

Financial Literacy and Financial Behavior: Experimental Evidence from Rural Rwanda

Aussi Sayinzoga,^{1,2} Erwin Bulte² and Robert Lensink^{2,3}

¹National University of Rwanda, Kigali, Rwanda. E-mail: asayinzoga@gmail.com

²Development Economics Group, Wageningen University, P.O. Box 8130, 6700 EW Wageningen, Netherlands. Phone: +31 317 485286, Fax: +31 317 484037, E-mail: Erwin.bulte@wur.nl

³Department of Economics, Econometrics and Finance, University of Groningen, the Netherlands. E-mail: b.w.lensink@rug.nl (* corresponding author)

Abstract

We organize a field experiment in rural Rwanda to measure the impact of a one-week financial training on financial literacy and financial behavior. Our respondents are smallholder farmers. The training increased financial literacy of participants, and changed their savings, borrowing and repayment behavior. We also document a positive effect on the start-up of income-generating activities. Using a two-stage regression framework, we identify enhanced financial literacy as an important factor explaining behavioral changes, but we argue that other mechanisms must be relevant as well. The study supports the claim that microfinance programs should include training modules to enhance their developmental impact.

Keywords: financial education, financial knowledge, savings, microfinance

JEL Codes: D14, O16

I. Introduction

The expansion of microfinance has increased rural households' access to financial services in many developing countries (Hulme, Moore and Barrientos (2009)). Yet evidence is mounting that access to credit may not be the most critical impediment to economic progress (Karlan and Morduch (2009)), while the evidence regarding the effects of access to finance on reducing poverty increasingly appears mixed. For example, McKenzie and Woodruff (2008) find that small injections of working capital have high rates of return, and Bruhn, Ibarra and McKenzie (2013) report that an expansion of bank credit increases household income and employment for low-income households in Mexico. But with data from India, Banerjee, Duflo, Glennerster and Kinnan (2013) show that access to microcredit does not make existing firms more profitable, nor does it increase household expenditures or affect key development outcomes such as health and education. Angelucci, Karlan and Zinman (2013) provide evidence that microcredit has positive effects on qualitative well-being and women's bargaining power, but they also document that it does not improve wealth, expenditures, or profits, on average. Using experimental data from a business grant program, De Mel, McKenzie and Woodruff (2008) document modest rates of return to capital. Berge, Bjorvatn and Tungodden (2011) also use experimental data from a business grant intervention but find no evidence that capital has any influence on economic outcomes, such as profits and sales.

These findings do not spell the end of the microfinance-based development agenda, but they do suggest the need to reconsider basic expansion strategies. Specifically, evidence points to considerable heterogeneity in treatment effects, such that the impact of microfinance may be conditional on the human capital of the borrower. If human and financial capital are

complements in development processes, scaled-up microfinance programs might usefully be accompanied by efforts to increase the human capital of potential recipients.

Experimental evidence regarding the impact of such efforts in developing countries is very scarce, and we again find mixed signals. Some rigorous evaluations note the impacts of so-called business training programs though. Karlan and Valdivia (2011) find little robust evidence that training influences economic outcomes, such as profits or sales, but Berge, Bjorvatn and Tungodden (2011) and Giné and Mansuri (2011) report substantial effects (at least for male entrepreneurs). McKenzie and Woodruff (2012) provide a recent overview of business training evaluations. In addition, a related component of human capital, amenable to outside intervention, is financial literacy, defined as consumers' awareness, skills, and knowledge that enable them make informed, effective decisions about their financial resources. Growing literature focuses on measuring financial literacy, but few studies rigorously address its impact on economic behavior in developing countries, and experimental evidence about the impact of related training is extremely scant. Despite this paucity of evidence, financial education initiatives for unbanked, underserved, and other disadvantaged groups seem critical as a means to improve the financial knowledge of members of these groups by enhancing their decision making and improving their ability to build assets (Greenspan (2002); Malkin (2003)).

With this study, we seek to assess the impact of financial literacy training on financial knowledge and behavior, using an experimental approach in a field in which rigorous evidence is extremely scarce. Therefore, we organized a randomized field experiment in rural Rwanda, a dynamic African country experiencing rapid changes to its savings culture. According to the National Institute of Statistics of Rwanda, the percentage of adult Rwandans with saving accounts increased from 9% in 2006 to almost 21% in 2011. Most savings in rural areas involve village banks; accordingly, we partnered with an international nongovernmental

organization (NGO) that provides financial training to village bank members and exposed a random subsample of them to standard financial literacy training. After 15 months, we revisited households in both the treatment and control groups and compared their financial knowledge and behaviors, including savings, borrowing, and repayment, as well as their efforts to initiate new income-generating activities.

The results are encouraging. Financial literacy affects financial knowledge, and enhanced financial knowledge translates into more savings and borrowing, along with an increased likelihood of starting new income-generating activities. Participating in a financial literacy program also may reduce late repayments of principal and interest, though the evidence for this effect is weaker. Nevertheless, considering the preponderance of the evidence, our data provide strong support for the proposition that financial and human capital work together to promote economic development. In the next section, we summarize existing literature on human capital and financial behavior in developing countries, paying special attention to the scant evidence available regarding financial literacy. In Section III, we describe the details of our intervention, explain our sampling strategy, and introduce our data. Section IV outlines our identification strategy, which is relatively simple in light of the (experimental) nature of our data. In Section V we present our results and attempt to unravel the chain from training to financial literacy to financial behavior. Section IV concludes.

II. Financial Literacy and Financial Behavior

Traditionally, savings have represented the key factor explaining investments and economic development, and thus, efforts to understand the determinants of saving behavior have a long tradition in economics research. Savings are driven by a range of variables, including demographic factors, the quality of financial institutions, investment opportunities, income dynamics, interest rates, and markets for pensions and insurance (see Deaton (1989)).

Financial literacy also might matter, though it is comparatively under-researched in developing countries. Instead, most studies focus on measuring the existing levels of financial literacy (often using the financial literacy module developed by Lusardi and Mitchell (2007)). These assessments show that overall levels of financial literacy are disappointingly low (Lusardi and Mitchell (2007), Lusardi and Mitchell (2008); Xu and Zia (2012), with ample room for improvement, even in more developed nations. In Africa, estimates of financial literacy levels are scarce or, for many countries, non-existent. FinScope studies provide some proxy measures (see <http://www.finscope.co.za/new/pages/default.aspx>), but the financial literacy information they provide is limited, because they focus on access to financial products, not capabilities.

Insofar as financial literacy is an important determinant of financial behavior in developing countries, financial training might be a promising supplementary activity, concomitant with the extension of financial services to heretofore unbanked populations. This prediction implicitly assumes a causal chain: Financial literacy training increases financial knowledge, which affects financial behavior. In support of the first link in that chain, Jappelli (2010) reveals, using survey data from 55 countries, that financial literacy correlates positively with proxies for human capital. In developed countries, various studies verify this finding (e.g., Danes, Huddleston-Casas and Boyce (1999); Greenspan (2001); Hira and Loibl (2005); Tennyson and Nguyen (2001), but no matching evidence exists for developing countries. Instead, research into business training (which arguably relates to financial literacy but implies a broader view) reveals that training can affect knowledge and financial management (Karlan and Valdivia (2011). Giné and Mansuri (2011)) show that business training, focused on business planning, marketing, and financial management, increases business knowledge and improves business practices among entrepreneurs in rural Pakistan.

