that effects are positive, on average (Miller et al., 2015; Kaiser and Menkhoff, 2017; Kaiser et al., 2020). Thus, a more recent debate focuses on improving effectiveness of interventions, including that of large-scale financial education programs (e.g., Bruhn et al., 2014, 2016; Brown et al., 2016; Cole et al., 2016; Berry et al., 2018). Therefore, researchers are evaluating alternatives to typical lecture-based classroom-programs. Proposals include tailoring interventions to narrow target groups (Doi et al., 2014; Drexler et al., 2014), introducing personalized elements like counseling (Carpena et al., 2019), and using mass media (Berg and Zia, 2017), among others. In contrast, we study an approach that aims for improving effectiveness within still pervasive classroom-based programs, i.e., by applying the concept of active learning to the field of financial education.

“Active learning” is an established and well evaluated umbrella term for interactive teaching methods that engage and involve participants. Specifically, in our setting, participants

not only speak more, discuss with each other, solve mini cases, and engage with prepared teaching material, but also show higher levels of physical activity than attendees of lecture programs. The advantage of an “active learning” approach over traditional “lecturing” is documented in large empirical literatures from other domains, including science, technology, engineering, and mathematics instruction (e.g., Deslauriers et al., 2011, 2019; Ruiz-Primo et al., 2011; Freeman et al., 2014; Wieman, 2014; Sheridan and Smith, 2020). We build on this literature from other domains and apply the active learning approach to financial education.

We conduct a cluster-randomized field experiment contrasting an “active learning” program with a traditional “lecturing” program, while keeping content, teachers, and intensity of training constant. The field-experiment was conducted in rural western Uganda with 1,291 small scale retailers in November and December 2015. The midline survey took place about six months later, while the endline was conducted in September 2019, i.e., almost four years after the baseline, as a phone survey. The latter comes with a restricted number of survey items and an attrition of 52 percent relative to baseline.

A clear result emerges: The group randomly allocated to the “active learning” program experiences an improvement in process outcomes (self-reported self-control and financial confidence) and, ultimately, some dimensions of financial behavior. By contrast, the group allocated to “lecturing” only reports increased levels of financial confidence but does not appear to change financial behaviors. Specifically, the active learning program causes an increase in two out of five outcome-domains at midline, each captured by an index. Among others, total savings increase by about 20 percent relative to the control group and total investments into the own business by about 35 percent. After almost four years these increases relative to the control group tend to persist (possibly at an even higher level), albeit estimates come with substantial uncertainty. Yet, our results suggest that at least part of the “active learning” group has persistently changed their financial behavior.

However, a rather worrying effect is that both treated groups report a significantly higher degree of late payments on loans than the control group. As we do not observe (significant) treatment effects on the frequency of borrowing, loan volume or loan repayment, and as savings and investments at both the midline and endline survey are uncorrelated with the likelihood of late payments, the reasons for increased late payments remain speculative within the setting of this study. This late repayment result is generally consistent with the evaluation of a large program in Brazil (Bruhn et al., 2016), which also finds adverse effects on debt-taking behavior among students.

Thus, the overall welfare effects of the financial education treatments examined are ambiguous until one understands if the late repayment results are real and, if so, how big these effects are relative to the benefits of the treatments. The opposing effects may be heterogeneously distributed, i.e., some individuals are better off and others worse. Alternatively, the effects may also occur for the same individuals, e.g., that those saving and / or investing more do less often service their loans on time because of additional liquidity constraints. Our experiment does not allow a definitive answer to this issue.

Our research not only adds to the growing literature that advances the understanding of the differing impact of delivery channels of financial education, but it also contributes to the debate on how to design effective and scalable training programs. Drexler et al. (2014) shows that a heuristics-based approach, relying on the simplification of complex financial concepts (“rule-of-thumb-training”), generates larger behavioral impacts than the teaching of traditional curricula (“full technical training”), especially among low-skilled individuals and individuals with low baseline financial literacy and motivation. Skimmyhorn et al. (2016) reruns this type of experiment but does not find evidence to support differential effects regarding the two types of curricula, probably because their sample of respondents has high levels of *ex-ante* human capital, confirming the result of Drexler et al. (2014) that the benefits of the “rule-of-thumb”

approach may be driven by strong effects on low-skilled individuals. Lusardi et al. (2017a) presents evidence from online experiments that interactive tools, narratives, and financial education videos may be more effective than written informational content in affecting financial knowledge and self-efficacy.

Moreover, Berg and Zia (2017) show that financial education interventions that primarily target non-cognitive channels through mass media can significantly impact financial behavior. Campos et al. (2017) demonstrate that a psychology-based training program for entrepreneurs, teaching a pro-active mindset, outperforms traditional business training for self-employed individuals in West Africa with strong differential effects on business profits. Iterbeke et al. (2020) shows that ability matching and differentiated instruction may especially benefit low-ability students. Finally, Carpena et al. (2019) shows that complementing classroom instruction with personalized elements, like individualized counseling and goal setting, yields higher treatment effects on financial behaviors.

Much of this evidence suggests that interventions relying on lecturing within classroom-settings appear to have relatively small effects. Thus, alternative approaches to lecture-based education seem to be important. Some argue that “one-size-fits-all” (Drexler et al., 2014; Carpena et al., 2019) classroom programs are not suitable for improving financial behavior and programs must be complemented with individualized elements. In contrast, we show that even within a one-size-fits-all classroom program, active learning techniques may affect how financial education programs impact financial behavior.

2 Treatments and experimental design

2.1 Context and financial education interventions

As a step toward promoting financial inclusion, the Bank of Uganda (*BoU*), the country's central bank, established a national strategy for financial literacy in Uganda.¹ This strategy seeks to foster the personal financial knowledge and behavior of different target groups, including school students, young adults in urban settings, and adults in rural areas. The *BoU* partnered with the German Development Cooperation (*GIZ*) to design effective financial education interventions. While the specific curricula and dissemination formats vary depending on the target group, they all target financial knowledge and behavior within the five sub-domains of (i) budgeting and personal financial management, (ii) savings, (iii) credit, (iv) business investing, and (v) payments and financial service providers.

Focusing on the financial education strategy's major objective to improve rural outreach, *GIZ* developed educational formats for the target population of the rural self-employed. These programs teach how to create a written household budget as well as how to keep track of household's financial inflows and outflows. It also encourages household savings, explains the costs and benefits of various forms of credit, explains the trade-off between risk and return regarding productive investments into micro-enterprises, highlights the benefits of diversification among sources of income and investments, as well as informs about the costs and benefits of using financial services provided by regulated financial institutions. The trainings emphasize the importance of direct and opportunity costs associated with each type of financial product, which sometimes also means considering how financial resources may be protected against the demands of peers. Thus, this training promotes the use of formal financial services, without generally discouraging semi-formal types of financial products, e.g., saving in village savings and loans associations (VSLAs) or rotating savings and credit associations (ROSCAs). The trainings do, however, caution against both the use of expensive credit

¹ See: https://www.bou.or.ug/opencms/bou/bou-downloads/Financial_Inclusion/Strategy-for-Financial-Literacy-in-Uganda_August-2013.pdf - last accessed February 9, 2018.

provided by informal moneylenders and the take up of costly loans to finance consumption expenditures in general.

At the time of our study, a *GIZ*-project in Western Uganda developed a new delivery method for the standard educational intervention. This created the opportunity to study the differential impact of alternative delivery approaches to financial education for the same target group. Thus, *GIZ* cooperated with external researchers to test these two approaches via an RCT. While these two programs are identical with regards to the content areas covered and their intensity (two hours), they differ in their concrete method of instruction, i.e., *how* this content is taught (cf. [Table A1](#) in Appendix A).

The financial education training using “active learning” methods is highly learner-centered (see Ruiz-Primo et al., 2011; Freeman et al., 2014; Sheridan and Smith, 2020). Its main feature are five distinct stations, each designed to provide problem-based learning opportunities and encourage discussion among the participants. Exercises and materials are designed to engage participants with the subject matter, e.g., by completing budgeting exercises or sorting savings options regarding their safety risk/return-profiles. Respondents are encouraged to share their experiences. The trainer has the role of a learning facilitator.

The traditional “lecturing” program, on the other hand, is organized as a community lecture, i.e., an “exposition-centered” (Freeman et al., 2014, p.8410) approach, relying mostly on lecturing with the aid of a flipchart and some room for participants to ask questions or to share experiences. Here, the lecturer explains important concepts and demonstrates, e.g., how to create a written budget and how different financial products could be categorized. The trainer can be characterized as a lecturer rather than a facilitator.

Thus, there are four characteristics that distinguish active learning from lecturing treatments: (i) Participants speak more. Based on our own classroom-observations and statements of trainers, participants speak about 30 to 60 percent of the time (i.e., 40 to 70 percent

for the trainer) while this share is less than 20 percent in the lecturing treatment. (ii) Discussion between participants is common while it is rare in lecturing treatments. (iii) Active learning always uses prepared teaching materials, often a poster that needs to be completed by sticking cards on it. Posters may show intuitive structures and mini cases, such as a “money tree” in the case of financial management. (iv) Participants are physically activated. They get up to stand in a half-circle in front of the poster, may move toward the poster, move to the next station, and may change position while discussing; by contrast, during the lecturing treatment, participants typically stay seated.

To evaluate the impact of the financial education programs, we employ the same group of newly recruited teachers to deliver both financial education treatments to the target groups. Thus, the different versions are not confounded with idiosyncratic characteristics of the teachers and implementation is not heterogeneous across experimental sites. The teachers are all enrolled in a program on banking and microfinance at a local university and have participated in a training of trainers offered by *BoU* and *GIZ*.

2.2 Experimental design

We organize a cluster-randomized experiment to study the differential impact of the two financial education interventions on financial behaviors. The main outcomes of interest are changes in *financial behavior* within five sub-domains addressed by the financial education interventions, i.e., (i) budgeting, (ii) usage and handling of credit, (iii) savings, (iv) business investing and formalization, and (v) the use of formal payment- and other financial services, such as formal insurance. Randomization is done at the market-level, because these markets are too small to avoid spillovers between groups. There are 83 rural marketplaces in the seven districts of the Rwenzori Region in Western Uganda, collectively forming the sample of clusters considered in this study (see Figure 1).

<Figure 1 about here>

To the best of our knowledge, the dataset covers all relevant permanent and regular marketplaces in the region.² Because prior information about the marketplaces (such as exact number of vendors and primary goods traded) is limited at the time of randomization (prior to the individual-level baseline survey), we perform a non-stratified randomization procedure to allocate the 83 clusters in our sample to either receive financial education treatment A (n=27) or B (n=28), or to be allocated to the control group (C) (n=28). The trainings each aim for reaching a target group of about 15 to 16 vendors.

Vendors were mobilized to participate in our survey and the financial education sessions by the local market-chairpersons. These chairpersons were blinded to the experimental condition and only told that there would be a half-day event organized by the local university including a survey. As the experimental group was unknown to the market-chairperson, no differential selection (mobilization) should be in place. However, the mobilization by itself may include a selection bias if market-chairpersons favor specific groups (such as their peers) over others in general. This would indeed impact the *external* validity of our experiment. Moreover, it may be expected that the program impact could be overestimated to some degree, as it is likely that chairpersons may select individuals whom they expect to be compliant. We cannot quantify this distortion but report that through all stages of our study compliance was quite high; for example, basically nobody left between survey and training in the treatment groups. While these implementation details may have implications for the external validity of the findings, the *internal* validity is not affected because these selection mechanisms will occur in all three groups.

After baseline survey, the treatment groups received either financial education treatment “active learning” or “lecturing” on the same day, immediately after the interviews. The “control

² There is no administrative data available regarding the location, size, or vendors in these marketplaces.

group” did not receive any treatment. After baseline survey and subsequent financial education treatments, we conducted the midline as follow-up surveys approximately 6 months later. The endline followed another 3 years and 3 months later in the form of a telephone survey.

