RATIONALITY & COMPETITION
CRC TRR 190

Financial Literacy and Intra-Household Decision Making: Evidence from Rwanda

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Discussion Paper No. 186

September 19, 2019

Financial literacy and Intra-household Decision Making: Evidence from Rwanda[*]

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13 August 2019

Research has consistently shown that women's involvement in household decision making positively affects household outcomes such as nutrition and education of children. Is financial literacy a determinant for women to participate in intra-household decision making? Using data on savings groups in Rwanda, we examine this relationship and show that women with higher financial literacy are more involved in financial and expenditure decisions. Instrumental Variable estimations confirm a causal link. For this reason, we perform a decomposition analysis breaking down the gender gap in financial literacy into differences based on observed sociodemographic and psychological characteristics and differences in returns on these characteristics. Our results show high explanatory power by education, happiness, symptoms of depression, and openness, but also suggest that a substantial fraction can be explained by differences in returns. We argue that this results from a strong role of society and culture.

Keywords: financial literacy, women empowerment, intra-household decision making

JEL Classification: D 14 (personal finance), J 16 (economics of gender), G 02 (behavioural finance: underlying principles)

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1. Introduction

Strengthening women empowerment within the household is not only a desirable goal in itself but also has other positive welfare effects (Duflo, 2012). Stronger involvement of women in household decision making can have important effects on outcomes such as child mortality (Moursund and Kravdal, 2003; Thomas, 1990), nutrition, health, and education of children (DFID, 2010; Duflo, 2003; Thomas, 1993). As one of the Sustainable Development Goals (SDGs), the United Nations (UN) has therefore announced women's empowerment and higher involvement in household decisions as an integral part of the 2030 agenda (UN, 2015).

Liberating and enhancing women's capacity to make choices within the household is crucial to women empowerment (Alsop et al., 2005). Kabeer (1999) conceptualizes women's empowerment and divides the ability to make choices into three moments in time. She frames the first moment as pre-condition or resource, the second moment as action or agency, and the third one as achievement; whereby agency tends to be operationalized as decision making. Based on early household models (McElroy and Horney, 1981), resources often comprise material resources, such as income (Anderson and Eswaran, 2009; Bobonis, 2009; De Brauw et al., 2014) and land ownership (Allendorf, 2007). More recently, resources have also been defined more broadly as human capital (see Doss, 2013; Fiala and He, 2017, for reviews).

This article contributes to the literature on the determinants of women's agency at home by examining the effect of a specific type of human capital, that is financial literacy, on a specific type of agency, that is financial decision making within the household. Throughout this manuscript financial literacy will refer to understanding of financial concepts, such as interest rate, risk diversification, and inflation. Following the framework developed by Kabeer (1999), financial literacy should act as a resource of empowerment by increasing women's ability and self-confidence to make financial decisions and ultimately enhance their involvement in intra-household decision making.

Using household data collected from savings group members in the Southern Province of rural Rwanda, we first run Ordinary Least Squares (OLS) regressions to look at correlations between financial literacy and women's involvement in households financial and expenditure decisions. We find that there is a strong and positive relationship. The cross-sectional design of this study, however, prevents us from making causal statements based on linear regressions. Although theory predicts a positive effect of financial literacy on women's involvement in household financial decisions (Kabeer, 1999), causality may occur in both directions. To establish causality of this effect, we

chose an Instrumental Variable (IV) regression approach. This is a common approach in the literature on the determinants of women's agency at home. For instance, Doss (2001) and Duflo and Udry (2004) use rainfall shocks to instrument for women's agricultural income and find expenditure shifts towards education and food.

Our identification strategy is based on financial literacy levels of other savings group members as an instrument for woman's own financial literacy level. Higher financial literacy levels of peers provide women with more information on finances, but is argued to not directly affect their decision-making power at home. OLS and IV estimates are comparable both in size and significance. This result and a large number of robustness tests to validate our instrument allows us to conclude that the effect is causal and runs from financial literacy to increased involvement by women in household decision making.