Regarding the second link, by which financial knowledge translates into behavior, developed countries again have been subject to ample analysis. Researchers have probed the impact of financial knowledge on a range of behaviors, such as savings, insurance, retirement planning, (financial) market participation, bank account ownership, investments, debt management, and financial practices (e.g., Braunstein and Welch (2002); Carpena, Cole, Shapiro and Zia (2011); Clark, D'Ambrosio, McDermed and Sawant (2004); Courchane and Zorn (2005); Hilgert, Hogarth and Beverly (2003); Hogarth, Anguelov and Lee (2005); Kimball and Shumway (2006); Lusardi (2008); Lusardi and Mitchell (2008); Lusardi and Tufano (2009); Mavrinac and Chin (2004); Robb (2011); Van Rooij, Lusardi and Alessie (2007); Xu and Zia (2012). Some studies also explore the effects of financial education provided in the workplace on savings or contributions to pension funds (Bayer, Bernheim and Scholz (1996), Bayer, Bernheim and Scholz (2009); Bernheim and Garrett (2003); Clark and Schieber (1998); McCarthy and Turner (1996). Experimental work by Duflo and Saez (2003) suggests smaller effects than documented in most non-experimental studies, but the overall evidence affirms that financial education affects behavior, including the findings that Gibson, McKenzie and Zia (2012) obtain from a randomized experiment to evaluate the impact of financial literacy training for migrants in New Zealand and Australia.

Few studies assess the impact of financial literacy in developing countries. Giné, Menand, Townsend and Vickery (2012) and Cohen and Young (2007) offer some evidence that financial literacy is an important determinant of insurance adoption. Tustin (2010) evaluates the impact of a financial literacy program on savings in Limpopo province (South Africa), using three survey questions, and finds self-reported effects of financial literacy training on saving behavior. Landerretche and Martínez (2012) similarly find that financial literacy increases savings in private pension plans in Chile. Among the studies that examine the impact of financial literacy on bank account ownership, Honohan and King (2009), using

FinScope data, assert there is no robust relationship, but Cole, Sampson and Zia (2011) indicate an impact of a two-hour financial literacy training session in India and Indonesia. The Indonesian study, which featured a randomized field experiment, has constituted the only published experimental evaluation in a developing country thus far.¹ Although they find no impact of the training for the entire population, they suggest that the likelihood of opening a bank account increased among the subsample of uneducated, less financially literate households. Finally, Bruhn, Ibarra and McKenzie (2013), with a large-scale financial literacy experiment in Mexico City, focus on the impact of a short financial literacy course; though the demand for such financial education appears limited, the course nevertheless appears to have had some short-term impacts on knowledge and savings.

III. Intervention, Sampling, and Data

This section explains the treatment, experimental details, and measures of financial literacy. We also summarize the data and show how our randomization effort helped us obtain a balanced sample, in terms of a range of observable variables, such that the treatment and control groups are similar at the baseline.

A. Financial Literacy Intervention

We evaluate the impact of standard financial literacy training offered by an international NGO to rural households in Rwanda, which aims to improve knowledge of basic financial concepts and engender changes in financial behavior. The data were collected from five agricultural savings and credit cooperatives, located in the southern province of Rwanda. The five cooperatives were randomly selected from among ten agricultural savings and credit cooperatives that together form the Union Ejo Heza (CLECAM, or *Coopérative Locale*

¹ Several randomized evaluations of financial literacy programs in developing countries are currently underway (Xu and Zia (2012)), and some evaluations focus on the financial education of children (Berry, Karlan, and Pradhan (2012); Supanantaroeck (2013)).

d'Epargne et Crédit Agricole Mutuel). The savings and credit cooperatives comprise vast numbers of village banks, which in turn consist of so-called solidarity groups, made up of five to seven individual members each. Village bank members meet twice a month to discuss their socioeconomic concerns. During these meetings, each member contributes Rwf 500 (around US\$0.9); the collected money then is used to provide loans to solidarity groups or individuals, depending on the policy of the village bank. All participants in this study are members of a savings and credit cooperative. Virtually all Rwandans in rural areas are encouraged to join village bank schemes, also called Umurenge SACCOs (Savings and Credit Cooperatives).

We invited the randomly selected village banks to send one representative to a central location to participate in financial literacy training for one week. The underlying idea was that the village bank representatives would share what they had learned with their fellow members, such that financial literacy would spread across the country. For the purposes of this study though, we focus on the knowledge and behaviors of the village bank representatives only.

Training was administered by trainers from the same (or a nearby) district. The training involved lecturing, discussions, questions, and illustrations; at the end of each day, a module of exercises was provided. The training took place in the local language, and the content was very similar across the five cooperatives (with minor differences in the examples used, depending on regional specificities). The standardized training program consisted of six modules: (i) cooperative principles; (ii) explanation of microfinance activities, savings and credit; (iii) how to develop a business plan for small, income-generating activity; (iv) loan management, (v) basic bookkeeping and management of small income-generating projects; and (vi) example business plans for small income-generating projects (see Appendix A).

Training sessions started at 8:00 a.m. and ran until 5:00 p.m., for five consecutive days. Tea and lunch were provided, and each participant received Rwf 2000 (around US\$3.5), as compensation for transportation and the opportunity costs of their time.

B. Sample Issues

Of the ten cooperatives in the CLECAM Ejo Heza, we randomly selected five to include in the study (Kamonyi, Kabagari, Mushishiro, Ruhango, and Ntongwe). These five cooperatives include a total of 378 village banks; we randomly selected 72 village banks per cooperative (360 village banks in total) and randomly allocated half of them to the treatment group.² The other half represented the control group, which was scheduled to receive the same treatment later. Thus, the treated and control banks had the same incentive to select and send a “good representative”—someone able to understand the material offered and share it with other members. Representatives of all 360 village banks also received an invitation to participate in a baseline survey. From the treated (control) group, 174 (167) representatives participated, indicating low noncompliance (19 of 360 representatives, or about 5%) that was relatively equally spread across the two groups.

We organized activities at the cooperative level, including five consecutive interview and training sessions, each with a maximum of 36 village bank representatives. The field work consisted of three activities. First, the treatment and control group members participated in a baseline survey (March–April 2011), including a few questions to measure *ex ante* financial literacy. Second, the 174 representatives of the treatment group received the one-week financial literacy training (March–May 2011). Third, approximately 15 months later, we conducted a follow-up survey (July–September 2012). In this follow-up survey, we received responses from 279 respondents, or 82% of the respondents to the baseline survey. Several

² Two cooperatives, Ruhango and Ntongwe, included fewer than 72 village banks, so we included all of their village banks (randomly allocating half to the treatment group and the rest to the control group), then invited more than one representative per village bank to arrive at a total of 72 representatives per cooperative.

initial respondents were unavailable for the follow-up because they were away from their homes during our visit. We also probed whether the attrition was random by estimating a probit model that explained their absence using our vector of baseline variables. When regressing dropouts on the full vector of baseline controls (12 variables, N = 253; Table I, variables 7–19), we find only one significant variable, *Years in cooperative* (negative sign). For a slightly more parsimonious model with only 10 baseline variables (omitting *Land size* and *Own livestock*, which increases the sample size to 338 respondents), only the measure of household expenditures (*Annual expenditures*) was significant (and *Years in cooperative* is not). Thus, there is little reason to believe that our statistical results are compromised by non-random attrition bias, as we detail in Appendix B.

C. Measuring Financial Literacy

We used the responses to six survey questions to construct a measure of financial literacy for each respondent. Following Carpena, Cole, Shapiro and Zia (2011), we tried to construct a measure that would capture more than just financial numeracy. The first two questions (compound interest and inflation) come from Lusardi and Mitchell (2007). The remaining four questions are based on the training material. Specifically, the third question seeks to elucidate if respondents can compute an interest rate, and the fourth question tests their knowledge of the difference between savings and deposits. We also ask about acceptable collateral and whether the respondents could recall at least three of eight requirements that cooperative members must fulfill to apply for a loan. In Appendix C, we provide the wording for all six questions. Respondents could earn one point for each correct answer (and fractions of points could be earned for partially correct answers to Questions 5 and 6). Because this proxy of financial literacy does not contain any measure of attitudes toward financial services or decisions, it may be incomplete in terms of assessing the cognitive impact of the training, a concern we address when discussing the results.