We report *ex ante* power-calculations for minimum detectable effect sizes in order to be able to rule out imprecisely estimated small- or zero-effects of financial education treatment. Baseline intra-cluster-correlation (ICC) ranges from 0.030 (financial literacy score and budgeting index) to < 0.001 (savings index) for the outcomes. Thus, our experiment has 80 percent power to precisely detect (at $\alpha = 0.05$) effect sizes as small as 0.15 to 0.18 standard deviation units. To put these minimal detectable effect sizes into perspective: The average effect size on financial behaviors in recent meta-analyses is about 0.1 SD units (Kaiser and Menkhoff, 2017; Kaiser et al., 2020).

2.3 Empirical strategy

To estimate the effect of the financial education interventions on financial literacy and behavior, we compare the two treatment groups “active learning” and “lecturing” with the “control group” (no treatment) at the time of the follow-up surveys. As selection into treatment is randomized, with balanced groups at baseline (see Section 3.2 and Appendix A), the unbiased intent-to-treat (ITT) treatment effect (average effect of being assigned to a treatment-cluster) can be estimated within the following ANCOVA framework (see McKenzie, 2012):

$$y_{ic(t)} = \alpha + \delta_1 y_{ic(t-1)} + \beta_1 A_c^T + \beta_2 B_c^T + \theta_d + \varepsilon_{ict} \quad (1)$$

Here, $y_{ic(t)}$ denotes the outcome variable (measure of financial behavior) for individual i in cluster c at the time of follow-up (t). $y_{ic(t-1)}$ controls for the value of the outcome at baseline and θ_d are district-level fixed-effects. A_c^T and B_c^T are dummy variables equal to one for respondents situated in a cluster assigned to the two treatments, respectively. Thus, β_1 captures the (ITT) treatment effect of the active learning intervention, and β_2 captures the (ITT)

treatment effect of the traditional lecturing intervention. ε_{ict} denotes the error-term. Standard errors are clustered at the market-level to account for the level of randomization.

To avoid problems inherent to testing multiple hypotheses (type-I-error inflation), we aggregate multiple related outcomes into index-measures of outcome families: Following Kling et al. (2007), Karlan and Valdivia (2011), and Drexler et al. (2014), we define y^* to be an equally weighted average z-score index of its components y_k^* . Thus, for each component of a given outcome family, we first rescale each outcome such that positive values indicate desirable treatment effects. Next, we standardize the component to have a mean of zero and standard deviation of one for the control-group: $y_k^* = \frac{y_k - \mu_k}{\sigma_k}$, with μ_k denoting the mean of y_k for the control group (C) and σ_k denoting the standard deviation of y_k for the control group. Following standard procedures (e.g., Kling et al., 2007; Karlan and Valdivia 2011), if some but not all of the components for an index for the dependent variable have missing values, we set the missing components to the mean value of the control group (i.e., zero). The aggregate index then takes the following form: $y^* = \frac{\sum_k y_k^*}{k}$. Finally, we standardize the outcome index (y^*) to have a mean of zero and standard deviation of one for the control-group. Thus, coefficients on A_{ic}^T and B_{ic}^T can be interpreted as standardized mean differences relative to control.

3 Data

After mapping of the markets, piloting the survey tools and interventions, as well as randomization, we conducted a comprehensive baseline survey between November 2 and December 19, 2015. This dataset covers all vendors invited to participate in our survey (n=1,292). The questionnaires were translated into three local languages widely spoken in the area and the enumerators conducting the face-to-face interviews in the local languages were trained extensively prior to the field-activities.

3.1 Response rates

Following the baseline-survey and the subsequent financial education treatments, we conducted midline surveys between April 6 and July 19, 2016. Including extensive tracking efforts, our final response rate is high, especially given the relatively mobile target group (see timeline [Figure A1](#)): We follow up with 1,162 vendors, i.e., 90 percent of the initial sample at midline survey (see Table 1). Regarding the endline survey in September 2019, we did not have the resources to repeat the earlier surveys in the field. Instead, we conceptualized a shorter telephone survey that was conducted by a professional survey firm in Kampala, Uganda, on our behalf. Due to the long follow-up period and limited tracking possibilities, the response rate to the telephone survey is much lower: 53 percent of the midline sample and 48 percent of the baseline sample.

<Table 1 about here>

Attrition rates appear to vary experimental condition and survey round. Thus, we study attrition in more detail in [Table A2](#) and use the predicted probabilities to attrite based on these observables as inverse probability weights to account for the selection into the survey-round to all our regressions. In general, we observe that few observables predict attrition but that those in the lecture treatment are less likely to respond to the survey (significant at the 10-percent level), while those with higher savings and higher levels of financial literacy at baseline are more likely to respond to the survey sample at midline. We find no interaction effects of outcomes or other covariates with the treatments. At endline, we observe that those in the control group are more likely to be tracked with no difference in attrition between the two treatment groups. Additionally, the relevant outcomes are not predictive of attrition but more educated individuals and those with higher household consumption are more likely to be tracked at endline. Given the importance of attrition, we also probe the sensitivity of our results

by estimating bounds on the treatment effects with several scenarios imputing missing observations at the midline and endline. Details are provided in the robustness Section 5 and Appendix B.

3.2 Descriptive statistics and randomization balance

Table 2 reports summary statistics at baseline for the three groups (i.e., control, active learning and lecturing) of the full sample and of the endline sample. The statistics for the midline sample are provided as [Table A3](#). The top panel in Table 2 shows variables that measure characteristics at the household level. For example, the average household size in the control group is 6.86 with an average of 2.12 adults contributing to the household's income. Several currency denominated outcomes had a long right tail, possibly indicating enumeration errors. Therefore, we winsorize all currency denominated outcomes at the 99th percentile. The resulting mean monthly household consumption value in control is about 593,000 UGX (\$519 in 2017 PPP).

<Table 2 about here>

The second panel reports variables at the respondent-level. The mean monthly individual income is around 220,000 UGX (\$192 in 2017 PPP). Household consumption is higher than added individual incomes because of subsistence farming, as reported by 83 percent of the sample. Our sample predominantly comprises women (80 percent) and the average age is 37 years. Only 28 percent report having participated in education beyond primary school. Our survey also includes a measure of financial literacy and psychological variables, such as self-control and financial confidence, which are standardized to have a mean of zero and a standard-deviation equal to one for the control group (see [Table A4](#)). These are used as process outcomes (Section 4).

The last panel shows descriptive statistics for outcome measures of financial behavior indices (standardized to have a mean of zero and a standard deviation equal to one) at baseline (see descriptive statistics for individual index components in [Table A5](#)).

Causal inference within the estimation framework introduced in Section 2.4 rests on the random assignment of clusters to the treatment conditions. Randomization balance is probed by comparing the means of the three groups, i.e., control, active learning, and lecturing, as reported in F-tests of equality of means in columns (4) and (8) of Table 2. Overall, randomization seems to have worked reasonably, as there are no statistically significant differences across the three groups. Reassuringly, a joint test of orthogonality results in a p-value of 0.15 for the full sample and 0.68 for the endline sample.

4 Exploring process outcomes

4.1 Financial literacy, self-control, and financial confidence

As a first step toward understanding the potential mechanisms by which financial education may impact behavior, we report results on process outcomes (not pre-specified at experiment registration). These indicate three possible cognitive and non-cognitive mechanisms. The first candidate is an improvement in financial literacy that enables individuals to make better financial decisions, i.e., financial education would impact financial behavior through a cognitive channel. Evidence on this possible causal pathway is documented (cf. Fort et al., 2016; Sayinzoga et al., 2016) and appears to be supported by a larger sample of experimental work (see Kaiser and Menkhoff, 2017). However, it is a robust insight of (financial) education research that a good transfer of knowledge into behavior is fostered by additional non-cognitive elements (cf. Berg and Zia, 2017; Carpena et al., 2019). Thus, as a second potential mechanism, evidence shows that better self-control and, in line with this, future-oriented time-preferences seem to be associated with more savings (e.g., Ashraf et al.,

2006; Alan and Ertac, 2018; Lührmann et al., 2018). Third, financial confidence and attitudes may play an important role in financial behavior (e.g., Berg and Zia, 2017; Carpena et al., 2019; Carpena and Zia, 2020).

In the following we describe the formation of the three variables. “Financial literacy” is assessed through the sum of correct answers to five standard questions on financial literacy, which are transformed to a z-score, then scaled by the mean and standard deviation for the control group (see Table A4). “Self-control” is assessed by a survey item asking respondents to reply to the question: “If you get money, do you tend to spend it too quickly?” on a 1 (often) to 4 (never) rating scale. Responses are transformed into a z-score, scaled by the mean and standard deviation for the control group (see descriptive statistics in Table 2 and in Table A4). “Financial confidence” is assessed by multiple items that are aggregated into an unweighted z-score-index of its components. The index covers responses to binary questions and statements that are answered on a rating-scale. Questions were asked on whether respondents felt that a complaint to a financial services provider would not change anything, whether respondents feel confident to inquire about the details of a financial product and to choose the financial product that best meets their needs, as well as whether respondents consider various products and options before making a financial decision (see definitions and descriptive statistics in Table A4).

Results are presented in Table 3. Active learning appears to have an effect on self-control and financial confidence, lecturing only impacts the measure of financial confidence, and the impact of both treatments on financial literacy appears to be small and not statistically significant.

<Table 3 about here>

Next, while there are no treatment effects on the aggregate financial literacy index, we examine if certain content areas of financial literacy were better understood by those individuals

who trained with the active learning program. We find a significant treatment effect on the probability of solving an item measuring the understanding of compound interest (see [Table A6](#)). Thus, one may speculate whether this effect contributes to an increased willingness to save and invest available funds. The increase in self-control may support this willingness. Somewhat differently from these process outcomes, the increase in financial confidence appears to be driven by a uniform effect across all index components (see [Table A7](#)). This may increase the willingness to take investment risks and to use financial products, however, it may also be related to some degree of overconfidence in financial matters and resulting financial behavior.

4.2 Teacher behavior and motivation

Finally, we investigate whether the two treatments may have contributed to differential teacher motivation and participant satisfaction. If teachers developed a preference for one program over the other, this could result in differences in motivation and teaching quality over time. To probe this hypothesis, we ask the endline-survey participants to retrospectively rate on a scale from 1 (poor) to 10 (excellent): (i) the overall quality of the training, (ii) their overall satisfaction with the training, (iii) the perceived motivation of the teacher, and, lastly, (iv) their own interest in attending another training session. We observe high average ratings of quality, satisfaction, and teacher motivation (see [Table 4](#)). We do not find evidence for differences in subjective evaluation of the two programs, while a similar experiment with introductory college physics courses shows even higher satisfaction with the lecturing approach (see Deslauriers et al., 2019). Finally, 87 percent of the respondents report being interested in attending another training, again, with no differential effect between the two treatments.

<Table 4 about here>

5 Results

5.1 Main treatment effects at a six-month horizon

Table 5 reports the average treatment effects of financial education interventions “active learning” and “lecturing” on five domains of financial behavior plus a summary effect aggregating the information across these five domains into a single index. The five domains of financial behavior are each measured by an index (results on all items forming these indices are shown in Appendix A).

<Table 5 about here>

Among these domains of financial behavior, the overall effects are strongest for the *investment index* (column 4), with effect sizes being relatively large (a quarter of a standard deviation). Active learning results in a statistically significant change in behavior. Lecturing is estimated to have a statistically insignificant effect size of about 0.11 standard deviation units.

Similarly, the effect on the *savings behavior index* (column 2) is sizeable for the active learning treatment (about 0.15 standard deviation units) and significant at the 5-percent level. Again, the lecturing treatment is statistically and economically insignificant (effect size of 0.02). In this context, we note that we do not observe significant increases of income over the six months observation period (see [Table A8](#)). However, the point estimate for consumption in the active learning treatment is negative and amounts to an estimated reduction of about 129,000 UGX over a 6-month period. This magnitude, while imprecisely estimated, may account for the observed increase in total savings (of about 110,000 UGX) over the same horizon. Thus, increased savings are not an indirect consequence of higher income but likely due to a change in (consumption and spending) behaviors.