These results motivate further analysis on how to improve women's financial literacy levels. We first show that, in line with the literature (Bucher-Koenen et al., 2017; Xu and Zia, 2012), women have lower financial literacy than men. So far, however, little discussion exists about the reasons behind this gender gap. That is why in a second step, we look at drivers behind this gender gap in financial literacy performing a detailed decomposition analysis. Unlike previous studies, we have information on deeply rooted personality traits in addition to more standard socio-demographic measures. The results show that 47 per cent of the gap stems from gender differences in endowments, particularly women's lower educational attainment (18 per cent), lower openness for new ideas (13 per cent), lower happiness (5 per cent), and greater symptoms of depression (3 per cent). 53 per cent of the gender gap stems from gender differences in returns on characteristics and thus remain unexplained by observed characteristics. We interpret this as a strong role of society and culture as has previously been shown by Filipiak and Walle (2015) for matrilineal societies in India and Grohmann et al. (2016) in Thailand.

This article adds to a nascent literature on the effect of financial literacy on financial decision making, as reviewed by (Lusardi and Mitchell, 2014). The research to date has tended to focus on financial outcomes rather than on decision-making processes. For example, IV analyses show that financial literacy improves retirement planning (Lusardi and Mitchell, 2007), wealth accumulation (van Rooij et al., 2012), stock market participation (van Rooij et al., 2011), and reduces the amount of debt held (Lusardi and Tufano, 2015; Gathergood, 2012). In developing countries, the literature is less extensive and the majority experimentally evaluate financial literacy programmes (see Kaiser and Menkhoff, 2017, for a meta-analysis). In Indonesia and

India, Cole et al. (2011) find only modest effects on account ownership for the poorest segment of the treated populations. Doi et al. (2014) and Sayinzoga et al. (2015) find significant impacts of financial literacy training on savings in the Philippines and Rwanda, respectively.

A second set of studies have looked at the link between access to finances and household decision making. Using an RCT, Ashraf et al. (2010) find that households are more likely to buy female-oriented durables when they get access to a commitment savings product. This implies women's increased control over monetary decisions at home. Likewise, Hashemi et al. (1996) provide evidence that bank or committee memberships increase participation in household and purchasing decisions. Despite increasing evidence on the material resources on intra-household decision making, there are currently few studies which attempt to provide rigorous estimates of the impact of skills and human capital.

Our research builds on these existing studies in several important ways. First, this study is the first we are aware of to empirically examine the link between financial literacy and intra-household decision making. Our IV approach provides a source of identification. Secondly, we disentangle the determinants of the gender gap in financial literacy taking into account a number of relevant personality traits.

These results can aid in designing policies intended to increase financial literacy levels for women. In particular, the effect of education and personality, together with the large unexplained part of the decomposition analysis suggests that women may benefit from tailored training that not only teaches financial concepts but also focuses on forming life skills, such as self-confidence and gender awareness.

Following this introduction, the remainder of the manuscript is organized as follows: Section 2 describes the setting and section 3 presents the data. Section 4 looks at women's involvement in household decisions. In Section 5, we perform a decomposition analysis. Section 6 provides robustness and Section 7 concludes.

2. Setting

2.1. Country context and savings groups

The Rwandan government and development organizations have made great efforts to promote women's empowerment leading to a more balanced picture between men and women in comparison with other sub-Saharan African countries. And even though in Rwanda, women are well represented in the Parliament and other leadership organs,

the country is still a patriarchal society and women lag behind in household decision making. Cultural norms persist and men are still the decision makers (Abbott et al., 2018). The majority of our female sample is informally employed in the agricultural sector with low probability to be economically included. In this context, women still lag behind in decision-making both socially and economically and the question how to increase their household decision-making power is highly relevant.

Our analysis relies on primary household data of savings groups in the Southern Province of Rwanda, a rural area where the majority of people save in informal groups such as tontines or Village Savings and Loan Associations (VSLAs).[1] The most recent FinScope report for Rwanda shows that on average about 54 per cent of adults use informal savings groups to manage their savings (FinScope, 2016). In the rural South, this number is likely higher and savings groups provide an important tool of ensuring financial inclusion for the most vulnerable. A typical VSLA in Rwanda is gender-mixed and consists of 15 to 30 people, with more than 75 per cent being women. Members meet once a week to contribute to or borrow from a shared fund. Savings are often as little as one or two hundred Rwandan Francs (RWF) (less than 0.25 USD) per week. Eight to twelve months after the savings circle has started, each member will receive her share-out of the fund and her accumulated savings.