Both the treatment and control groups scored higher on the follow-up survey than on the baseline version, though this difference was significant only at the 5% level for the treatment group. At the baseline, the financial literacy scores of the treated and control groups were statistically similar (2.88 versus 2.73; see Table I). At the end, treated respondents earned average scores of 3.35 out of 6, whereas the control group members scored only 2.99 on average. That is, the *ex post* financial literacy scores for the treatment group were significantly higher than those for the control group. The associated *p*-value of the t-test equaled 0.016—early evidence that the training contributed to building financial knowledge.

D. Data Summary and Balance Check

Table I summarizes our baseline data. Panel (i) contains the behavior data, which provide the main dependent variables when measured in the follow-up survey. The measures focus on savings (which may be converted into a savings rate when divided by household income) and entrepreneurship, according to whether the respondents initiated new income-generating activity during the past 12 months, such as poultry breeding, buying and reselling agricultural produce (mainly beans and sorghum), small animal rearing (rabbit, goat, pig), bicycle transportation, sewing, petty trade in manufactured items, selling traditional beer, legume and fruit production, or bee keeping.

About half of the respondents received a loan from the cooperative before the training; among this subsample, we also consider repayment performance, using data provided by the cooperative. Thus, we could construct a simple measure of repayment behavior as a sum of the number of delayed payments. We focus on respondents who took out a loan *before* the training, to avoid non-random differences between borrowers in the control and treatment groups (i.e., loans initiated because the respondent participated in the training and learned how to borrow money). In this case, we compare similar smallholders who self-select into a

borrowing group prior to the intervention. Therefore, a selection bias may limit the external validity of our estimate of the impact of the training on repayment performance for a broader population of smallholders. Because the subsample of borrowers is much smaller than our savings and investment samples, the statistical power of these tests also is questionable.

We consider the impact of financial literacy training on loan usage. In theory, the impact of the financial literacy training on borrowing must be unclear in advance, because enhanced financial literacy might reduce over-borrowing while also increasing borrowing to finance new start-up activities. Our measure of borrowing simply refers to the uptake of a loan (dummy variable), to explain whether a greater fraction of the population of smallholders borrows from the cooperative after they receive training. For all six measures, we find that at the baseline, the control and treatment groups are not significantly different.

Panel (ii) of Table I contains a vector of household characteristics, including our financial literacy score at the baseline, which is the same for the treatment and control groups, as we noted. It also contains a range of socio-demographic and wealth variables that we use as covariates in some of the regression models. The treatment and control groups are similar in terms of gender composition, age, marital status, education levels, household size, cognition, wealth, and years of cooperative membership. A measure of cognitive ability, based on responses to nine numeracy questions,³ also indicates no differences between the two groups, nor do we find any difference in a variable measuring whether the household regularly takes notes to keep track of its financial situation, which is a proxy of *ex ante* financial awareness.

<< *Insert Table I about here* >>

IV. Estimation Methods

³ Our numeracy measures include three simple arithmetical questions (Cole, Sampson, Zia (2009)), four numeracy questions adapted from the 2002 English Longitudinal Study of Aging (ELSA) questionnaire (see appendix 1 in Banks et al. (2010)), and two questions that ask respondents to observe a series of pictures and contrast them.

To probe the impact of financial literacy training on knowledge and behavior, we used various regression techniques, all of which should provide unbiased estimates of the effects of training and financial knowledge on our outcome variables of interest. Including additional controls is theoretically unnecessary for unbiased measures of treatment effects, because randomization implies that financial literacy should be orthogonal to household characteristics. In principle, differences between control and treated households after the training can be attributed to the training. However, we include control variables in several models, to increase the precision of our estimates, which is particularly helpful because our sample is relatively small, so differences between the two groups might exist. Thus, we present difference-in-difference estimates (controlling for time-invariant unobservable variables).

First, we estimate parsimonious and elaborate ordinary least square (OLS) models, controlling for a vector of covariates, as follows:

$$Y_{it} = \alpha + \beta D_i + \delta_j \sum X_{ij(t-1)} + u_{it}, \quad (1)$$

where Y_{it} denotes an outcome variable for respondent i (in 2012), D_i is a dummy variable equal to 1 if the respondent received training, X_{ij} is a vector of j covariates measured at the baseline (in 2011), and u_i is an $IIDN(0, \sigma^2)$ error term. Furthermore, β is the coefficient of interest, which measures the difference between the treatment and control groups in terms of savings, borrowing, delayed payments, and start-up of new income-generating activities. We cluster standard errors at the cooperative level.

Because we have access to baseline and post-training data, we can improve on the specification in Equation (1) by estimating a panel with fixed effects that also controls for unobservable variables:

$$Y_{it} = \alpha_i + \beta D_{it} + \delta_j \sum X_{ijt} + u_{it}. \quad (2)$$

In this model, the training dummy takes a value of 1 only for the treated group in 2012.

As a robustness analysis, we also estimate an analysis of covariance (ANCOVA) specification and regress the outcome variables (Y_{i2012}) on the training dummy D_i and a lagged outcome variable (Y_{i2011}):

$$Y_{i,2012} = \alpha + \beta D_i + \delta Y_{i,2011} + u_i. \quad (3)$$

We use the ANCOVA estimates to estimate treatment effects, because the comparison of ANCOVA estimates with diff-in-diff estimates may improve the power considerably (McKenzie (2012)).

A. Probing the Theory of Change

The theory of change that motivates financial literacy interventions is simply that participating in a training builds financial knowledge, which translates into better informed financial decision making. We seek to unravel this causal chain by estimating an instrumental variable (IV) model, exploiting our *ex post* and *ex ante* financial literacy data. Specifically, we use standardized least squares (2SLS) to explain variation in financial behavior according to the differences in financial knowledge and a set of controls, such that financial knowledge is instrumented by the training dummy and all other exogenous variables in the system. The IV set-up identifies exogenous variation in financial knowledge and addresses conventional endogeneity challenges that occur when regressing behavior on knowledge (i.e., omitted variables and reverse causality). We run two sets of IV regressions: one based on the follow-up data, and another using panel data. The first stage of each model includes regressions of the measure of financial literacy (FL) on the training dummy D (and its covariates). The cross-sectional version of the model is as follows:

$$FL_i = \alpha + \beta D_i + \delta_j \sum X_{ij} + u_i. \quad (4)$$

In the second stage, we explain financial behavior by including the predicted level of financial literacy in outcome Equation 1, which yields

$$Y_i = \alpha + \beta FL^*_i + \delta_j \sum X_{ij} + u_i. \quad (1')$$

Training is orthogonal to smallholder characteristics, and the instrument is properly exogenous. However, it is uncertain if the exclusion restriction is fully satisfied or if training affects financial behavior only through financial literacy. Carpena, Cole, Shapiro and Zia (2011) casts some doubt on this assumption by noting that financial literacy may also affect financial decision-making through other channels, for instance by making households more aware of product choices available to them, equipping them to ask the right questions to financial providers, encouraging them to seek professional and personalized financial advice, and changing their attitudes towards purchasing and recommending formal financial products and services. These alternate channels may be as important if not more than enhancing numeracy skills.