In line with low expectations from the literature on the effectiveness of financial education to change *borrowing behavior* (Fernandes et al., 2014; Miller et al., 2015; Kaiser and Menkhoff, 2017; Kaiser et al., 2020), we do not find any significant effect for both treatments (column 3). Regarding training effects on the *budgeting index* (column 1), the effect size

estimates are positive but small and statistically not significant. The coefficient levels are higher for the *financial services index* (column 5); this is the only case where the coefficient of the lecturing treatment is higher than that of the active learning treatment, but both coefficients are estimated with a large standard error and, thus, remain statistically not significantly different from each other.

Finally, we aggregate information on all outcome domains into a *summary index* (column 6) that is defined as an equally weighted z-score index of the five financial behavior indices, informing about the overall impact of both treatments. The effect size of lecturing is about 0.06 standard deviation units and, thus, of plausible size given that the training lasts only two hours relative to the average treatment effect of 0.1 standard deviation units at an average intensity of 1 to 2 days in a meta-analysis of 76 RCTs (Kaiser et al., 2020). The effect size of active learning is about 0.19 SD. Thus, the overall treatment effect of active learning is significantly different from zero.

To summarize, we see that the active learning treatment results in a significant effect on two out of five financial behaviors addressed in the training. As lecturing is, on the other hand, associated with smaller estimated effects and larger standard errors, it does not have a statistically significant (at the 5%-level) effect on any of the addressed financial behaviors

5.2 Treatment effects at a four-year horizon

The endline survey took place almost four years (exactly three years and nine months) after the baseline and was conducted by telephone. Thus, the survey is restricted to a minimum and focuses on variables where the midline indicates changes of interest, i.e., savings (two variables), investment, late payment on loans, and the use of mobile money. Accordingly, Table 6 reports results on these five variables. Panel A provides estimates for the outcomes at midline, Panel B shows outcomes at the endline survey.

<Table 6 about here>

Overview. The outcome pattern after three years is similar to the short-term results. The coefficients are mostly positive, i.e., in line with the treatment goals, except for zero effects on “any savings” (at a high level of 92 percent for the control group); moreover, we find adverse effects, as the higher late payment rates observed in both groups are not intended by the trainings. The effect sizes are generally larger for the active learning treatment than for the lecturing treatment. However, due to the reduced sample size, the estimates come with substantial uncertainty. Overall, these results suggest that both treatments may cause a longer-lasting effect that is, however, in our sample, only stronger and marginally significant for the active learning treatment.

Savings and investment. While the overall pattern of results mirrors the short-term findings, the magnitudes of estimated treatment effects on savings and investment appear inflated. However, the result looks more moderate when compared to the levels of the control group as this group also states quite high savings and investment levels relative to the baseline. The high absolute savings amounts in the control group at endline relative to baseline survey (see Table 5) confirms that the respondents to the endline survey are not a random sample of the baseline. At midline, the average total savings in the control group is about 510,000 UGX. The respective magnitude for the endline survey is 840,000 UGX for the control group. Thus, it appears that those who are relatively wealthy have been reached by the telephone survey in general (see also Table 2). For these individuals the relative increase at the mean due to the active learning treatment over the control group is about 54 percent for total savings (statistically insignificant) and about 62 percent for total investments (statistically significant at the 10-percent level) compared to 20 to 35 percent at the short-term horizon. Such an effect suggests that part of the treatment group has persistently changed behavior such that their savings and investments are not just stimulated for a short period of time.

Late payments and mobile money. Another interesting result of the endline survey is the increase in late payments on loans for both treatment groups. As with savings and investment, the level of the control group, at about 50 percent of individuals reporting late payments at least once, is much higher than at the midline survey, when around 27 percent of the control group report late payments (see Table 6). Lecturing increases the share of late payments by 13 percentage points and active learning by 16 percentage points, both increases being not only economically meaningful but also statistically significant. One element of this pattern, which can be analyzed at midline, seems to be that neither group increases the number of loans or total debt volume significantly (see [Table A14](#)); thus treated individuals may pay late regarding existing loan volumes rather than additional loans they aren't able to service. We also do not observe treatment effects on the total amount repaid at midline indicating that late payments could be temporary and may be resolved later.

Still, this result of increasing late payments is worrying. Reasons for this may be additional (self-induced) liquidity constraints at the cost of lenders, overconfidence of some retailers regarding immediate returns of their business investments or it could be possible that they even calculate with strategic defaults. While we cannot test these hypotheses, there is no correlation of late payments with the *total amount* of savings or investments at midline or endline, indicating that these may be two separate effects rather than the increases in investments being driven by loans which lead to late payments (see [Table A15](#)). Regarding the use of mobile money, we see no effects at the midline or endline survey.

Interpretation. It does not seem self-evident that a brief treatment has effects that can be measured almost four years after the intervention. We note that there may be four reasons for this result: (i) The target group has a high demand for financial education; for example, only about 40 percent had a correct understanding of interest rates. (ii) The target group has ability to improve their financial behaviors; for example, 85 percent of participants report savings at

the baseline. (iii) The results may be viewed considering selection of individuals into the study and survey rounds; at baseline, participants decide whether to spend (paid) time with researchers, while participants at endline have elevated socio-economic characteristics. These reasons (i) to (iii) may dampen external validity of this RCT but not its internal validity. While we do not fully understand why the active learning treatment may have led to persistent effects (see also Horn et al., 2020), (iv) we see that it stimulates self-control and financial confidence and changes in these non-cognitive factors (measured after six months) may translate into lasting effects; a mechanism consistent with our point estimates at midline is that treated households may increase savings by reducing their consumption.

5.3 Robustness

We probe the robustness of results in comprehensive exercises. These show that results of the main paper are robust, but results must be viewed in light of limited power and high attrition at endline. While details are provided in [Appendix B](#), these checks are briefly reported here, covering three main areas: (i) As the sample is characterized by attrition, we address this issue by showing bounds analysis for the midline survey with midline results are generally robust to several scenarios. (ii) Showing unweighted regression results and results with additional covariate adjustments, we find that results are largely insensitive to these modifications. (iii) Finally, we address multiple hypothesis testing by providing adjusted p-values based on false discovery rate and family wise error rate corrections. These corrections generally lead to deflated p-values and, thus, higher uncertainty about the estimated effects mirroring the limited power of the cluster-RCT.

6 Conclusion

Our research contributes to revealing the determinants of effective financial education interventions. As such a potentially crucial determinant, we compare an active learning approach with traditional lecturing. We explore possible process outcomes by which financial education may translate into changes in financial behavior. For this purpose, we examine the role of cognitive and non-cognitive process outcomes, i.e., financial literacy, self-control, and financial confidence. We find that while both treatments have no effect on financial literacy, active learning positively affects self-control and confidence, while lecturing only impacts financial confidence.

We then study five outcome groups of financial behavior, finding that active learning mostly leads to higher intended effect sizes than traditional lecturing. In two out of five outcome indices – savings and investment – active learning has an effect on financial behavior, while traditional lecturing has much smaller or zero effects. The economic effects at the midline tend to persist at endline survey for a limited subset of variables and respondents but are estimated with higher uncertainty. Moreover, we find a potentially adverse effect of financial education in the borrowing domain: late payments on loans appear to increase in both treated groups (see also Bruhn et al., 2016). Our design and data do not allow to fully understand if the late payments are real, and, if so, whether these indicate heterogeneous treatment effects or whether these effects coincide with potentially beneficial effects for the same individuals. Thus, welfare effects of the financial education programs remain ambiguous with current knowledge.

Overall, active learning methods seem to be a way to improve existing classroom programs without increasing the costs that result from other approaches, like lowering the student to teacher ratio or moving to strictly personalized interventions such as counseling. An important area for future research would be to study the effects of active learning for a broader set of target groups and circumstances.

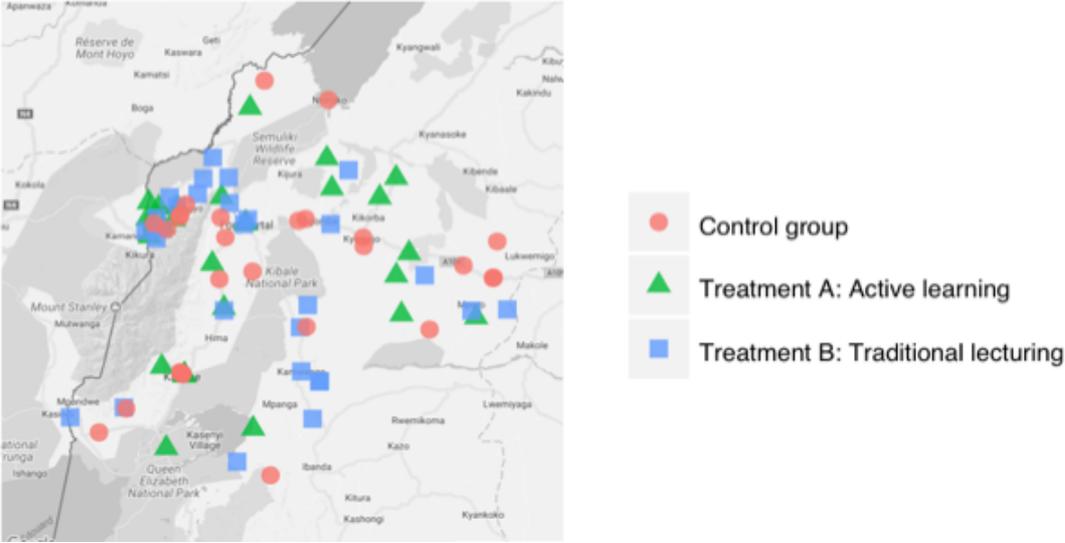
References

- Alan, S. and S. Ertac (2018). Fostering patience in the classroom: Results from a randomized educational intervention. *Journal of Political Economy*, 126(5): 1865–1911.
- Ashraf, N., Karlan, D., and Yin, W. (2006). Tying Odysseus to the mast: Evidence from a commitment savings product in the Philippines. *Quarterly Journal of Economics*, 121(2): 635–672.
- Berg, G. and Zia, B. (2017). Harnessing emotional connections to improve financial decisions. Evaluating the impact of financial education in mainstream media. *Journal of the European Economic Association*, 15(5): 1025–1055.
- Berry, J., Karlan, D., and Pradhan, M. (2018). The impact of financial education for youth in Ghana. *World Development*, 102: 71–89.
- Bruhn, M., Ibarra, G.L., and McKenzie, D. (2014). The minimal impact of a large-scale financial education program in Mexico City. *Journal of Development Economics*, 108: 184–189.
- Bruhn, M., de Souza Leao, L., Legovini, A., Marchetti, R., and Zia, B. (2016). The impact of high school financial education: Evidence from a large-scale evaluation in Brazil. *American Economic Journal: Applied Economics*, 8(4): 256–295.
- Brown, M., Grigsby, J., van der Klaauw, W., Wen, J., and Zafar, B. (2016). Financial education and the debt behavior of the young. *Review of Financial Studies*, 29(9): 2490–2522.
- Campos, F., Frese, M., Goldstein, M., Iacovone, L., Johnson, H. C., McKenzie, D., and Mensmann, M. (2017). Teaching personal initiative beats traditional training in boosting small business in West Africa. *Science*, 357(6357): 1287–1290.
- Carpena, F., Cole, S., Shapiro, J., and Zia, B. (2019). The ABCs of financial education. Experimental evidence on attitudes, behavior, and cognitive biases. *Management Science*, 65(1):346–369.
- Carpena, F. and Zia, B. (2020). The causal mechanism of financial education: Evidence from mediation analysis. *Journal of Economic Behavior and Organization*, 177: 143–184.
- Cole, S., Sampson, T., and Zia, B. (2011). Prices or knowledge? What drives demand for financial services in emerging markets? *Journal of Finance*, 66(6): 1933–1967.
- Cole, S., Paulson, A., and Shastry, G.K. (2016). High school curriculum and financial outcomes: The impact of mandated personal finance and mathematics courses. *Journal of Human Resources*, 51(3): 656–698.