It is possible that this regular meeting and contribution structure may increase understanding of financial concepts and that this, together with selection issues, means that our sample has higher interest in money management that likely goes beyond the financial literacy of other rural residents. The decomposition analysis benefits from this, as unobservable factors related to financial interest can to some extent be neglected. Given that members voluntarily select themselves into groups, it is possible that the composition of groups is related to wealth, education or other socio-demographic characteristics. A comparison of our sample to the Rwandan Housing and Population Census 2012 (NISR, 2012) shows that the sample is comparatively less educated and poorer than the overall Rwandan population. This is, however, not systematic between men and women.

Unlike previous household surveys in developing countries, the sample not only includes the household head and hence the potential financial decision maker, but instead is representative for all savings group members in southern Rwanda. This can include the household head or any other household member. It is therefore well suited to study the effect of financial literacy on women's involvement in household decisions.

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[1]See Karlan et al. (2017) for a detailed description of the VSLA model.

2.2. Sampling

Sampling was done in two random stages. First, we stratified the sample by district and drew a total of 300 VSLAs from a complete list of all active VSLAs in southern Rwanda. Second, we randomly selected five individuals from each VSLA. This was done by first compiling a list of all active members of the visited VSLA. Using smart mobile devices, a random number generator then randomly selected five names from this list. Our sample is, hence, representative for VSLA members in Rwanda's Southern Province. The target population is older than 18 years. Respondents also qualify as poor according to Rwanda's poverty levels[2] and have limited access to formal financial services provider. We designed the questionnaire specifically to answer questions regarding financial issues of the household. It contains questions on the household's socio-demographic variables, household composition, intra-household decision making, financial services used and financial literacy. Each interview took about 45 minutes.

The final sample collected in 2015 covers 283 of the 300 sampled VSLAs and about 1400 respondents. 17 VSLAs from the initial list of active groups either no longer existed or could not be reached. No VSLA refused to participate in the survey.

3. Descriptive statistics and variables

3.1. Socio-demographics

Summary statistics are presented in Table 1 separated by gender. Respondents are on average 40 years old, married and poorly educated. Only 57 per cent of women and 72 per cent of men can spell a simple word in the local language correctly. Women are also more likely to be widowed than men. Looking at measures for personality such as happiness and the depression index[3], women's indices are below that of men. The majority of respondents report farming as their main occupation, which they undertake independently and in employment for others. The average household size is about five. What is interesting in this data is that the highest proportion of female savings groups members tend to belong to the lowest income quartile, whereas the highest proportion

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[2]In Rwanda, poor people are selected into the first or second 'Ubudehe category'.

[3]We use the widely known 'Center for Epidemiologic Studies Depression Scale Revised' (CESD-R). It is standard battery of 20 questions that measure depression and depressive disorders in nine different groups: sadness, loss of interest, appetite, sleep, thinking and concentration, guilt, tired, movement, suicidal ideation (Radloff, 1977; Eaton et al., 2004).

of their male counterparts belong to the upper income quartile.[4] We also construct an asset index that is the first principal component of the respondents reported assets. This asset index indicates that women participate in VSLAs out of poorer households than men. Moreover, mobile phone ownership is less likely in households of female than male savings groups members.

- set Table 1 about here -

3.2. Intra-household decision making

The first part of this article focuses on financial decision making as outcomes of interest. Outcome variables are defined as who within the household decides on income, credit, investment, and expenditure decisions. The latter is further divided into energy and food expenses of the household, women's own health and clothing expenses, and children's health and clothing expenses. These indicators are similar to those included in Demographic and Health Surveys (DHS) and have previously been used by Allendorf (2007) and Connelly et al. (2010) to study intra-household decision making.

Table 2 provides descriptive statistics. The majority of both sexes indicate to jointly decide on financial matters. In comparison with men, women are more likely to report that they either make the decision themselves or that their husbands make the decision alone. On the contrary, men are more likely than women to report that both partners make the decision together. Patterns are consistent for all types of financial decisions.

- set Table 2 about here -

3.3. Financial literacy gender gap

We measure financial literacy using an adjusted version of the Lusardi and Mitchell (2011) questions and developed further by Cole et al. (2011). This approach focuses on numeracy skills for calculating financial trade-offs. Questions that were asked are the following:

- Suppose you borrow RWF 10,000 from a moneylender at an interest rate of two per cent per month, with no repayment for three months. After three months, do you owe less than RWF 10,200, exactly RWF 10,200, or more than RWF 10,200?