If financial literacy training affects financial behavior through channels other than enhanced financial literacy, our IV approach based on exogenous variation in financial literacy will provide a biased estimate of the total effect of the training.

V. Results

In Table II we report the OLS and panel results of models in which we seek to explain variation in financial behavior induced by the training dummy. The top row presents the results of a series of parsimonious models, in which we only regress outcome measures on the training dummy. We also present the results of a series of more complete models, controlling for a range of covariates. The results are similar and consistent.

From the OLS estimates, we observe that attending the training leads to significantly greater savings, more borrowing, better repayment performance, and a higher probability of starting new income-generating activities. Using the elaborate model, we find that farmers who received the training save an extra Rwf 15,917 compared with farmers in the control group, on average ($p = 0.035$), and their savings rate is 5.8% higher ($p = 0.034$). The training also is associated with 0.49 fewer delays in repayment by indebted farmer ($p = 0.008$), and trained farmers exhibit a 16% greater probability to start up a new income-generating activity ($p = 0.003$). Such coefficients can be compared easily against the baseline values for the same group, which reveals that the training invites economically significant changes in behavior. Savings are 44% higher than at the baseline, the savings rate is 33% higher, the share of the population that has taken a loan increases by 24%, delayed payments fall by 49%, and the start-up rate of new activities is 16% higher. Furthermore, though some of the covariates have significant effects in some models, none of them is significant across columns (or tables). Thus financial literacy training appears to offer one of the few robust determinants of financial behavior.

Panel (ii) of Table II contains the fixed effects panel estimates, that is, the results of the difference-in-difference model. This model is based on within-, rather than between-, subject variations in financial behavior. The savings and income-generating results are similar, but the effect on delayed payments is no longer significant. The coefficient is of the same sign and magnitude but is less precisely estimated (i.e., large standard errors). This model suffers from low power, due to the relatively small number of observations. The results for the propensity to borrow are significant in the elaborate model but not in the parsimonious specification.

<< *Insert Table II about here* >>

Table III contains the results of the robustness analyses. According to the ANCOVA model, training significantly influences all outcome variables: savings (rates), borrowing, repayment, and start-up of new activities. The estimated coefficients are similar to those in the OLS models. Except for the lagged value of the variable measuring the start-up of income-generating activities, we find that the lagged outcome variables are statistically significant.

In Table IV, we try to identify the mechanism that links the training to financial behavior; to instrument financial literacy, we use the training dummy. Again we provide the results of the parsimonious models (without covariates), followed by the matching results for more elaborate models. Column (1) of Panel (i) presents a first-stage regression of the 2SLS model (associated with the savings model in Column (2); other first-stage models are comparable). The first-stage outcomes confirm that attending the training improves financial literacy, such that attendance increases the FL score by 0.36 points, which constitutes a large effect when we consider that the average score was only 2.8 at the baseline. The partial F-statistic for this parsimonious model exceeds the conventional threshold of 10, though the same finding does not hold for the other IV models, for which the partial F-scores range from 5 to 10. Thus, the excluded instrument does not appear very strong.

We use predicted financial literacy to explain variation in financial behavior in Columns (2)–(6). The results support the OLS results from Table II, though the coefficients are larger in magnitude and tend to be somewhat less significant. According to Panel (i), respondents with higher financial literacy scores save more (higher savings rates) and are more likely to start new income-generating activities, in both the parsimonious and elaborate models. According to the elaborate model, financially literate respondents are less likely to delay their repayment. The coefficients for the borrowing variable are of the expected sign, but neither the parsimonious nor the elaborate model produces statistically significant results.

<< *Insert Tables III and IV about here* >>

When we use the panel structure of the data, we obtain results that are statistically weaker. That is, (predicted) financial literacy significantly explains variation in savings behavior (and savings rates), but we no longer obtain significant effects for repayment discipline or activity start-ups. The signs of the associated coefficients are in the expected directions, but the coefficients are less precisely estimated.

One interpretation of these results, when we consider the findings in Tables II and IV, is that financial literacy training has an impact on financial behavior through multiple channels. In addition to the financial literacy channel (theory of change), it may exert an impact on behavior due to changed attitudes or different perceptions of the salience of financial intermediation (Carpena, Cole, Shapiro and Zia (2011)). The OLS and panel results in Table II thus might provide a reduced form estimate of the total effect of the training; the IV results in Table IV should be taken with a pinch of salt, because the exclusion restriction may not be fully satisfied.

VI. Conclusion and Discussion

Access to finance correlates robustly with poverty reduction, but recent empirical work suggests that improved access alone may not be enough to improve consumers' economic performance. Financial literacy emerges as an increasingly important component of financial reform efforts. The perceived problem of limited financial literacy has triggered governments, firms, and NGOs to allocate considerable resources to financial education programs, designed to target millions of potential beneficiaries. Yet, especially in developing countries, rigorous evidence of the impact of financial education remains scant.

We organized a field experiment to probe the impact of an intensive one-week training on financial literacy and financial behavior of a sample of Rwandan smallholders. Not

surprisingly, their financial literacy improved through training; in addition, the training exerted an effect on financial behavior that is both statistically and economically significant. Our results reveal that training increased savings, induced non-borrowing farmers to take up loans, and enhanced the start-up of new income-generating activities. It also improved repayment performance for the subsample of farmers who had borrowed prior to the training. More speculatively, we obtain an auxiliary result that confirms a claim by Carpena, Cole, Shapiro and Zia (2011). When trying to explain the differences in financial behavior by focusing on the financial literacy channel in an IV framework, we obtain results that are weaker for borrowing, repayment discipline, and investment. Therefore, the training appears to influence financial behavior through multiple channels, and that enhanced financial literacy may not be the only factor inducing behavioral change—for example, altered attitudes toward financial services could matter too.

In light of the relatively short period between the intervention and the follow-up survey (about 15 months), we did not seek to explain variation in other variables of ultimate interest (e.g., household consumption, investments in human capital). We intend to revisit these households in the future to collect such information. We also intend to survey fellow village bank members to examine the diffusion of financial knowledge across the population of interest.

Our findings are consistent with prior research related to financial literacy training. Various studies report that financial education efforts translate into greater financial literacy and that financial literacy is a relevant determinant of financial decision making (e.g., Cole, Sampson and Zia (2011); Giné, Menand, Townsend and Vickery (2012); Berge, Bjorvatn and Tungodden (2011)). However, our findings contrast with other results. For example, Bruhn, Ibarra and McKenzie (2013) report very limited demand for financial education and assert that participation in such programs is usually very limited. Such limited participation may

reflect binding constraints on potential beneficiaries, preventing them from participating, or it may suggest that respondents expect to gain very little from participating. For our sample of Rwandan smallholders, we obtained nearly full compliance, possibly because the intervention was organized in a convenient period, with modest opportunity costs (i.e., no overlap with important agricultural practices). We also paid transportation costs. However, differences in demand also could reflect the nature of the intervention. Our partner NGO offered a full-week intensive course, likely creating greater benefits than a single training session that lasted just a few hours.

We close with a word of caution regarding the external validity of these findings. Rwanda is a small country with a strong state. The government's reach into the hinterland is considerable, facilitated by a complex architecture of local institutions. Although our respondents are poor, they have access to a range of financial services offered through a country-wide system of village banks (organized in cooperatives, which in turn are accountable to the state). They also can access a range of markets for various factors and commodities. It is an open question to what extent the lessons learned in Rwanda apply to countries characterized by weaker states and more limited market integration. More research in this domain remains a priority.