- Deslauriers, L., Schelew, E., and Wieman, C. (2011). Improved learning in a large-enrollment physics class. *Science*, 332(6031): 862–864.
- Deslauriers, L., McCarty, L.S., Miller, K., Callaghan, K., and Kestin, G. (2019). Measuring actual learning versus feeling of learning in response to being actively engaged in the classroom. *Proceedings of the National Academy of Sciences*, 116(39): 19251–19257.
- Doi, Y., McKenzie, D., and Zia, B. (2014). Who you train matters: Identifying combined effects of financial education on migrant households. *Journal of Development Economics*, 109: 39–55.
- Drexler, A., Fischer, G., and Schoar, A. (2014). Keeping it simple: Financial literacy and rules of thumb. *American Economic Journal: Applied Economics*, 6(2): 1–31.
- Fernandes, D., Lynch Jr., J.G., and Netemeyer, R.G. (2014). Financial literacy, financial education, and downstream financial behaviors. *Management Science*, 60(8): 1861–1883.
- Fort, M., Manaresi, F., and Trucchi, S. (2016). Adult financial literacy and households' financial assets: The role of bank information policies. *Economic Policy*, 31(88): 743–782.
- Freeman, S., Eddy, S.L., McDonough, M., Smith, M.K., Okoroafor, N., Jordt, H., and Wenderoth, M.P. (2014). Active learning increases student performance in science, engineering, and mathematics. *Proceedings of the National Academy of Sciences*, 111(23): 8410–8415.
- Hastings, J.S., Madrian, B.C., and Skimmyhorn, W.L. (2013). Financial literacy, financial education, and economic outcomes. *Annual Review of Economics*, 5: 347–373.
- Horn, S., Jamison, J.C., Karlan, D., and Zinman, J. (2020). Does lasting behavior change require knowledge change? Evidence from savings interventions for young adults. NBER Working Paper 28011.
- Iterbeke, K., De Witte, K., Declercq, K., and Schelfhout, W. (2020). The effect of ability matching and differentiated instruction in financial literacy education. Evidence from two randomised control trials. *Economics of Education Review*, forthcoming.
- Kaiser, T., Lusardi, A., Menkhoff, L., and Urban, C.J. (2020). Financial education affects financial knowledge and downstream behaviors. *Journal of Financial Economics*, forthcoming (NBER Working Paper 27057).
- Kaiser, T. and Menkhoff, L. (2017). Does financial education impact financial behavior, and if so, when? *World Bank Economic Review*, 31(3): 611–630.

- Karlan, D. and Valdivia, M. (2011). Teaching entrepreneurship: Impact of business training on microfinance clients and institutions. *Review of Economics and Statistics*, 93(2): 510–527.
- Kling, J.R., Liebman, J.B., and Katz, L.F. (2007). Experimental analysis of neighborhood effects. *Econometrica*, 75(1): 83–119.
- Lusardi, A. and Mitchell, O. S. (2014). The economic importance of financial literacy: Theory and evidence. *Journal of Economic Literature*, 52(1): 5–44.
- Lusardi, A., Samek, A.S., Kapteyn, A., Glinert, L., Hung, A., and Heinberg, A. (2017a). Visual tools and narratives: New ways to improve financial literacy. *Journal of Pension Economics and Finance*, 16(3): 297–323.
- Lührmann, M., Serra-Garcia, M., and Winter, J. (2018). The impact of financial education on adolescents' intertemporal choices. *American Economic Journal: Economic Policy*, 10, 309–322.
- McKenzie, D. (2012). Beyond baseline and follow-up: The case for more T in experiments. *Journal of Development Economics*, 99(2): 210–221.
- Miller, M., Reichelstein, J., Salas, C., and Zia, B. (2015). Can you help someone become financially capable? A meta-analysis of the literature. *World Bank Research Observer*, 30(2): 220–246.
- OECD (2015). National strategies for financial education. OECD/INFE policy handbook, <https://www.oecd.org/finance/National-Strategies-Financial-Education-Policy-Handbook.pdf>.
- Ruiz-Primo, M.A., Briggs, D., Iverson, H., Talbot, R., and Shepard, L.A. (2011). Impact of undergraduate science course innovations on learning. *Science*, 331(6022): 1269–1270.
- Sayinzoga, A., Bulte, E.H., and Lensink, R. (2016). Financial literacy and financial behaviour: Experimental evidence from rural Rwanda. *Economic Journal*, 126(594): 1571–1599.
- Sheridan, B.J. and Smith, B. (2020). How often does active learning actually occur? Perception versus reality, *AEA Papers and Proceedings*, 110: 304–308.
- Skimmyhorn, W.L., Davies, E.R., Mun, D., and Mitchell, B. (2016). Assessing financial education methods: Principles vs. rules-of-thumb approaches. *Journal of Economic Education*, 47(3): 193–210.
- Wieman, C.E. (2014). Large-scale comparison of science teaching methods sends clear message. *Proceedings of the National Academy of Sciences*, 111(23): 8319–8320.

Figure 1: Location and treatment status of clusters



Notes: This map shows the study area in Western Uganda. The main city Fort Portal is located a bit towards the NW of the center of this map. Circles show “control group” locations, triangles indicate “active learning” locations, and squares indicate “lecturing” locations.

Table 1: Sample overview

Wave	Control group	Active learning	Lecture	Total	Attrition (% of baseline)
Baseline	456	414	421	1,291	
Midline	417	384	361	1,162	129 (9.99%)
Endline	239	184	197	620	671 (51.98%)

Notes: Randomization was done in Stata and is fully reproducible. The cluster-level dataset contained one duplicate cluster (market) that was known by two different names in the local languages. Thus, randomization was done with 84 markets. This was discovered only after randomization and initial field activities. The duplicate (which was allocated to the active learning group) was removed *ex post*. The baseline survey was conducted between November 2nd and December 19th, 2015. The midline survey was conducted between April 6th and July 19th of 2016 with additional tracking efforts and surveys in October 2016 and February 2017. The endline survey was conducted in September 2019 (see Timeline Figure A1 in Appendix A).

Table 2: Randomization-balance at baseline

	Full baseline sample (n=1,291)				Endline sample (n=620)			
	Control	Active learning	Lecture	Equality of means (p-val.)	Control	Active learning	Lecture	Equality of means (p-val.)
	Mean (SD)	Mean (SD)	Mean (SD)		Mean (SD)	Mean (SD)	Mean (SD)	
Household size	6.86 (3.52)	7.00 (4.25)	6.64 (3.52)	0.35	7.16 (3.66)	7.08 (4.53)	6.67 (3.54)	0.50
No. of contributors	2.12 (2.01)	2.06 (1.95)	2.19 (1.98)	0.56	2.08 (1.94)	1.92 (1.64)	2.11 (2.00)	0.97
No. of children	4.29 (2.88)	4.29 (3.23)	3.94 (2.75)	0.40	4.50 (3.06)	4.55 (3.44)	3.86 (2.55)	0.12
Monthly consumption ⁺	592,748 (404,893)	617,150 (450,766)	570,268 (372,067)	0.86	625,136 (442,031)	734,024 (559,547)	585,047 (411,224)	
Monthly income ⁺	222,401 (337,539)	203,232 (283,402)	233,565 (355,164)	0.31	254,309 (367,257)	230,246 (311,366)	223,073 (306,436)	0.66
Female	0.80	0.79	0.80	0.98	0.78	0.73	0.78	0.92
Age	37.72 (12.36)	35.38 (11.53)	35.46 (11.60)	0.14	37.90 (11.66)	35.43 (10.70)	37.22 (12.12)	0.57
Education (>primary)	0.28	0.22	0.26	0.56	0.32	0.28	0.28	0.43
Self-control (z)	0.00 (1.00)	0.08 (1.02)	-0.04 (0.99)	0.66	0.10 (1.00)	0.09 (0.99)	-0.01 (1.01)	0.38
Fin. knowledge (z)	0.00 (1.00)	0.11 (0.99)	-0.02 (0.98)	0.86	0.07 (1.00)	0.35 (0.99)	-0.06 (0.92)	0.37
Fin. confidence (z)	0.00 (1.00)	-0.04 (0.97)	-0.13 (0.98)	0.19	0.06 (0.90)	0.07 (0.88)	-0.12 (0.99)	0.38
Cluster size	17.16 (3.90)	16.70 (4.36)	16.36 (4.35)	0.49	16.80 (3.60)	17.52 (4.18)	16.23 (4.31)	0.65
(1) Budgeting index	0.00 (1.00)	-0.10 (0.91)	0.04 (0.97)	0.68	-0.01 (1.03)	0.02 (0.97)	0.05 (0.97)	0.57
(2) Savings index	0.00 (1.00)	0.10 (1.12)	0.11 (1.01)	0.25	0.09 (0.98)	0.24 (1.24)	0.16 (1.05)	0.58
(3) Borrowing index	0.00 (1.00)	0.03 (1.24)	0.11 (1.39)	0.25	0.03 (1.01)	0.07 (1.34)	0.04 (1.35)	0.89
(4) Investment index	0.00 (1.00)	-0.04 (1.04)	0.04 (1.05)	0.72	0.16 (1.11)	0.17 (1.17)	0.10 (1.07)	0.71
(5) Fin. service index	0.00 (1.00)	-0.03 (0.99)	0.10 (1.07)	0.35	0.14 (1.06)	0.18 (1.05)	0.13 (1.03)	0.95
(6) Summary index	0.00 (1.00)	-0.01 (1.10)	0.14 (1.18)	0.24	0.14 (1.04)	0.24 (1.23)	0.17 (1.13)	0.84
Joint orthogonality (p-val.)				0.15				0.68

Notes: ⁺ indicates that the currency denominated outcome (in Ugandan Shilling (UGX)) is winsorized at the 99th percentile. The F-test of joint orthogonality regresses a categorical variable indicating the three groups on the full set of variables. Standard errors are clustered at the market-level. Tests are unadjusted for multiple hypothesis testing.

Table 3: Results on process outcomes at midline

	(1) Fin. literacy (z)	(2) Self-control (z)	(3) Fin. confidence (z)
Active learning	0.090 (0.077)	0.143* (0.079)	0.147* (0.084)
Lecture	0.064 (0.073)	-0.055 (0.091)	0.169** (0.086)
$A - B = 0$ (p-value)	0.761	0.029**	0.800
Mean (SD) of y_t in control	0.000 (1.000)	0.000 (1.000)	0.000 (1.000)
Observations	1,162	1,162	1,162
Clusters	83	83	83

Notes: Table shows WLS regression results weighted by the inverse probability of selection into the midline sample. All models include the lagged outcome (y_{t-1}) at baseline and district-level fixed effects. Standard errors (clustered at the market-level) are reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 4: Ratings of training and teacher quality at endline

	(1) Overall training quality	(2) Overall satisfaction	(3) Teacher motivation	(4) Interested in another training
Active learning	0.057 (0.212)	0.233 (0.187)	0.122 (0.225)	-0.002 (0.036)
Mean (SD) of y_t in Lecture group	6.982 (1.518)	7.089 (1.634)	7.006 (1.734)	0.867
Observations	381	381	381	381
Clusters	55	55	55	55

Notes: Table shows WLS regression results weighted by the inverse probability of selection into the endline sample. All models include district-level fixed effects. Standard errors (clustered at the market-level) are reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 5: Treatment effects on indices at midline

	(1)	(2)	(3)	(4)	(5)	(6)
	Budgeting index (z)	Savings index (z)	Borrowing index (z)	Investment index (z)	Fin. services index (z)	Summary index (z)
Active learning	0.052 (0.089)	0.151** (0.073)	-0.021 (0.066)	0.261*** (0.089)	0.098 (0.082)	0.194** (0.082)
Lecture	0.009 (0.087)	0.017 (0.081)	-0.079 (0.078)	0.112 (0.090)	0.164* (0.097)	0.059 (0.078)
$A - B = 0$ (p)	0.641	0.139	0.479	0.121	0.507	0.117
Mean (SD) of y_t in control group	0.000 (1.000)	0.000 (1.000)	0.000 (1.000)	0.000 (1.000)	0.000 (1.000)	0.000 (1.000)
Observations	1,162	1,162	1,162	1,162	1,162	1,162
Clusters	83	83	83	83	83	83