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[4]We use expenditures to proxy for income. All expenditure categories were aggregated on a yearly base and further divided into fourths.

- If you have RWF 10,000 in a savings account earning one per cent interest per annum, and prices for goods and services rise two per cent over a one-year period, can you buy more than, less than, or the same amount of goods in one year as you could today, with the money in the account?

- Is it riskier to plant multiple crops or one crop?

- Suppose you need to borrow RWF 50,000. Two people offer you a loan. One loan requires you to pay back RWF 60,000 in one month. The second loan requires you to pay back in one month RWF 50,000 plus 15 per cent interest. Which loan represents a better deal for you?

All questions were multiple choice; two questions with two possible answers and two questions with three possible answers. Respondents also had the option to answer 'I don't know' or to refuse to answer. For each question the respondent provides a correct answer for, she receives one point. That means that the aggregated financial literacy index ranges from zero to four.

In comparison to studies in countries with a similar level of development, respondents in our Rwandan sample are slightly more financially literate, for example more literate than the Indian sample used in Cole et al. (2011). The proportion of correct answers is highest for the question on risk-diversification. Since 92 per cent of respondents are working in the agricultural sector, this might be obvious as the question is framed in a manner requiring agricultural knowledge. In contrast, knowledge in basic numeracy is low.

Figure 1 shows the share of correct answers broken down by gender.[5] On average, women are less likely than men to provide correct answers. Only 45 per cent of female respondents and 61 per cent of male respondents correctly answered the borrowing decision. 57 per cent of men showed basic understanding of interest and inflation. In contrast, only 45 per cent of women correctly dealt with these economic concepts (see Table 3). While 34 per cent of men correctly answered all four questions, only 22 per cent of women did so. The financial literacy level is significantly lower for women than for men, irrespective of how financial literacy is measured (see Table 4).

- set Figure 1 about here -

Furthermore, women are more likely to indicate that they do not know the correct answer. As many as 26 per cent of women indicated that they do not know the answer

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[5]Table A.1 in the Appendix compares financial literacy over additional socio-demographic categories.

to the first compound interest question, whereas the proportion of men is much lower (15 per cent) (see Table 3). 35 per cent of women gave at least one 'don't know' response to one of four financial literacy questions, the proportion of men doing so is about 19 per cent (see Table 4).

- set Table 3 about here -

- set Table 4 about here -

Our findings confirm results found in other studies on financial literacy and gender, where women are more likely to say that they do not know the answer and perform worse than men (Bucher-Koenen et al., 2017). This is true even for the most educated women (Mahdavi and Horton, 2014). So far, only very little evidence exists on the reasons behind this gender gap. Grohmann et al. (2016) argue that the gender gap is caused by culture and that financial literacy is similar between sexes in Thailand because Thai women are traditionally in charge of financial matters. Likewise, Filipiak and Walle (2015) find that women in matrilineal societies in India have better financial literacy than women living in patrilineal societies. Hsu (2016) attributes women's lower financial literacy to specialization of tasks within the household.

4. Financial literacy and decision making

4.1. OLS analysis

To examine the link between financial literacy and intra-household financial decision making, we first look at simple OLS regressions. We regress the financial literacy index described above against three financial decisions and two indexes. We look at three types of financial decisions that are income, credit, and investment decisions. Results are shown in Table 5. In columns one to three, we display outcome variables that are unity if a woman is involved in a financial decision. This means that she reports that she either makes the decision alone or that she and her husband make the decision together. We decided to focus on this outcome variable, as it is woman's involvement in financial decision making that is argued to have positive effects on household welfare, rather than women taking decisions alone (Duflo, 2012). Nevertheless, we also look at sole decision making in the Appendix.[6] In columns four and five, we report two

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[6]In Table A.2, we regress financial literacy against whether a woman reports that she makes financial decisions alone. The results show a negative relationship, probably because women who make household decision themselves are more likely to be widowed and these tend to have lower financial literacy.

indexes, one for financial decisions and one for expenditure decisions. The financial decisions index is the sum among income, credit, and investment decisions that a woman is involved in. The expenditure decisions index is the total of the following six decisions that a woman is involved in: food and energy, own health and clothing, and children's health and clothing decisions. Results for the individual decisions are shown in the Appendix.[7]

In all regressions in Table 5, we include a set of control variables that have been shown to be correlated with someone's financial literacy level, such as age, whether the person can read and write, and marital status with being single acting as the excluded category (Lusardi and Mitchell, 2014). We further control for the number of household members and the number of children in different age groups. Four expenditure quartile dummies proxy for income because it is commonly hard to measure in developing countries. The lowest expenditure quartile is excluded from the regression. An asset index using the first principal of a principal component analysis additionally controls for household wealth.