References

- Angelucci, Manuela, Dean Karlan, and Jonathan Zinman, 2013, Win some lose some? Evidence from a randomized microcredit program placement experiment by compartamos banco, NBER Working Paper No. 19119 (National Bureau of Economic Research).
- Banerjee, Abhijit, Esther Duflo, Rachel Glennerster, and Cynthia Kinnan, 2013, The miracle of microfinance? Evidence from a randomized evaluation, Working Paper No. 13-09 (MIT Department of Economics, Massachusetts).
- Banks, James, Cormac o’Dea, and Zoë Oldfield, 2010, Cognitive function, numeracy and retirement saving trajectories, *The Economic Journal* 120, 381-410.
- Bayer, Patrick J, B Douglas Bernheim, and John Karl Scholz, 1996, The effects of financial education in the workplace: Evidence from a survey of employers, NBER Working Paper No. 5655 (National Bureau of Economic Research).
- Bayer, Patrick J, B Douglas Bernheim, and John Karl Scholz, 2009, The effects of financial education in the workplace: Evidence from a survey of employers, *Economic Inquiry* 47, 605-624.
- Berge, Lars Ivar, Kjetil Bjorvatn, and Bertil Tungodden, 2011, Human and financial capital for microenterprise development: Evidence from a field and lab experiment, *NHH Dept. of Economics Discussion Paper*.
- Bernheim, B Douglas, and Daniel M Garrett, 2003, The effects of financial education in the workplace: Evidence from a survey of households, *Journal of Public Economics* 87, 1487-1519.
- Berry, Jim , Dean Karlan, and Menno Pradhan, 2012, Evaluating the efficacy of school based financial education programs in ghana, Impact and Policy Conference: Evidence in Governance Financial Inclusion and Entrepreneurship (Innovations for Poverty Action (IPA), Bangkok).
- Braunstein, Sandra, and Carolyn Welch, 2002, Financial literacy: An overview of practice, research, and policy, *Fed. Res. Bull.* 88, 445.
- Bruhn, Miriam, Gabriel Lara Ibarra, and David McKenzie, 2013, Why is voluntary financial education so unpopular? Experimental evidence from mexico, Policy Research Working Paper No. 6439 (The World Bank, Development Research Group).
- Carpena, Fenella, Shawn Cole, Jeremy Shapiro, and Bilal Zia, 2011, Unpacking the causal chain of financial literacy, Policy Research Working Paper Series No. 5798 (World Bank).
- Clark, Robert, Madeleine D’Ambrosio, Ann McDermed, and Kshama Sawant, 2004, Sex differences, financial education and retirement goals, in Olivia S. Mitchell, and Stephen Utkus, eds.: *Pension design and structure: New lessons from behavioral finance* (Oxford University Press, Oxford).
- Clark, Robert L, and Sylvester J Schieber, 1998, Factors affecting participation rates and contribution levels in 401 (k) plans, in Olivia S Mitchell, and Sylvester J Schieber, eds.: *Living with defined contribution pensions: Remaking responsibility for retirement* (University of Pennsylvania Press, Philadelphia).
- Cohen, Monique, and Pamela Young, 2007, Using microinsurance and financial education to protect and accumulate assets, in Caroline O. N. Moser, ed.: *Reducing global poverty: The case for assets accumulation* (The Brookings Institution, Washington DC).
- Cole, Shawn, Thomas Sampson, and Bilal Zia, 2009, Valuing financial literacy training, Conference on measurement, promotion, and impact of access to financial services (Washington DC).
- Cole, Shawn, Thomas Sampson, and Bilal Zia, 2011, Prices or knowledge? What drives demand for financial services in emerging markets?, *The Journal of Finance* 66, 1933-1967.
- Courchane, Marsha, and Peter Zorn, 2005, Consumer literacy and creditworthiness, Federal Reserve System Conference, Promises and Pitfalls: As Consumer Options Multiply, Who Is Being Served and at What Cost (Wisconsin Department of Financial Institutions, Task Force on Financial Literacy).
- Danes, Sharon M, Catherine Huddleston-Casas, and Laurie Boyce, 1999, Financial planning curriculum for teens: Impact evaluation, *Financial Counseling and Planning* 10, 25-37.
- De Mel, Suresh, David McKenzie, and Christopher Woodruff, 2008, Returns to capital in microenterprises: Evidence from a field experiment, *The Quarterly Journal of Economics* 123, 1329-1372.
- Deaton, Angus, 1989, Saving in developing countries: Theory and review, *Proceedings of the World Bank Annual Conference on Development Economics* World Bank: Washington DC, 61-96.
- Duflo, Esther, and Emmanuel Saez, 2003, The role of information and social interactions in retirement plan decisions: Evidence from a randomized experiment, *The Quarterly Journal of Economics* 118, 815-842.
- Gibson, John, David McKenzie, and Bilal Zia, 2012, The impact of financial literacy training for migrants, *The World Bank Economic Review* 1-32.
- Giné, Xavier, and Ghazala Mansuri, 2011, Money or ideas? A field experiment on constraints to entrepreneurship in rural pakistan, Working Paper (World Bank, Development Research Group).
- Giné, Xavier, Lev Menand, Robert Townsend, and James Vickery, 2012, Microinsurance: A case study of the indian rainfall index insurance market, *Handbook of the Indian Economy* 167-194.
- Greenspan, Alan, 2001, The importance of financial education and literacy in today's economy, Federal Reserve Bank of Chicago Proceedings (Chicago).
- Greenspan, Alan, 2002, Economic development and financial literacy, Remarks at the Ninth Annual Economic Development Summit, The Greenlining Institute, Oakland, California, USA (The Federal Reserve Board).
- Hilgert, Marianne A, Jeanne M Hogarth, and Sondra G Beverly, 2003, Household financial management: The connection between knowledge and behavior, *Fed. Res. Bull.* 89, 309-322.
- Hira, Tahira K, and Cázilia Loibl, 2005, Understanding the impact of employer-provided financial education on workplace satisfaction, *Journal of Consumer Affairs* 39, 173-194.
- Hogarth, Jeanne M, Christoslav E Anguelov, and Jinhook Lee, 2005, Who has a bank account? Exploring changes over time, 1989-2001, *Journal of Family and Economic Issues* 26, 7-30.