Notes: The dependent variables (y_t) are equally weighted z-score indices of financial behaviors and are standardized to have a zero mean and a standard deviation of one for the control group. All currency denominated outcomes (in Ugandan Shilling (UGX)) within the indices in columns (2), (3) and (4) are winsorized at the 99th percentile. Column (6) shows results for an equally weighted z-score index of all five financial behavior indices. All models include the lagged outcome at baseline and district-level fixed effects. Regressions are weighted by the inverse of the estimated probability of selection into the midline survey. Standard errors (clustered at the market-level) are reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 6: Mid- and endline results on selected index components

	(1)	(2)	(3)	(4)	(5)
	Any savings	Total savings ⁺	Total investments ⁺	Ever used mobile money	Ever late payment on loan
Panel A: Short-term treatment effects (after six months) (n=1,162)					
Active learning	0.037 (0.026)	106,137* (62,805)	94,791*** (34,137)	0.053 (0.038)	0.079** (0.035)
Lecture	0.043 (0.029)	-23,774 (60,615)	50,298 (43,359)	0.048 (0.042)	-0.009 (0.035)
$A - B = 0$ (p)	0.812	0.066*	0.324	0.913	0.015**
Mean (SD) of y_t control	0.852	510,357 (926,964)	266,940 (503,136)	0.439	0.266
Observations	1,162	1,162	1,162	1,162	1,162
Clusters	83	83	83	83	83
Panel B: Long-term treatment effects (after 3.5 years) (n=620)					
Active learning	0.003 (0.029)	448,510 (294,101)	453,329* (247,896)	0.111 (0.067)	0.160** (0.069)
Lecture	0.025 (0.027)	243,740 (228,128)	64,294 (187,132)	0.035 (0.073)	0.130* (0.076)
$A - B = 0$ (p)	0.481	0.560	0.180	0.279	0.697
Mean (SD) of y_{t+1} control	0.921	839,431 (1356,715)	747,040 (1170,581)	0.541	0.498
Observations	620	620	620	620	620
Clusters	83	83	83	83	83

Notes: Columns (1), (4) and (5) are linear probability models. All models include the lagged outcome (y_{t-1}) at baseline as well as district-level fixed effects. ⁺ indicates that the outcome (in Ugandan Shilling (UGX)) is winsorized at the 99th percentile. Means and SD in control are weighted by the inverse of the estimated probability of selection into survey round. Regression estimates are weighted by the inverse of the estimated probability of selection into the endline survey. Standard errors (clustered at the market-level) are reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Appendix

(online appendix not intended for print publication)

to accompany

**“Active learning improves financial education:
Experimental evidence from Uganda”**

Appendix A: Supplementary tables and figures

Appendix B: Robustness checks

Appendix A: Supplementary tables and figures

Figure A1: Timeline

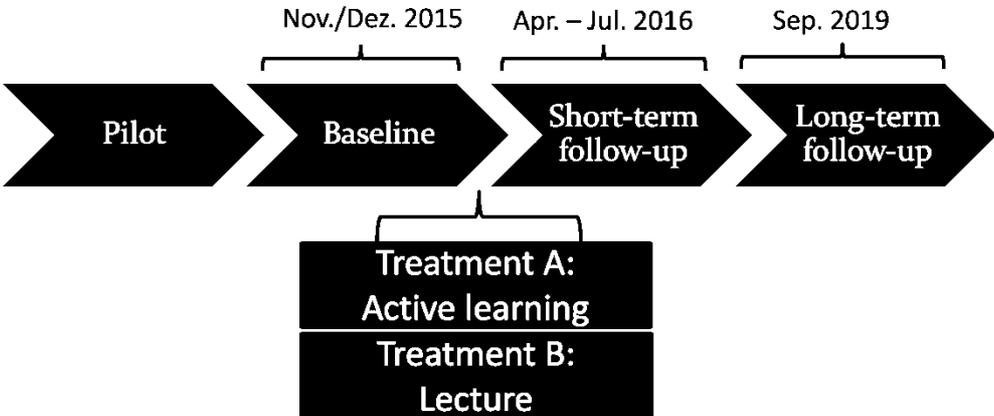


Table A1: Overview of financial education treatments

Topic		Active learning		Traditional lecturing	
		Time (mins)	Activity	Time (mins)	Activity
1	Personal financial management	3	The trainer introduces the topic by asking the participants what they think is involved in personal finance.	20	<p>The lecturer writes the headings of each topic on a flip chart and <u>tells the participants</u> about the learning objectives of the lecture.</p> <p>Learning objectives of the first topic are:</p> <ul style="list-style-type: none"> - The participants are able to differentiate between inflows and outflows - The participants are able to differentiate between wants and needs - The participants know how to create a simple budget
		10	The trainer reads out a case study of a family with five children, three sources of income and several expenditures. The trainer explains the concept of the “money tree” (metaphor for household budget) with a display and invites participants to identify the family’s inflows (roots) and outflows (leaves) and to place them on the “money tree”. The trainer <u>asks the participants to calculate</u> the total amounts of income and expenditures. Total expenditures are larger than total incomes.		
		5	The trainer asks the participants what they notice about the family’s money tree (defining the problem of overspending) and what could be done about it. The trainer then introduces the concept of needs and wants and <u>asks participants to differentiate</u> between what they consider are the family’s “needs” and “wants” and to remove the wants from the money tree and cluster them elsewhere.		
		4	The trainer introduces the new family budget (after removing the “wants”) and links it to the money tree. A picture of a written household budget is shown to the participants and the trainer <u>asks the participants to give their views</u> on how the family could spend the resulting surplus.		
		3	The session is being wrapped up by <u>asking the participants how they would rate</u> the importance of financial management and whether the introduced concepts are relevant for their own lives.		
2	Savings	3	The trainer, again, refers to the case of the hypothetical family and pins up a definition of “saving” followed by <u>personal questions to the participants</u> : Who is saving? What are you saving for? How often are you saving? Why are you saving? Trainer pins mentioned reasons on a poster and adds those mentioned and notion model cards.	5	<p><u>The lecturer asks</u> the participants whether they have questions or comments.</p>
		8	The trainer introduces different ways to save (account, cash, durables,...) and explains that each way of saving comes with a specific “ease of access and return” profile and that these generally resemble conflicting goals. The trainer now <u>asks the participants to indicate their preferences</u> with regard to this trade-off by means of <u>placing themselves on a line on the floor</u> where the far left of the continuum indicates “easy to access” and the far right indicates “high return”. Trainer <u>asks the participants to share the rationale behind their decisions</u> . The trainer now chooses one example of saving forms at a time and asks participants where they would place the different examples of ways of saving. The trainer encourages discussion about these decisions.		
		9	The trainer reads statements on “saving” and <u>asks the participant to cross out wrong statements</u> . This results in a collection of ten		
		3		20	<p><u>The lecturer writes</u> the topic of this section on a flip chart and defines the learning objectives:</p> <ul style="list-style-type: none"> - The participants know the meaning of savings - The participants know at least 3 ways to save - The participants know at least 2 benefits of savings - The participants know the trade-off between ease of access (liquidity) and return <p><u>The lecturer writes</u> the following keywords on a flipchart and discusses the topics with the participants.</p> <ul style="list-style-type: none"> - Saving in kind vs. in cash - <u>Conflicting savings-goals</u>: - safety - return - ease of access <p><u>The lecturer draws</u> a line on the flipchart, illustrating the ease of access and return trade-off. <u>The lecturer illustrates</u> this using the examples of 'money under the mattress' and 'money in a fixed deposit account' on the line.</p>
		5	The trainer reads statements on “saving” and <u>asks the participant to cross out wrong statements</u> . This results in a collection of ten	5	The lecturer asks the participants whether they have questions or comments.

		statements on the benefits of savings which are subsequently repeated.		
3	Borrowing	5	20	<p>The trainer <u>asks the participants to share their experiences</u> with loans and subsequently displays a card with a formal definition of a loan.</p> <p>The lecturer writes the topic of this section on a flip chart and defines the learning objectives:</p> <ul style="list-style-type: none"> - The participants are able to differentiate between a sensible and non-sensible reasons to take up a loan - The participants know typical direct and indirect costs of borrowing
		5		<p>The trainer refers to the hypothetical family and adds more detail to their financial situation. The <u>participants are asked to identify</u> three things that the hypothetical family plans to borrow money for (consumption vs. productive investments).</p> <p>The lecturer writes the following keywords on a flipchart and discusses the topics with the participants:</p> <ul style="list-style-type: none"> - <u>Reasons for borrowing:</u> - to finance productive investments - to finance consumption goods - to cater for emergencies
		7		<p>The trainer asks the participant what they consider sensible and non-sensible reasons to take up a loan. The <u>participants use cards with example pictures and cluster these</u> on a poster into the two categories. Loans are evaluated on the basis on whether they may put to productive use. <u>Participants agree on the advice they would give</u> this family on which loan to take and which loan not to take.</p> <p><u>The cost of borrowing</u></p> <ul style="list-style-type: none"> - Direct costs vs. indirect costs of borrowing <p>Questions to ask a lender before taking up a loan:</p> <ul style="list-style-type: none"> - Interest rate - Collateral - Installments (how much, how often) - Penalties for delinquency
		4	5	<p>The trainer informs the group that a loan comes with (direct and indirect) costs and is usually tied to specific conditions. <u>The participants are asked to place cards</u> with the various costs of borrowing on the poster.</p> <p>The trainer concludes with the station and asks whether the participants have any further questions regarding borrowing. The trainer cautions the participants against the use of expensive credit to finance consumption expenditures.</p> <p>The lecturer asks the participants whether they have questions or comments.</p>
		2		<p>The trainer concludes with the station and asks whether the participants have any further questions regarding borrowing. The trainer cautions the participants against the use of expensive credit to finance consumption expenditures.</p>
4	Investment	4	20	<p>The trainer pins up a card with the word “investment” and <u>asks the participants for a definition</u>. The trainer complements this discussion with a formal definition.</p> <p>The lecturer writes the topic of this section on a flip chart and defines the learning objectives:</p> <ul style="list-style-type: none"> - The participants know what an investment is - The participants know different forms of investment - The participants know the trade-off between safety (minimal risk) and return
		13		<p>The trainer requests the participants to reflect on the discussion they have just had about and <u>asks the participants to share their experiences</u> with regard to investments they have made themselves. The trainer then introduces illustrative cards that display either consumption or investment activities and <u>asks participant to assess</u> whether the cards indicate productive investments.</p> <p>The lecturer writes the following keywords on a flipchart and discusses the topics with the participants:</p> <p><u>Forms of investments:</u></p> <ul style="list-style-type: none"> - Animals - Land - Business (own and other’s) - Buildings <p><u>Why invest?</u></p> <ul style="list-style-type: none"> - Create wealth and security - Increase the ability to earn more income - Planning for old age - Create employment opportunities for oneself and others - Short term investment examples
				<p>The trainer informs participants that each form of investment comes with a unique “safety-return” profile. “Safety” and “return” represent conflicting goals and that an investment always comes with certain risks. The trainer now <u>asks the participants to indicate their preferences with regard to this trade-off by means of placing themselves on a line</u> where the far left of the continuum indicates “safety” and the far right indicates “high return”. Trainer asks the participants to <u>share the rationale behind their decisions</u>.</p> <p>The trainer now chooses one example of investment forms at a time and asks participants where they would place the different examples of ways of investing. The trainer <u>encourages discussion about these decisions</u>.</p>