- set Table 5 about here -

The results in Table 5 show that there is a clear and strong correlation between financial literacy and women's involvement in household decision making. This relationship is positive and economically significant for individual financial decisions as well as for the two indexes. It is significant despite the large number of control variables entering the regressions.

Apart from financial literacy, other expected patterns can be observed. Older women tend to be more involved in intra-household decision making, albeit this relationship is non-linear. Women who are married, divorced or widowed are less likely to be involved in household decisions than women who are single. There is also a negative relationship between a woman having decision-making power within the household and the size of that household in which she lives. Interestingly, women's decision-making power is not significantly associated with income and wealth.

The most striking result to emerge from the data is, however, the correlation between financial literacy and women's involvement in household decision making. The effect of being able to correctly answer one more financial literacy question is, for

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[7]Table A.3 shows results for OLS regression on expenditure decisions at home. There is a significant positive correlation between a woman's financial literacy and her involvement in household's food and energy consumption as well as her own health and clothing decisions. Her decisions regarding children's health and clothing are not significantly associated with financial literacy.

example, larger than the effect of being one year older. In the next section, we employ IV regression to establish whether this finding is causal.

4.2. IV analysis

The cross-sectional design of this study poses potential endogeneity problems due to omitted variable bias or reverse causality. For example, unobservable personal attributes could drive financial literacy and decision making at the same time. Similarly, it is possible that reverse causality is at play and that decision makers use their greater agency to learn about financial matters. Of course, better financial literacy might then further enhance involvement in household decisions. We, however, extrapolate theoretical backing for a positive causal relationship running from financial literacy to more involvement in intra-household decision making by women. In line with the concept by Kabeer (1999), financial literacy can be thought of as a resource that affects decision making.

To nullify endogeneity issues, we employ an IV approach. We collected a number of potential instruments such as whether parents taught their children how to budget, the proportion of people in a district who report the nearest bank to be less than 30 minutes away, the proportion of people who report the nearest market to be less than 30 minutes away, the quality of the public transport. Yet, none of these potential instruments pass the standard tests for weak instruments. Instead, our identification strategy is based on the VSLA's average financial literacy index excluding the person who is examined. This instrument is highly correlated with the financial literacy of that person as group members are likely to learn from each other.

The IV regression results, as shown in Table 6, indicate similar patterns as simple OLS regression analyses in Table 5.[8] Financial literacy has a significantly positive effect on women's involvement in intra-household financial decision making. This holds for the three financial decisions as well as for the two indexes. Interestingly, the size of the coefficient is similar between OLS and IV models, which is unusual in the financial literacy literature.

Our identification strategy assumes that after adding all demographic, household, and wealth controls, the average financial literacy of other group members has no independent impact on household decision making. Following conventional intra-household, decision-making theory, we believe that each household member's contribution to the household determines decision-making power at home (McElroy and

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[8]Results separated by expenditure decisions are listed in Table A.4 in the Appendix.

Horney, 1981). Hence, we argue that intra-household decision making is a private process determined by the members of that household. We examine possible threats to this exclusion restriction in the robustness section below. Another concern may arise if financial literacy levels vary with the location people live in. This is especially worrisome when some savings groups are on average more financially literate than others because they live in more progressive areas where women are also more involved in household decisions. Mapping the study groups, however, mitigates this concern because the variation in VSLA average financial literacy is not systematic between rural and more urban areas (see Figure A.1). Table A.5 in the Appendix further shows no significant correlations between group financial literacy levels and distances to urban spots such as markets or health centres. Moreover, groups with high financial literacy and groups with low financial literacy may differ in other ways, which then influences their financial decision making. In Table A.6, we run t-tests between groups with financial literacy above the mean and groups with financial literacy below the mean and see that there are no significant differences in observables. We also show that the coefficient on the IV is not sensitive to the inclusion of covariates (see Table A.7). This indicates little effect of unobserved variable bias. Another concern could be other group specific characteristics, apart from the location, that influence both financial literacy and decision-making processes within the household. Table A.8 in the Appendix, therefore, shows IV results with group fixed effects. These findings establish similar relationships between financial literacy and intra-household decision making, albeit only statistically significant for the financial decisions index.