- Honohan, Patrick, and Michael King, 2009, Cause and effect of financial access: Crosscountry evidence from the finscope surveys, IIS Discussion Paper No. 399, World Bank mimeo (Trinity College Dublin).
- Hulme, David, Karen Moore, and Armando Barrientos, 2009, Assessing the insurance role of microsavings, Working Paper No. 83 (United Nations, New York).
- Jappelli, Tullio, 2010, Economic literacy: An international comparison, *The Economic Journal* 120, 429-451.
- Karlan, Dean, and Jonathan Morduch, 2009, Access to finance: Credit markets, insurance, and saving, in Dani Rodrik, and Mark R. Rosenzweig, eds.: *Handbook of development economics* (Amsterdam: North-Holland).
- Karlan, Dean, and Martin Valdivia, 2011, Teaching entrepreneurship: Impact of business training on microfinance clients and institutions, *Review of Economics and Statistics* 93, 510-527.
- Kimball, Miles, and Tyler Shumway, 2006, Investor sophistication, and the participation, home bias, diversification, and employer stock puzzles, Unpublished Manuscript (University of Michigan).
- Landerretche, Oscar, and A Martínez, 2012, Voluntary savings, financial behavior and pension finance literacy: Evidence from Chile, *Journal of Pension Economics and Finance* (forthcoming).
- Lusardi, Annamaria, 2008, Financial literacy: An essential tool for informed consumer choice?, NBER Working Paper No. 14084 (National Bureau of Economic Research).
- Lusardi, Annamaria, and Olivia S Mitchell, 2008, Planning and financial literacy: How do women fare?, *American Economic Review: Papers & Proceedings* 98, 413-417.
- Lusardi, Annamaria, and Olivia S Mitchell, 2007, Baby boomer retirement security: The roles of planning, financial literacy, and housing wealth, *Journal of Monetary Economics* 54, 205-224.
- Lusardi, Annamaria, and Peter Tufano, 2009, Debt literacy, financial experiences, and overindebtedness, NBER Working Paper No. 14808 (National Bureau of Economic Research).
- Malkin, Jennifer 2003, Financial education in native communities: A briefing paper, Native American Financial Literacy Coalition's national policy development forum on Financial Education in Native Communities (Denver, Colorado).
- Mavrinac, Sarah, and Wan Ping Chin, 2004, Financial education for women in Asia Pacific, Women's Financial Education Summit (CITIGROUP/INSEAD, Hong Kong, China).
- McCarthy, David, and John Turner, 1996, Financial sophistication, saving and risk bearing, Working Paper (US Department of Labor, Washington DC).
- McKenzie, David, 2012, Beyond baseline and follow-up: The case for more t in experiments, *Journal of Development Economics* 99, 210-221.
- McKenzie, David, and Christopher Woodruff, 2008, Experimental evidence on returns to capital and access to finance in Mexico, *The World Bank Economic Review* 22, 457-482.
- McKenzie, David, and Christopher Woodruff, 2012, What are we learning from business training and entrepreneurship evaluations around the developing world?, IZA Discussion Paper No. 6895 (Institute for the Study of Labor (IZA)).
- Robb, Cliff A, 2011, Financial knowledge and credit card behavior of college students, *Journal of Family and Economic Issues* 32, 690-698.
- Supanantaroek, Suthinee, 2013, Financial literacy and saving attitudes of children: Empirical evidence for Uganda, Working Paper (The Private Education Development Network).
- Tennyson, Sharon, and Chau Nguyen, 2001, State curriculum mandates and student knowledge of personal finance, *Journal of Consumer Affairs* 35, 241-262.
- Tustin, Deon Harold, 2010, An impact assessment of a prototype financial literacy flagship programme in a rural South African setting, *African Journal of Business Management* 4, 1894-1902.
- Van Rooij, Maarten, Annamaria Lusardi, and Rob Alessie, 2007, Financial literacy and stock market participation, NBER Working Paper No. 13565 (National Bureau of Economic Research).
- Xu, Lisa, and Bilal Zia, 2012, Financial literacy around the world: An overview of the evidence with practical suggestions for the way forward, Policy Research Working Paper No. 6107 (World Bank).

Table I: Balance test

Variables	Mean and differences between groups				
	Treatment (1)	Control (2)	Difference (3)	P. Value (4)	N (5)
(i) Dependent variables					
1. Savings	36354.8 (6623.537)	33108.24 (5247.664)	3246.564 (8503.022)	0.7029	285
2. Savings rate	17.448 (2.716)	16.889 (2.375)	0.5585 (3.622)	0.8776	285
3. Borrowing	0.454 (0.0379)	0.509 (0.0388)	-0.055 (0.0542)	0.3113	341
4. Repaid on time	0.646 (0.0542)	0.580 (0.0552)	0.065 (0.0773)	0.3960	160
5. Number of times delayed to repay	1.013 (0.1902)	1.235 (0.211)	-0.222 (0.2845)	0.4366	160
6. Initiated new Income Generating Activity	0.976 (0.0238)	0.977 (0.0233)	-0.001 (0.0333)	0.9868	85
(ii) Independent variables					
7. Financial literacy score (out of 6)	2.875 (0.0905)	2.727 (0.09)	0.1489 (0.1277)	0.2443	341
8. Gender	0.529 (0.038)	0.497 (0.0388)	0.032 (0.0543)	0.5592	341
9. Age	40.856 (0.8133)	39.940 (0.8541)	0.916 (1.179)	0.4375	341
10. Married	0.753 (0.0328)	0.766 (0.0328)	-0.014 (0.0464)	0.7699	341
11. Education	4.023 (0.2247)	3.862 (0.2118)	0.161 (0.3093)	0.6037	341
12. Household size	5.886 (0.1752)	5.925 (0.179)	-0.04 (0.2504)	0.8734	327
13. Cognitive ability score (out of 9)	6.414 (0.115)	6.467 (0.127)	-0.053 (0.1713)	0.7560	341
14. Years in cooperative	4.411 (0.2759)	4.609 (0.3136)	-0.198 (0.4165)	0.6355	338
15. Land size	1.414 (0.2136)	1.080 (0.093)	0.333 (0.2325)	0.1527	265
16. Own livestock	0.841 (0.0281)	0.873 (0.0265)	-0.032 (0.0388)	0.4065	328
17. Annual expenditures	432727 (49576.74)	502217.7 (84180.45)	-69490.7 (96755.39)	0.4731	341
18. Subjective happiness	0.621 (0.0369)	0.659 (0.0368)	-0.038 (0.0521)	0.4666	341
19. Take at least monthly notes of income and expenditures	0.580 (0.0375)	0.545 (0.0387)	0.036 (0.0539)	0.5096	341

Currency is Rwandan Francs Rwf560 = \$1 when data was collected

Standard errors in parentheses

Table II: Impact of training on savings, borrowing, repayment, and starting a new income-generating activity