	8	<p>The trainer refers to the case of the hypothetical family and asks the participants to summarize the investment decisions the family has taken. <u>The trainer asks the participants to summarize the associated risks and benefits of these investment decisions.</u></p> <p>The trainer asks the participants whether they are aware of strategies to manage these risks. Afterwards he introduces the notion of formal and informal insurance, as well as insurance through diversification.</p>	<ul style="list-style-type: none"> - Medium term investment examples - Long term investment examples <p><u>Investment Risks:</u></p> <ul style="list-style-type: none"> - Loss of value (depreciation) - Theft - Mismanagement - Assets destroyed or damaged <p>The lecturer draws a line on the flipchart, illustrating the ease of “safety” and “return” trade-off. The lecturer illustrates this using the examples of “land” and “livestock” on the line.</p> <p><u>Risk management strategies:</u></p> <ul style="list-style-type: none"> - Diversification (“do not put all eggs in one basket”) - Formal and informal insurance: - Insurance premium - Insurance coverage - Insurance contract
Financial service providers <i>-continued-</i>	6	<p>The trainer refers to the hypothetical case of the family and <u>asks the participants to name institutions</u> where the family could save money at. The trainer classifies these answers into regulated and non-regulated institutions (by the central bank).</p>	<p>5</p> <p>The lecturer asks the participants whether they have questions or comments.</p> <p>20</p> <p>The lecturer writes the topic of this section on a flip chart and defines the learning objectives:</p> <ul style="list-style-type: none"> - The participants know the difference between regulated and unregulated financial service providers - The participants know rights and responsibilities of financial service users - The participants know different options to make money-transfers and payments
	6	<p>The trainer discusses advantages and disadvantages of financial institutions regulated or not-regulated by the central bank and <u>asks the participants to give the hypothetical family advice</u> on where to save the money.</p>	<p>The lecturer writes the following keywords on a flipchart and discusses the topics with the participants:</p> <p>Classification of financial services sector in Uganda:</p> <ul style="list-style-type: none"> - Tier i - Commercial Banks - Tier ii – Credit Institutions - Tier iii – Micro Deposit Taking Institutions - Tier iv – Other Financial Institutions (e.g. VSLAs, ROSCA Unregulated vs. regulated by the Bank of Uganda (Tier i to iii))
	7	<p>Trainer introduces the aspect of rights and responsibilities of consumers of financial services. The trainer informs participants that they have rights and responsibilities as Financial service consumers/users. The trainer asks the <u>participants to complete a true/false exercise</u> on statements related to consumer protection rights.</p>	<ul style="list-style-type: none"> - Rights and responsibilities of consumers - <u>Payments:</u> - Understanding the costs involved - Keeping ones personal information secure - Make safer payments (track who got it) - Mobile money & transaction costs - Automated Teller Machines (ATMs)
	5	<p>The trainer moves to a discussion of payment services and <u>asks the participants to name different ways of transferring money</u> (i.e. for remittances) and asks the participants to discuss the costs attached to these services.</p> <p>The trainer closes the station by encouraging the participants to compare prices and to analyze all options available to them to make sound financial decisions.</p>	<p>5</p> <p>The lecturer asks the participants whether they have questions or comments.</p>

Table A2: Predictors of selection into survey round

	l= reached at midline survey	l= reached at endline survey
Active learning	0.257 (0.341)	-0.321* (0.172)
Lecture	-0.522* (0.288)	-0.342** (0.170)
Household size	0.026 (0.038)	-0.021 (0.021)
No. of contributors	-0.109*** (0.037)	-0.060** (0.030)
No. of children	0.086 (0.063)	0.042 (0.030)
Monthly consumption ⁺	0.000 (0.000)	0.000*** (0.000)
Monthly income ⁺	-0.000 (0.000)	-0.000 (0.000)
Female	0.491* (0.259)	0.058 (0.179)
Age	0.019* (0.011)	0.007 (0.005)
Education (>primary)	-0.113 (0.242)	0.315* (0.163)
Self-control (z)	-0.121 (0.104)	0.101 (0.063)
Fin. numeracy (z)	0.226* (0.125)	0.062 (0.065)
Fin. confidence (z)	0.113 (0.117)	0.069 (0.066)
Cluster size	0.011 (0.029)	0.036* (0.019)
Budgeting index	-0.044 (0.112)	-0.010 (0.072)
Savings index	0.237*** (0.090)	0.078 (0.071)
Borrowing index	0.062 (0.094)	-0.021 (0.061)
Investment index	-0.123 (0.110)	0.068 (0.075)
Fin. service index	0.023 (0.093)	0.126** (0.061)
Pseudo R ²	0.092	0.093
District FEs	yes	yes
n (Individuals)	1,291	1,291
n (Clusters)	83	83

Notes: Results from logit models and show coefficients as logged odds with standard errors (clustered at the market-level) in parentheses. Missing indicators are omitted from the models, as two variables with low proportions of missing values (“No. of contributors” 1.08 percent and “No. of children”, 1.39 percent missing values) appear to predict selection into midline perfectly, resulting in 29 observations being omitted. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A3: Descriptive statistics and randomization balance for midline sample at baseline

	Full baseline sample (n=1,291)				Midline sample (n=1,162)			
	Control	Active learning	Lecture	Equality of means (p-val.)	Control	Active learning	Lecture	Equality of means (p-val.)
Household size	6.86 (3.52)	7.00 (4.25)	6.64 (3.52)	0.35	6.84 (3.67)	6.76 (4.29)	6.61 (3.74)	0.39
No. of contributors	2.12 (2.01)	2.06 (1.95)	2.19 (1.98)	0.56	2.04 (1.91)	2.02 (1.95)	2.12 (1.90)	0.39
No. of children	4.29 (2.88)	4.29 (3.23)	3.94 (2.75)	0.40	4.32 (2.95)	4.26 (3.18)	4.01 (2.83)	0.50
Monthly consumption ⁺	592,748 (404,893)	617,150 (450,766)	570,268 (372,067)	0.86	592,935 (412,093)	623,786 (453,482)	571,278 (380,471)	0.67
Monthly income ⁺	222,401 (337,539)	203,232 (283,402)	233,565 (355,164)	0.31	218,343 (340,230)	197,598 (280,814)	215,774 (331,427)	0.69
Female	0.80	0.79	0.80	0.98	0.78	0.77	0.80	0.97
Age	37.72 (12.36)	35.38 (11.53)	35.46 (11.60)	0.14	37.54 (12.83)	35.17 (11.69)	35.92 (12.38)	0.32
Education (>primary)	0.28	0.22	0.26	0.56	0.27	0.22	0.25	0.47
Self-control (z)	0.00 (1.00)	0.08 (1.02)	-0.04 (0.99)	0.66	0.00 (1.00)	0.08 (1.02)	-0.09 (0.97)	0.57
Fin. literacy (z)	0.00 (1.00)	0.11 (0.99)	-0.02 (0.98)	0.86	0.02 (1.00)	0.12 (0.95)	0.01 (0.97)	0.95
Fin. confidence (z)	0.00 (1.00)	-0.04 (0.97)	-0.13 (0.98)	0.19	-0.01 (0.88)	-0.03 (0.86)	-0.06 (0.88)	0.39
Cluster size	17.16 (3.90)	16.70 (4.36)	16.36 (4.35)	0.49	17.12 (3.83)	16.84 (4.26)	16.20 (4.40)	0.43
(1) Budgeting index	0.00 (1.00)	-0.10 (0.91)	0.04 (0.97)	0.68	-0.01 (1.00)	-0.10 (0.91)	0.02 (0.97)	0.75
(2) Savings index	0.00 (1.00)	0.10 (1.12)	0.11 (1.01)	0.25	0.03 (1.02)	0.12 (1.14)	0.10 (1.01)	0.45
(3) Borrowing index	0.00 (1.00)	0.03 (1.24)	0.11 (1.39)	0.25	0.01 (0.95)	0.02 (1.25)	0.11 (1.34)	0.31
(4) Investment index	0.00 (1.00)	-0.04 (1.04)	0.04 (1.05)	0.72	0.00 (1.00)	-0.03 (1.05)	0.04 (1.02)	0.77
(5) Fin. service index	0.00 (1.00)	-0.03 (0.99)	0.10 (1.07)	0.35	0.00 (1.00)	-0.03 (0.98)	0.11 (1.08)	0.35
(6) Summary index	0.00 (1.00)	-0.01 (1.10)	0.14 (1.18)	0.24	0.01 (0.97)	-0.01 (1.11)	0.14 (1.14)	0.31
Joint orthogonality (p-val.)	0.15				0.30			

Notes: ⁺ indicates that the currency denominated outcome (in Ugandan Shilling (UGX)) is winsorized at the 99th percentile. The F-test of joint orthogonality regresses a categorical variable indicating the three groups on the full set of variables. Standard errors are-clustered at the market-level. Tests are unadjusted for multiple hypothesis testing.

Table A4: Descriptive statistics for process outcome variables at baseline

	Control	Active learning	Lecture	Equality of means
	Mean (SD)	Mean (SD)	Mean (SD)	(p-val.)
(1) Fin. literacy (z-score)	0.00 (1.00)	0.11 (0.99)	-0.02 (0.98)	0.86
Item 1	0.50 (0.50)	0.57 (0.50)	0.52 (0.50)	0.15
Item 2	0.66 (0.47)	0.68 (0.47)	0.67 (0.47)	0.18
Item 3	0.65 (0.48)	0.62 (0.49)	0.65 (0.48)	0.19
Item 4	0.43 (0.50)	0.42 (0.49)	0.46 (0.50)	0.17
Item 5	0.44 (0.50)	0.53 (0.50)	0.49 (0.50)	0.07
(2) Fin. confidence (z-score)	0.00 (1.00)	-0.04 (0.97)	-0.13 (0.98)	0.19
Item 1	0.41 (0.49)	0.40 (0.49)	0.39 (0.49)	0.27
Item 2	2.56 (0.69)	2.53 (0.71)	2.50 (0.75)	0.55
Item 3	2.56 (0.67)	2.53 (0.69)	2.49 (0.73)	0.51
Item 4	0.59 (0.49)	0.60 (0.49)	0.56 (0.50)	0.79
(3) Self-control (z-score)	0.00 (1.00)	0.08 (1.02)	-0.04 (0.99)	0.66
F-test of joint orthogonality (p-value)				0.44

Notes: For wording of financial numeracy items see Table A14. Fin. confidence is an aggregate measure (equally weighted z-score index of its components and standardized to have a zero mean and a SD of one for the control group) of the following four items: (i) “In case you are dissatisfied with a financial service provider and you complain, do you think that the financial service provider is more powerful than you, and that the complaint will therefore not lead to anything?” (y/n). (ii) “I am confident enough to approach a bank and ask questions to learn more about their products.” (disagree strongly – agree strongly). (iii) “I am confident that among a range of loans offered by different banks, I can choose the loan that best suits my specific needs” (disagree strongly – agree strongly). (iv) Which of the following statements best describes how you last chose a financial product? (a) I considered several products from different companies before making my decision. (b) I considered the various products from one company. (c) I didn’t consider any other products at all (d) I looked around but there were no other products to consider. Category (a) is coded as a binary variable. Self-control is assessed through the following survey question: “If you get money, do you tend to spend it too quickly? (a) often (b) sometimes (c) rarely (d) never. Standard errors are clustered at the market-level. Tests are unadjusted for multiple hypothesis testing. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A5: Descriptive statistics for components of outcome indices at baseline