As a consequence, we rule out unobserved variables or selection into groups that are better financially educated as drivers of our results. We believe that the only channel through which the instrument affects intra-household decision making is via the financial literacy of the individual. We, therefore, argue that there is a causal relationship and that higher financial literacy strengthens women's intra-household decision making.

- set Table 6 about here -

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5. Analysing the financial literacy gender gap

5.1. Empirical strategy

Previous sections show: (a) that there is a significant difference in financial literacy between men and women, and (b) that financial literacy is an important aspect for women's involvement in intra-household decision making. As a tangible consequence, this section investigates why men outperform women on financial literacy and so aims to inform policy makers on how to improve women's financial literacy. This is done in two steps. First, we run a simple multivariate regression with the financial literacy index as dependent variable in order to explore the heterogeneity along potential covariates. Second, we use the multivariate decomposition technique popularized by Blinder (1973) and Oaxaca (1973) to study mean outcome differences in financial literacy between men and women. The decomposition tests two explanatory approaches: (i) one that explains differences based on observed characteristics ('the endowment effect'), and (ii) another that explains differences in returns on these characteristics ('the coefficient effect').

Differences in financial literacy may exist due to gender differences in endowments; for example, when women are less educated than men. What would be the average financial literacy of women if they would be just as educated as men? Would this counterfactual financial literacy level of women be improved? Or would women still face lower returns to education and thus score lower in financial literacy tests, most likely due to societal or environmental factors. Previous evidence shows that marital status, age, education, and income can only partially explain the difference in financial literacy between men and women (Fonseca et al., 2012; Bucher-Koenen et al., 2017). That is why we examine whether differences in financial literacy hold when we apply men's coefficients to women's endowments.[9] These findings are important to inform policymakers who aim to increase women's financial literacy by highlighting the relative contribution of personal characteristics (the endowment effect or explained variables) and the cultural and societal context the person lives in (the coefficient effect or unexplained variables).

A general formulation of the two-fold decomposition technique is provided by Yun (2004). He proposes to decompose differences not only in sample means but rather in first moments, and so to extend the linear Blinder-Oaxaca decomposition to non-linear

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[9]Depending on the context of the research question, the coefficient effect has been interpreted in different ways. In the gender wage gap literature, for instance, this effect has often been used as a measure for discrimination (Blinder, 1973; Oaxaca, 1973).

models. Accordingly, the level of financial literacy, Y, can be explained by a given set of observable characteristics, X, and coefficients, β:

$$Y = F(X\beta),$$

where the mapping function, $F(.)$, can but not need to be linear as long as it is once differentiable (Yun, 2004). We estimate a linear probability model in the main specification and non-linear models as robustness checks. The difference in financial literacy, Y, at the first moment between men, A, and women, B, can be summarized in the following equation:

$$
\begin{aligned}
\overline{Y}_A - \overline{Y}_B &= [\overline{F(X_A\beta_A)} - \overline{F(X_B\beta_B)}] \qquad (1) \\
&= \underbrace{[\overline{F(X_A\beta_A)} - \overline{F(X_B\beta_A)}]}_{\text{endowment effect}} + \underbrace{[\overline{F(X_B\beta_A)} - \overline{F(X_B\beta_B)}]}_{\text{coefficient effect}} \qquad (2)
\end{aligned}
$$

The first part describes the overall endowment effect, whereby the latter indicates overall differences in coefficients. Estimating the relative contribution of each variable, i, to the total gender gap can yield a more detailed picture. Yun (2004) proposes to calculate weights to the endowments and coefficients effects as follows:

$$\overline{Y}_A - \overline{Y}_B = \sum_{i=1}^{i=K} W_{\Delta X}^i [\overline{F(X_A\beta_A)} - \overline{F(X_B\beta_A)}] + \sum_{i=1}^{i=K} W_{\Delta\beta}^i [\overline{F(X_B\beta_A)} - \overline{F(X_B\beta_B)}], \quad (3)$$