Covariates	Panel 1: OLS with single baseline and Endline					Panel 2: Fixed Effects				
	Outcome variables					Outcome variables				
	Savings (1)	Savings rate (2)	Borrowing (3)	Number of times delayed to repay (4)	Started New Income Generating Activity (5)	Savings (1)	Savings rate (2)	Borrowing (3)	Number of times delayed to pay (4)	Started New Income Generating Activity (5)
<i>(i) No covariates</i>										
Training dummy (D)	11653.26 * (4507.294)	6.174 ** (1.796)	0.1157 * (0.0663)	-0.5128 *** (0.0573)	0.1623 *** (0.0534)	17238.73 *** (631.843)	5.251 * (2.864)	0.0101 (0.0587)	-0.3878 (0.4179)	0.1182 *** (0.0414)
Constant	39977.5 (6480.616)	12.592 (1.423)	0.4327 (0.0488)	1.051 (0.4044)	0.1953 (0.0393)	26027.95 (184.07)	14.278 (0.8072)	0.529 (0.0165)	1.049 (0.1045)	0.2368 (0.0223)
N	271	228	228	91	279	484	440	440	163	558
<i>(ii) With Covariates</i>										
Training dummy (D)	15917.19 ** (5056.026)	5.774 ** (1.824)	0.1157 * (0.0682)	-0.4875 *** (0.0441)	0.1632 *** (0.0545)	13219.22 * (6284.576)	11.809 *** (2.745)	0.1552 * (0.0936)	-0.4194 (0.4535)	0.1007 ** (0.0438)
Age	-2111.394 (2216.459)	-0.1582 (0.779)	0.0294 (0.023)	-0.1126 (0.1389)	0.0098 (0.0179)	24144.4 * (9987.788)	8.218 (8.336)	0.069 (0.1406)	-1.16 (0.988)	-0.0056 (0.0128)
Age squared	20.77 (26.027)	0.001 (0.0066)	-0.0003 (0.0003)	0.0014 (0.0016)	-0.0001 (0.0002)	-275.356 (147.901)	-0.133 (0.1057)	-0.0019 (0.0018)	0.0129 (0.0117)	0.0001 (0.0001)
Married	15494.3 (5173.423)	-4.079 ** (2.59)	0.008 (0.0902)	-0.4843 (0.338)	0.0105 (0.0692)	-12543.98 * (5852.955)	5.441 (9.383)	0.1836 (0.1164)	-0.186 (0.752)	0.0183 (0.0485)
Education	-1836.319 (1441.571)	-0.3716 (0.2272)	0.0044 (0.0133)	0.0267 (0.0943)	0.0031 (0.0101)	-716.786 (1078.126)	-1.32 (0.9936)	0.0123 (0.0148)	0.0345 (0.0264)	0.014 ** (0.0072)
Household size	-252.31 (2826.681)	-1.1411 ** (0.3192)	-0.0144 (0.0158)	0.1329 (0.1244)	-0.0178 (0.0124)	2443.54 * (1093.323)	0.3196 (0.9006)	0.0138 (0.0294)	0.0932 (0.1642)	-0.0126 (0.0091)
Years in cooperative	-158.964 (745.994)	0.6648 ** (0.2443)	0.0065 (0.0094)	-0.0002 (0.022)	0.0082 (0.0076)	-657.533 (784.843)	-0.116 (0.2944)	0.0039 (0.0112)	0.0201 (0.0236)	-0.0004 (0.0058)
Log of expenditures	13909.42 ** (3954.151)	-1.098 (1.344)	0.0453 (0.0332)	-0.2307 * (0.1102)	0.0549 ** (0.0246)	1444.121 (3199.904)	-11.302 *** (0.8939)	-0.0264 (0.0412)	0.1292 (0.2396)	0.0125 (0.0178)
Own livestock	-6410.914 (7557.986)	-4.717 ** (1.513)	-0.0666 (0.0982)	-0.2441 (0.7232)	0.0367 (0.0807)	5961.665 (7517.135)	3.854 (6.964)	0.1219 (0.1052)	0.1921 (0.7036)	0.0653 (0.0594)
Size of land owned	700.71 (4312.28)	-0.3244 (0.3176)	0.0121 (0.0119)	-0.0493 (0.0349)	-0.0006 (0.0138)	907.27 (1923.415)	1.531 (1.619)	0.0054 (0.0134)	0.0139 (0.037)	-0.0078 (0.011)
Subjective happiness	-3469.628 (7709.522)	-4.491 (5.457)	0.0733 (0.0741)	0.1599 (0.3943)	0.0332 (0.0593)	13807.97 (8165.582)	2.884 (4.663)	-0.1211 (0.0905)	0.2191 (0.5627)	-0.0314 (0.0435)
Take notes	-10109.11 (8255.97)	1.278 (3.057)	0.049 (0.0724)	0.22 (0.163)	0.0044 (0.0565)	3531.555 (5799.241)	6.3 *** (1.407)	0.0617 (0.0866)	-0.4098 (0.4402)	0.1031 *** (0.0397)
Cognitive ability	4846.016 (4498.069)	0.1413 (1.332)	-0.0185 (0.023)	0.0673 (0.0608)	0.0306 * (0.0181)	1295.245 (2410.5)	0.2518 (1.571)	0.0598 (0.0293)	-0.1092 (0.0949)	0.0024 (0.0128)
Constant	-97791.69 (31792.76)	45.282 (19.496)	-0.6339 (0.5696)	5.069 (2.405)	-0.8513 (0.4271)	-511575.5 (153775.1)	43.372 (159.724)	0.7399 (3.254)	24.082 (18.175)	0.0535 (0.3194)
Fixed Effects	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
N	265	225	225	90	273	458	431	431	160	525

Robust standard errors in parentheses (Clustered at the cooperative level)

*Coefficient significant at 10 percent; ** at 5 percent; *** at 1 percent or less

FL Scores in full is: Financial Literacy Scores out of six

Table III: ANCOVA of the effects of training on savings, borrowing, repayment, and starting a new income-generating activity

Covariates	Outcome variables (With Follow-up data)				
	Savings (1)	Savings rate (2)	Borrowing (3)	Number of times delayed to repay (4)	Started new Income Generating Activity (5)
Training dummy (D)	11953.97 *** (2602.259)	6.8308 * (2.6398)	0.1424 ** (0.0698)	-0.5077 ** (0.1302)	0.1503 ** (0.0613)
Savings in baseline	0.2613 ** (0.0734)				
Savings rate in baseline		0.2207 *** (0.0479)			
Borrowing in the baseline			0.3387 *** (0.0705)		
Times delayed to repay in baseline				0.2548 * (0.0981)	
New income activity in baseline					-0.0274 (0.0724)
Constant	22795.44 (3635.748)	10.0054 (1.9197)	0.2551 (0.066)	0.8208 (0.4014)	0.2078 (0.0441)
N	211	184	184	97	211

Robust standard errors in parentheses (clustered at the cooperative level)

*Coefficient significant at 10 percent; ** at 5 percent; *** at 1 percent or less

FL Scores in full is: Financial Literacy Scores out of six

Table IV: Impact of financial knowledge on savings, borrowing, repayment, and starting a new income-generating activity (IV regression models)

Covariates	Panel A: IV regression with single baseline and endline data					Panel B: IV regression with Fixed Effects (with panel data)						
	Outcome variables					Outcome variables						
	First Stage	Second Stage				First Stage	Second Stage					
	FL Scores	Savings	Savings rate	Borrowing	Number of times delayed to repay	Started new Income Generating Activity	FL Scores	Savings	Savings rate	Borrowing	Number of times delayed to repay	Started new Income Generating Activity
	(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)	(3)	(4)	(5)	(6)
<i>(i) No covariates</i>												
Training dummy (D)	0.3648 ** (0.1371)						0.4167 *** (0.1609)					
FL Scores		32289.5 * (18223.99)	47.745 * (26.728)	0.1866 (0.2787)	-2.832 (2.443)	0.447 (0.188)		35678.13 ** (17432.92)	27.898 * (15.881)	0.0261 (0.1524)	-0.5789 (0.7451)	0.05 (0.156)
Constant	3.008 (0.0874)	-56674.22 (60019.61)	-124.204 (82.176)	-0.0976 (0.8929)	10.096 (7.973)	-1.137 (0.6087)	2.883 (0.0696)	-77865.81 (52327.65)	-64.766 (47.64)	0.4477 (0.457)	2.753 (2.309)	0.1138 (0.4679)
N	266	266	246	274	102	274	344	344	356	356	160	344
F of Excluded instrum.	11.16 (0.0288)						6.71 (0.0104)					
<i>(ii) With covariates</i>												
Training dummy (D)	0.3699 ** (0.1222)						0.4047 ** (0.167)					
FL Scores		43228.97 * (24518.5)	17.49 * (10.36)	0.2828 (0.193)	-2.069 * (1.094)	0.415 ** (0.1762)		30515.94 * (17704.2)	19.58 * (10.583)	0.1259 (0.1585)	-0.4405 (0.68)	0.0965 (0.1756)
Married	-0.0241 (0.0804)	16816.63 ** (7065.601)	-3.036 * (1.586)	0.0143 (0.0434)	-0.3281 (0.5462)	0.0171 (0.0289)	-0.9788 *** (0.3722)	16243.79 (23397.88)	23.846 (13.986)	0.3087 (0.2095)	-1.003 (1.455)	0.0467 (0.2321)
Household size	0.0341 (0.0230)	-2354.916 (2613.294)	-1.607 *** (0.2719)	-0.015 (0.0145)	0.2767 (0.0666)	-0.0319 (0.0102)	0.1118 * (0.0681)	-1645.27 (3329.052)	-2.078 (1.99)	0.0052 (0.0298)	0.2277 * (0.1477)	-0.012 (0.033)
Log of expenditures	0.0372 (0.0592)	10498.84 *** (2722.249)	-2.229 (1.692)	0.0304 (0.0353)	-0.535 (0.1291)	0.051 (0.0229)	0.1219 (0.1121)	1928.085 (5660.47)	-13.604 *** (3.384)	-0.0622 (0.0507)	0.0402 (0.2991)	-0.0352 (0.0561)
Own livestock	-0.2301 (0.1552)	2960.797 (4183.758)	0.7426 (2.387)	0.0171 (0.0725)	-1.665 (0.7017)	0.1191 *** (0.044)	0.2098 (0.3119)	5903.394 (14236.91)	-0.1511 (8.51)	0.1024 (0.1274)	0.8108 (0.732)	-0.1586 (0.1412)
Size of land owned	0.0243 (0.0251)	-576.757 (4672.507)	-0.7352 (0.5264)	0.0075 (0.0138)	-0.0729 (0.0407)	-0.01 (0.0142)	0.0164 (0.0436)	460.781 (1861.351)	1.012 (1.113)	0.002 (0.0167)	0.049 (0.0693)	-0.0204 (0.0185)
Subjective happiness	0.1509 (0.1101)	-9902.288 (7062.531)	-6.657 * (3.94)	0.0401 (0.0988)	0.8636 (0.6186)	-0.0333 (0.0509)	0.3388 (0.2225)	-3930.079 (12097.83)	-4.748 (7.231)	-0.1545 (0.1083)	0.2255 (0.5267)	-0.081 (0.12)
Take notes	0.177 (0.0803)	-17052.14 *** (4676.491)	-2.506 (4.678)	-0.0266 (0.0792)	1.043 (0.7301)	-0.0661 (0.0603)	-0.1744 (0.2298)	15032.65 (10287.67)	10.705 * (6.149)	0.0857 (0.0921)	-0.7938 (0.5581)	0.2754 *** (0.102)
Cognitive ability	0.111 * (0.0628)	-634.347 (5779.834)	-1.775 (2.034)	-0.0478 (0.0376)	0.4224 * (0.2352)	-0.0168 (0.0397)	0.173 ** (0.0723)	-4252.424 (4055.126)	-3.527 (2.424)	0.0298 (0.0363)	0.0414 (0.1642)	-0.0057 (0.0402)
Constant	1.642 (0.7407)	-200320.9 (57174.74)	16.573 (14.58)	-0.4234 (0.3899)	10.312 (3.257)	-1.404 (0.4915)	0.0875 (1.53)	-73687.6 (65441.32)	134.217 (39.118)	0.4154 (0.5859)	0.5671 (3.296)	0.5446 (0.649)
Fixed Effects	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
N	262	262	226	226	87	270	342	342	342	342	158	342
F of Excluded instrum.	7.32 (0.0538)						5.87 (0.0165)					