	Control	Active learning	Lecture	Equality of means (p-val.)
	Mean (SD)	Mean (SD)	Mean (SD)	
(1) Budgeting index	0.00 (1.00)	-0.10 (0.91)	0.04 (0.97)	0.68
Knows how to write a budget	0.12 (0.33)	0.10 (0.31)	0.10 (0.30)	
Usually keeps track of spending	0.59 (0.49)	0.59 (0.49)	0.64 (0.48)	
Separates business and private budget	0.32 (0.47)	0.28 (0.45)	0.36 (0.48)	
Keeps a written budget	0.24 (0.43)	0.20 (0.40)	0.25 (0.43)	
Has kept track of spending in last 6 month	0.24 (0.43)	0.20 (0.40)	0.24 (0.43)	
(2) Savings index	0.00 (1.00)	0.10 (1.12)	0.11 (1.01)	0.25
Any savings	0.78 (0.42)	0.78 (0.41)	0.81 (0.40)	
Total savings+	336,102 (667,250)	409,960 (845,120)	396,865 (770,338)	
Net savings+	224,729 (760,300)	294,348 (821,473)	264,296 (723,618)	
(3) Borrowing index	0.00 (1.00)	0.03 (1.24)	0.11 (1.39)	0.25
Loans for consumption+	3,592 (24,862)	5,219 (30,854)	5,634 (32,290)	
Loans for productive investment+	151,022 (387,398)	164,710 (419,685)	193,943 (493,829)	
Debt to asset ratio (z)	0.00 (1.00)	0.00 (0.84)	0.05 (0.96)	
Loan if no clear plan	0.01 (0.10)	0.03 (0.18)	0.05 (0.22)	
Can identify "bad" loan	0.89 (0.31)	0.84 (0.36)	0.86 (0.34)	
Ever late payment on loan	0.243 (0.430)	0.256 (0.437)	0.287 (0.453)	
(4) Investment index	0.00 (1.00)	-0.04 (1.04)	0.04 (1.05)	0.72
Total investments+	395,130 (753,875)	418,060 (842,834)	447,655 (823,972)	
Total number of items owned	51.32 (35.58)	46.95 (30.50)	48.80 (28.61)	
Business formally registered	0.228 (0.430)	0.241 (0.428)	0.266 (0.442)	
(5) Fin. services index	0.00 (1.00)	-0.03 (0.99)	0.10 (1.07)	0.35
Ever purchased a formal Insurance product	0.07 (0.25)	0.06 (0.24)	0.08 (0.27)	
Ever used mobile money	0.45 (0.50)	0.44 (0.50)	0.50 (0.50)	

Notes: + indicates that the currency denominated outcome (in Ugandan Shilling (UGX)) is winsorized at the 99th percentile. Standard errors are clustered at the market-level. Tests are unadjusted for multiple hypothesis testing.

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

Table A6: Analysis of effects on individual items in the financial literacy score

	(1) Item 1	(2) Item 2	(3) Item 3	(4) Item 4	(5) Item 5
Active learning	0.066 (0.041)	0.013 (0.033)	-0.014 (0.028)	-0.014 (0.038)	0.081** (0.035)
Lecture	0.016 (0.043)	0.004 (0.029)	-0.001 (0.031)	0.031 (0.048)	0.041 (0.034)
$A - B = 0$ (p-value)	0.187	0.757	0.699	0.301	0.330
Mean of y_t in control group	0.509	0.669	0.642	0.459	0.495
Observations	1,162	1,162	1,162	1,162	1,162
Clusters	83	83	83	83	83
District FEs	yes	Yes	yes	yes	yes
$y_{(t-1)}$ covariate	yes	yes	yes	yes	yes

Notes: See questions and definitions in Table A14. Table shows WLS regression results weighted by the inverse probability of selection into the midline sample. Coefficients show results from linear probability models. All models include the lagged outcome at baseline and district-level fixed effects. Standard errors (clustered at the market-level) are reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A7: Analysis of effects on individual items in the financial confidence score

	(1) Item 1	(2) Item 2	(3) Item 3	(4) Item 4
Active learning	0.018 (0.052)	0.076 (0.059)	0.087 (0.060)	0.036 (0.040)
Lecture	-0.034 (0.052)	0.087 (0.060)	0.091 (0.056)	0.093** (0.042)
$A - B = 0$ (p-value)	0.336	0.839	0.951	0.115
Mean (SD) of y_t in control group	0.418	2.496 (0.713)	2.476 (0.738)	0.604
Observations	1,162	1,162	1,097	1,136
Clusters	83	83	83	83
District FEs	yes	Yes	yes	yes
$y_{(t-1)}$ covariate	yes	yes	yes	yes

Notes: See definitions in Table A4. Table shows WLS regression results weighted by the inverse probability of selection into the midline sample. Coefficients show results from linear probability models. All models include the lagged outcome at baseline and district-level fixed effects. Standard errors (clustered at the market-level) are reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A8: Impact of financial education treatments on individual-level income and household-level consumption

	(1) Income ⁺	(2) Consumption ⁺
Active learning	-9,071 (38,940)	-21,522 (35,601)
Lecture	-22,470 (47,214)	-18,967 (30,735)
$A - B = 0$ (p-value)	0.763	0.946
R ²	0.110	0.258
Mean (SD) of y_t in control group	385,181 (560,777)	709,744 (483,259)
Observations	1,136	1,162
Clusters	83	83
District FEs	yes	Yes
$y_{(t-1)}$ covariate	yes	yes

Notes: Table shows OLS regression results of ANCOVA models. + indicates that the outcome (in Ugandan Shilling (UGX)) is winsorized at the 99th percentile. All models include the lagged outcome at baseline and district-level fixed effects. Standard errors (clustered at the market-level) are reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A9: Budgeting index - individual components

	(1) Knows how to write a budget	(2) Usually keeps track of spending	(3) Separates business and private budget	(4) Keeps a written budget	(5) Has kept track of spending in last 6 month
Active learning	0.004 (0.025)	0.043 (0.040)	0.050 (0.038)	-0.015 (0.037)	-0.011 (0.036)
Lecture	-0.046** (0.021)	0.038 (0.039)	0.062 (0.043)	-0.006 (0.034)	0.001 (0.034)
$A - B = 0$ (p-value)	0.015**	0.893	0.787	0.801	0.724
Mean of y_t in control group	0.097	0.667	0.454	0.287	0.277
Observations	1,162	1,160	1,153	1,157	1,156
Clusters	83	83	83	83	83
District FEs	yes	yes	yes	yes	yes
$y_{(t-1)}$ covariate	yes	yes	yes	yes	yes

Notes: Coefficients show results from linear probability models. All models include the lagged outcome at baseline and district-level fixed effects. Standard errors (clustered at the market-level) are reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A10: Savings index - individual components

	(1) Any savings	(2) Total savings ⁺	(3) Net savings ⁺
Active learning	0.034 (0.022)	100,254.155 (63,986.913)	135,741.583** (63,605.581)
Lecture	0.027 (0.025)	-23,495.884 (68,861.157)	-6,718.931 (67,170.925)
$A - B = 0$ (p-value)	0.759	0.094*	0.049**
Mean (SD) of y_t in control group	0.852	510,283 (927,228)	379,655 (963,133)
Observations	1,162	1,162	1,162
Clusters	83	83	83
District FEs	yes	yes	yes
$y_{(t-1)}$ covariate	yes	yes	yes

Notes: Table shows WLS regression results weighted by the inverse probability of selection into the midline sample. Columns (1) is a linear probability model. All models include the lagged outcome at baseline and district-level fixed effects. + indicates that the outcome (in Ugandan Shilling (UGX)) is winsorized at the 99th percentile. Standard errors (clustered at the market-level) are reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A11: Borrowing index – individual components

	(1) Debt to asset ratio (z-score)*	(2) Loans for consumpti on*	(3) Loans for productive investment	(4) Can correctly identify a “bad” loan	(5) Would take loan if no clear plan*	(6) Ever late payment on loan*
Active learning	-0.079 (0.063)	2,335 (5,662)	-13,599 (36,749)	-0.001 (0.010)	-0.049** (0.023)	0.091** (0.037)
Lecture	0.036 (0.091)	13,215 (9,039)	-41,219 (37,141)	0.003 (0.010)	-0.033 (0.022)	0.003 (0.036)
$A - B = 0$ (p-value)	0.204	0.212	0.420	0.754	0.505	0.016**
Mean (SD) of y_t in control group	0.000 (1.000)	21,863 (100,814)	202,821 (479,976)	0.029	0.139	0.266
Observations	1,162	1,162	1,162	1,162	1,143	1,162
Clusters	83	83	83	83	83	83
District FEs	yes	yes	yes	yes	yes	yes
$y_{(t-1)}$ covariate	yes	yes	yes	yes	yes	yes

Notes: Table shows WLS regression results weighted by the inverse probability of selection into the midline sample. Columns (4) and (5) are linear probability models. Dependent variable in Column (1) reports the ratio between debt and household assets and is transformed to a z-score. I Column (2) is the amount credit intended for consumption purposes. Dependent variable in Column (3) is debt intended for productive investments. Dependent variables in Columns (4) and (5) are binary items reporting whether a respondent would be willing to take up a loan if he or she had no plans on how to use the money or whether a respondent can separate between good and bad reasons to take up a loan as stated in a hypothetical example. Items marked with an asterisk (*) are later rescaled for the composition of the index such that positive values indicate better outcomes and vice versa. All models include the lagged outcome at baseline and district-level fixed effects. + indicates that the currency denominated outcome (in Ugandan Shilling (UGX)) is winsorized at the 99th percentile. Standard errors (clustered at the market-level) are reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A12: Investment index – individual components

	(1) Total investments ⁺	(2) Business formally registered	(3) Total number of durable items owned
Active learning	94,487.395** (43,563.663)	0.084** (0.034)	5.274** (2.008)
Lecture	51,119.578 (56,228.535)	0.059 (0.037)	2.131 (1.736)
$A - B = 0$ (p-value)	0.484	0.491	0.098*
Mean (SD) of y_t in control group	299,826 (494,339)	0.232	51.225 (34.200)
Observations	1,162	1,144	1,162
Clusters	83	83	83
District FEs	yes	yes	yes
$y_{(t-1)}$ covariate	yes	yes	yes

Notes: Table shows WLS regression results weighted by the inverse probability of selection into the midline sample. Column (2) is a linear probability models. All models include the lagged outcome at baseline and district-level fixed effects. + indicates that the outcome (in Ugandan Shilling (UGX)) is winsorized at the 99th percentile. Standard errors (clustered at the market-level) are reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A13: Financial services index – individual components

	(1) Ever purchased a formal insurance product	(2) Has ever used mobile money
Active learning	0.004 (0.026)	0.061 (0.038)
Lecture	0.051 (0.035)	0.034 (0.048)
$A - B = 0$ (p-value)	0.135	0.570
Mean of y_t in control group	0.099	0.439
Observations	1,156	1,162
Clusters	83	83
District FEs	yes	yes
$y_{(t-1)}$ covariate	yes	yes

Notes: Table shows WLS regression results weighted by the inverse probability of selection into the midline sample. Coefficients show results from linear probability models. All models include the lagged outcome at baseline and district-level fixed effects. Standard errors (clustered at the market-level) are reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A14: Debt taking behavior – additional results

	(1) Number of loans taken since baseline	(2) Total debt volume ⁺	(3) Total amount repaid ⁺
Active learning	0.056 (0.053)	-14,556 (31,996)	6,371 (13,512)
Lecture	-0.087* (0.049)	-13,965 (32,119)	1,874 (14,358)
$A - B = 0$ (p-value)	0.009***	0.986	0.746
Mean of y_t in C	0.537 (0.604)	207,992 (408,500)	77,931 (221,046)
Obs.	1,162	1,162	1,162
Clusters	83	83	83
District FEs	yes	yes	yes
$y_{(t-1)}$ covariate	no	yes	yes

Notes: All models include district-level fixed effects. + indicates that the outcome (in Ugandan Shilling (UGX)) is winsorized at the 99th percentile. Standard errors (clustered at the market-level) are reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A15: Correlation of selected outcomes at midline and endline survey

	(1) Total savings at midline ⁺	(2) Total Investments at midline ⁺	(1) Total savings at endline ⁺	(2) Total Investments at endline ⁺	Late payment (midline)	Late payment (endline)
Total savings at midline ⁺	1					
Total Investments at midline ⁺	0.228***	1				
Total savings at endline ⁺	0.175***	0.234***	1			
Total Investments at endline	0.337***	0.217***	0.348***	1		
Late payment (midline)	-0.004	0.039	0.034	-0.075*	1	
Late payment (endline)	0.015	0.062	-0.021	-0.019	0.152***	1

Notes: This table shows pearson correlation coefficients for selected outcomes. + indicates that the outcome (in Ugandan Shilling (UGX)) is winsorized at the 99th percentile. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A16: Financial numeracy items

Item	Topic	Question and response options
1	Compound interest	Suppose you borrow 100,000 UGX at an interest rate of 2% per month, with no repayment for 3 months. After 3 months, do you owe A) less than. 102,000 UGX, B) exactly. 102,000 UGX, C) or more than 102,000 UGX? Y) Don't know Z) Refuse to Answer
2	Inflation	If you have UGX. 100,000 in a savings account earning 1% interest per annum, and prices for goods and services rise 2% over a 1-year period, can you buy A) more than, B) less than, C) or the same amount of goods in 1 year as you could today, with the money in the account?" Y) Don't know Z) Refuse to Answer
3	Diversification	Is it riskier to plant...? A) multiple crops or B) one crop Y) Don't know Z) Refuse to Answer
4	Interest rate (loan)	Suppose you need to borrow 500,000 UGX. Two people offer you a loan. Which loan represents a better deal for you? A) One loan requires you to pay back 600,000 UGX in 1 month. B) The second loan requires you to pay back in 1 month 500,000 UGX plus 15% interest. Y) Don't know Z) Refuse to Answer
5	(Compound) interest (loan)	If you were offered a loan with 5% monthly interest rate and a loan with 20% annual interest rate, which loan would offer better value? A) 5% monthly interest rate B) 20% annual interest rate Y) Don't know Z) Refuse to Answer

Appendix B: Robustness checks

This appendix deals with the issue of selective attrition and probes the sensitivity of our results to changes in the empirical strategy and corrections for multiple hypothesis testing.