*Coefficient significant at 10 percent; ** at 5 percent; *** at 1 percent or less. Robust standard errors in parentheses (clustered at the cooperative level).

FL Scores in full is: Financial Literacy Scores out of 6

Appendix A: Financial Education Training Material

AQUAVED financial education program comprises the following modules:

1. "Teaching cooperative principles";
2. "Teaching concepts of microfinance, savings and credit";
3. "Teaching how to make a business plan for a small Income-Generating Activity";
4. "Teaching loan management";
5. "Basic book keeping and management of small Income-Generating Activities";
6. "Examples of business plans of small income-generating projects".

Module 1 entitled "Teaching cooperative principles" focuses on the role and objectives of savings and credit cooperatives, how they are managed and various tasks of their management organs, the duties of their members and what they can benefit from them. During workshops, participants are invited to raise problems encountered while working with their cooperatives, and suggest solutions for any difficulties evoked.

Module 2, "Teaching concepts of microfinance, savings and credit," explains how MFIs operate, their main mission of serving the poor, various services offered by MFIs including savings and credit, the difference between savings and deposits, and the role of credit officers.

Module 3, "Teaching how to make a business plan for a small Income-Generating Activity," takes participants through all steps to elaborate a business plan for small income-generating projects. Using an example of an income-generating activity existing in the study area, the trainer goes step by step showing participants how to make a business plan. These steps include the description of the product and its market, the financial appraisal that details investment costs, financing plan, loan repayment, working capital, expected operating costs, as well as wide socio-economic impact that the project might have for the population.

Module 4, "Teaching loan management," covers explanation of how to apply for a loan and the requirements to secure it, the types of loans according their terms and destination, the types of collaterals, how to compute interests, and the best practices in loan management.

Module 5, "Basic book keeping and management of small income-generating projects," teaches participants how to find markets for their products, how determine product prices, and the importance of keeping records. Participants are taught how to record entries, uses, and balance, how to keep inventories by recording purchases, sales, and stock on hand. They also learn how to keep record of those who owe them money, as well as how to keep record of money they repay.

The last module "Examples of business plans of small income-generating projects," consist of review and practice of business plan elaboration. The trainer recapitulates how to make a business plan using examples of a business plan of a small project to sell milk in a small town, an example of a small project of selling local beer on a local market, and a small project of raising poultry. Then, participants are divided into groups to practice how to make business plans.

Appendix B: Probing Attrition Randomness

Covariates	Binary for attrition	
	Attrition	Attrition
Training dummy (D)	-0.3611 (0.3037)	-0.3906 (0.3186)
Age	0.0418 (0.0518)	-0.0218 (0.0427)
Age squared	-0.0007 (0.0006)	0.0000 (0.0005)
Married	-0.0946 (0.1077)	-0.1279 (0.1448)
Education	-0.0329 (0.0287)	0.0042 (0.0196)
Household size	0.0142 (0.0523)	-0.0265 (0.037)
Years in cooperative	-0.0332 (0.0109) ***	-0.0009 (0.0237)
Log of expenditures	0.0639 (0.0506)	0.0861 (0.0123) ***
Own livestock	-0.288 (0.3517)	
Size of land owned	-0.0057 (0.03)	
Subjective happiness	-0.2956 (0.1853)	-0.1985 (0.1625)
Take notes	-0.1424 (0.28)	-0.1876 (0.2772)
Cognitive ability	0.0471 (0.0291)	0.0558 (0.0403)
Constant	-1.603 (1.193)	-0.8741 (0.7785)
<i>N</i>	253	338

Robust standard errors in parentheses

*** Coefficient significant at 1 percent level or less

Appendix C: Financial Literacy Questions*

1) Suppose you had Rwf100000 in a savings account and the interest was 20% per year, and you never withdrew money or interest payments. After 5 years, how much would you have on this account in total?

More than Rwf200000?

Exactly Rwf200000?

Less than Rwf200000?

Do not know

2) Imagine interest on your savings was 1% and inflation was 2% per year. After 1 year, how much would you be able to buy with the money in this account?

More than today?

Exactly the same?

Less than today?

Do not know

3) Given a table showing how interest and other loan charges are computed for a loan of Rwf6000 for 6 months at 2% interest a month and Rwf1000 to be paid per month on the principal? Fill in the table interest to be paid after the second month given that interest for the first month was 120.

Answer: **100**

4) Is the following statement correct? Savings and deposit are both for the long term.

Yes

No

5) Give three types of collateral that are accepted by your savings and credit cooperative?

Properties and durable goods

Solidarity groups guaranty

Savings

6) Mention three requirements that have to be fulfilled by members of your cooperative who wish to apply for loans? (any three among the following)

To have already paid one's contribution;

To have no bad records for the last three months;

To prove that you have an income-generating activity in which you are going to invest money in

To show proofs of reimbursement capacity;

To have on your account 20% of the amount applied for if you are a member of solidarity groups and 30% of the amount for non-solidarity group members;

To have demonstrated integrity before;

To accept to be monitored;

To demonstrate experience in the project for which you apply loan for.

* Correct answer in bold for the first 4 questions.