Bounds estimates for the financial education treatments at midline. Similar to Karlan and Valdivia (2011) and Drexler et al (2014), we follow Horowitz and Manski (2000) and Lee (2002) and impute plausible values for missing observations to estimate bounds for the treatment effect. We impute missing values for the treatment groups “active learning” and “lecture” as their respective means minus 0.1, 0.25 or 0.5 standard deviations of the observed distribution for the group. Missing values for the control group are imputed as the mean of the control group plus 0.1, 0.25 or 0.5 standard deviations, respectively. Plausible upper bounds for 0.1, 0.25, and 0.5 standard deviations are calculated analogously.

Reassuringly, results appear robust to scenarios up to -0.5 SD and + 0.5 SD, respectively.

OLS with covariate adjustment. Tables B2 and B3 show results using unweighted OLS adjusting for baseline covariates. It may be reassuring that results are similar to the results relying on IPW in the main text.

Multiple hypothesis testing. In the main text, we rely on “summary index tests” (Anderson 2008, p.1484) to reduce the number of hypotheses being tested and addressing the danger of false rejections. While the main result of the paper (at midline) is robust to aggregating all outcome variables into a single summary index (see Table 5 of the main text), we implement alternative ways to account for multiple hypothesis testing. Table B4 shows the main experimental results with sharpened q-values based on the approach described in Andersen (2008, p.1487). This approach controls for the False Discovery Rate (FDR), i.e., the expected proportion of false rejections of the null hypothesis. Additionally, we report Westfall and Young (1993) p-values based on the procedure described in Jones et al. (2019). This

approach controls for the Family Wise Error Rate (FWER), i.e., the probability of any false rejections of the null hypothesis.

Due to the limited power of our cluster-RCT, the both the FDR and FWER adjusted p-values are substantially inflated and the results come with substantially more uncertainty. As we address the problem of multiple hypothesis testing using indices for outcome families in the main text, the reader may interpret this result as an additional note of caution regarding the results of our cluster-RCT with limited power.

References in Appendix B

Anderson, M. L. (2008). Multiple inference and gender differences in the effects of early intervention: A reevaluation of the Abecedarian, Perry Preschool, and Early Training Projects. *Journal of the American Statistical Association*, 103(484): 1481–1495.

Drexler, A., Fischer, G., and Schoar, A. (2014). Keeping it simple: Financial literacy and rules of thumb. *American Economic Journal: Applied Economics*, 6(2): 1–31.

Horowitz, J. L. and Manski, C. F. (2000). Nonparametric analysis of randomized experiments with missing covariate and outcome data. *Journal of the American Statistical Association*, 95(449): 77–84.

Jones, D., Molitor, D., and Reif, J. (2019). What do workplace wellness programs do? Evidence from the Illinois workplace wellness study. *Quarterly Journal of Economics*, 134(4): 1747–1791.

Karlan, D. and Valdivia, M. (2011). Teaching entrepreneurship: Impact of business training on microfinance clients and institutions. *Review of Economics and Statistics*, 93(2): 510–527.

Lee, D.S. (2002). Trimming for bounds on treatment effects with missing outcomes. *NBER Technical Working Paper 277*.

Table B1: Bounds estimates at midline (indices)

	(1) -0.50 SD	(2) -0.25 SD	(3) -0.10 SD	(4) Unadjusted	(5) + 0.10 SD	(6) +0.25 SD	(7) + 0.50 SD
Panel A: Savings index (z)							
Active learning	0.078 (0.069)	0.119* (0.069)	0.143** (0.069)	0.161** (0.074)	0.176** (0.070)	0.200*** (0.070)	0.241*** (0.073)
Lecture	-0.119 (0.073)	-0.064 (0.072)	-0.031 (0.072)	0.004 (0.080)	0.013 (0.071)	0.046 (0.072)	0.100 (0.073)
$A - B = 0$ (p)	0.019**	0.027**	0.033**	0.079*	0.046**	0.060*	0.093*
Obs.	1,291	1,291	1,291	1,162	1,291	1,291	1,291
Panel B: Investment index (z)							
Active learning	0.172* (0.090)	0.214** (0.087)	0.239*** (0.086)	0.262*** (0.090)	0.272*** (0.084)	0.297*** (0.083)	0.339*** (0.082)
Lecture	-0.009 (0.085)	0.050 (0.084)	0.086 (0.083)	0.113 (0.090)	0.133 (0.083)	0.168** (0.083)	0.227*** (0.085)
$A - B = 0$ (p)	0.059*	0.083*	0.102	0.125	0.136	0.169	0.240
Obs.	1,291	1,291	1,291	1,162	1,291	1,291	1,291
Panel C: Summary index (z)							
Active learning	0.110 (0.081)	0.150* (0.079)	0.174** (0.078)	0.200** (0.083)	0.206*** (0.077)	0.230*** (0.077)	0.270*** (0.076)
Lecture	-0.062 (0.077)	-0.004 (0.075)	0.031 (0.074)	0.055 (0.081)	0.078 (0.073)	0.113 (0.073)	0.171** (0.074)
$A - B = 0$ (p)	0.043**	0.063*	0.081*	0.100	0.115	0.149	0.229
Obs.	1,291	1,291	1,291	1,162	1,291	1,291	1,291

Notes: All models include district fixed effects as well as the lagged value of the dependent variable as well as missing indicator for missing observations of baseline outcome variables. Standard errors, clustered at the market-level, in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table B3: Main experimental results at midline (OLS with controls instead of IPW)

	(1) Budget index (z)	(2) Savings index (z)	(3) Borrowing index (z)	(4) Invest- ments (z)	(5) Fin. services index (z)	(6) Summary index
Active learning	0.050 (0.078)	0.197*** (0.069)	-0.011 (0.068)	0.267*** (0.081)	0.095 (0.077)	0.214*** (0.066)
Lecture	0.034 (0.076)	0.031 (0.070)	-0.058 (0.082)	0.151* (0.087)	0.173* (0.093)	0.116 (0.070)
$A - B = 0$ (p-value)	0.837	0.037**	0.598	0.183	0.384	0.151
Mean (SD) of y_t in control group	0.000 (1.000)	0.000 (1.000)	0.000 (1.000)	0.000 (1.000)	0.000 (1.000)	0.000 (1.000)
Observations	1,162	1,162	1,162	1,162	1,162	1,162
Clusters	83	83	83	83	83	83

Notes: All models include district fixed effects as well as the lagged value of the dependent variable as well as missing indicator for missing observations of baseline outcome variables. Standard errors, clustered at the market-level, in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table B4: Mid- and endline results on selected index components (OLS with controls instead of IPW)

	(1) Any savings	(2) Total savings ⁺	(3) Total investments ⁺	(4) Ever used mobile money	(5) Ever late payment on loan
Panel A: Short-term treatment effects (after six months) (n=1,162)					
Active learning	0.045** (0.020)	137,901.288** (64,562.585)	99,313.417** (40,376.374)	0.061 (0.037)	0.087** (0.036)
Lecture	0.029 (0.022)	-10,901.062 (63,931.593)	70,602.340 (50,206.947)	0.033 (0.047)	-0.000 (0.035)
$A - B = 0$ (p)	0.458	0.026**	0.605	0.534	0.021**
Mean (SD) of y_t control	0.854	512,670 (931,318)	301,067 (497,640)	0.441	0.269
Observations	1,162	1,162	1,162	1,162	1,162
Clusters	83	83	83	83	83
Panel B: Long-term treatment effects (after 3.5 years) (n=620)					
Active learning	-0.001 (0.029)	335,279.470 (249,898.577)	323,392.017 (205,786.687)	0.136* (0.070)	0.134** (0.062)
Lecture	0.035 (0.024)	245,110.610 (211,227.543)	123,131.110 (169,416.035)	0.072 (0.066)	0.111* (0.062)
$A - B = 0$ (p)	0.187	0.734	0.377	0.335	0.683
Mean (SD) of y_{t+1} control	0.921	911,557 (1500,392)	811,081 (1288,151)	0.527	0.515
Observations	620	620	620	620	620
Clusters	83	83	83	83	83

Notes: All models include district fixed effects as well as the lagged value of the dependent variable as well as missing indicator for missing observations of baseline outcome variables. Standard errors, clustered at the market-level, in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table B5: Multiple hypothesis testing (FDR and FWER for results on indices at midline)

	(1)	(2)	(3)	(4)	(5)	(6)
	Budgeting index (z)	Savings index (z)	Borrowing index (z)	Investment index (z)	Fin. services index (z)	Summary index (z)
Active learning	0.052	0.151**	-0.021	0.261***	0.098	0.194**
(SE)	(0.089)	(0.073)	(0.066)	(0.089)	(0.082)	(0.082)
[FDR q-value]	[0.880]	[0.168]	[0.880]	[0.064]*	[0.454]	[0.124]
{FWER p-value}	{0.981}	{0.389}	{0.993}	{0.106}	{0.801}	{0.242}
Lecture	0.009	0.017	-0.079	0.112	0.164*	0.059
(SE)	(0.087)	(0.081)	(0.078)	(0.090)	(0.097)	(0.078)
[FDR q-value]	[0.880]	[0.880]	[0.563]	[0.454]	[0.280]	[0.835]
{FWER p-value}	{0.993}	{0.992}	{0.613}	{0.801}	{0.577}	{0.949}
$A - B = 0$ (p)	0.641	0.139	0.479	0.121	0.507	0.117
Mean (SD) of y_t in control group	0.000 (1.000)	0.000 (1.000)	0.000 (1.000)	0.000 (1.000)	0.000 (1.000)	0.000 (1.000)
Observations	1,162	1,162	1,162	1,162	1,162	1,162
Clusters	83	83	83	83	83	83

Notes: Table shows WLS regression results weighted by the inverse of the estimated probability of selection into the midline sample. The dependent variables (y_t) are equally weighted z-score indices of financial behavior and are standardized to have a zero mean and a standard deviation of one for the control group. All currency denominated outcomes (in Ugandan Shilling (UGX)) within the indices in columns (2), (3) and (4) are winsorized at the 99th percentile. Column (6) shows results for an equally weighted z-score index of all five financial behavior indices. All models include the lagged outcome at baseline and district-level fixed effects. Sharpened False Discovery Rate (FDR) q-values (Anderson 2008) accounting for all the hypothesis tests in the table in brackets. FWER Westfall and Young (1993) p-values based on the method by Jones et al. (2019) in braces. Standard errors (clustered at the market-level) are reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.