where

$$W_{\Delta X}^i = \frac{(\overline{X}_A^i - \overline{X}_B^i)\beta_A^i f(\overline{X}_A\beta_A)}{(\overline{X}_A - \overline{X}_B)\beta_A f(\overline{X}_A\beta_A)} = \frac{(\overline{X}_A^i - \overline{X}_B^i)\beta_A^i}{(\overline{X}_A - \overline{X}_B)\beta_A}$$

$$W_{\Delta\beta}^i = \frac{\overline{X}_B^i(\beta_A^i - \beta_B^i) f(\overline{X}_B\beta_B)}{\overline{X}_B(\beta_A - \beta_B) f(\overline{X}_B\beta_B)} = \frac{\overline{X}_B^i(\beta_A^i - \beta_B^i)}{\overline{X}_B(\beta_A - \beta_B)}$$

Weights add up exactly to one (100 per cent) and can simply be calculated using the average values of characteristics and their coefficients (Yun, 2004).[10]

One caveat of detailed decomposition techniques is linked to categorical regressors. Usually, in a regression framework one of the categories is chosen to be the base category. It is set to zero and all comparisons will be made relative to that category. Oaxaca and Ransom (1999), however, show that the results of the detailed decompo-

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[10]For non-linear models, however, results are sensitive to the order in which independent variables enter the decomposition. Yun (2004) proposes a convenient solution for the so-called 'path dependence'. He obtains weights from a first order Taylor expression to linearise the endowments and coefficients effects in equation (2) around $\overline{X}_A\beta_A$ and $\overline{X}_B\beta_B$.

sition are not invariant to the choice of the (omitted) base category. We, therefore, follow the solution by Yun (2008) and normalize the effects for a set of indicator variables representing one categorical regressor in the model.

5.2. Regression results

Table 7 shows results of multivariate regression analyses. The outcome variable is the financial literacy index and the main variable of interest is the female dummy. For ease of interpretation, explanatory variables are collected into groups and separately introduced into the regression analysis.

Results are in line with Lusardi and Mitchell (2014). Women have significantly lower financial literacy than men. As for other control variables, age is humped shaped. Financial literacy first increases with age and then falls for the elderly. This effect turns statistically insignificant when adding household composition variables but its direction remains robust. The number of children in the household may thus be an alternative measure for being middle aged and absorbs the effect of age. For all specifications, our results point to a strong and significantly positive relationship between the ability to write and being financially literate. In contrast, the marital status is insignificant. Happiness as one measure for well-being is significantly positive associated with financial literacy. Similarly, albeit only significant in the first model, the depression scale is negatively correlated with financial literacy; meaning that people who are less depressed are more likely to be financially literate. The relationship between the economic status of the household and financial literacy is ambiguous. Even though the asset index is statistically insignificant, we find that those with higher incomes are more financially literate. Having children at school-age also increases the probability of being financially literate. Further, the exposure to financial concepts may vary by type of occupation and as such drives differences in financial literacy. Consistent with this theory, we observe that those in independent occupations have higher financial literacy than those in dependent occupations. Similar to Aterido et al. (2013), we interpret mobile phone ownership as a proxy for being more open to new ideas. Even if we control for household assets, the effect of mobile phone ownership on financial literacy is positive and statistically significant.

Importantly, the coefficient on the female dummy remains significant and about the same size as we introduce a large set of additional control variables. This finding already indicates that the gender gap in financial literacy is not only driven by confounding factors, but that other non-observables also drive this gender gap.

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Coefficients in this section were estimated using simple OLS estimations. Hence, relationships described cannot be interpreted as causal. As a consequence and because variables that are potentially endogenous in these regressions are not significantly related to financial literacy, we will focus on only exogenous variables in later analyses.

- set Table 7 about here -

5.3. Decomposition results

Decomposition results are shown in Table 8. Both analyses estimate a linear probability model with the financial literacy index as outcome variable. The left hand side of the table does not contain a measure of wealth, whereas the right hand side does in form of the asset index. The table reports the coefficient estimates along with percentage shares. Standard errors are cluster-adjusted at the VSLA-level in order to account for intra-group correlation.

Overall, the mean of the financial literacy index is 2.833 for men and 2.363 for women. This yields a gender gap of 0.470. The increase of 0.223 indicates that 47 per cent of the gap stems from gender differences in endowments. The remaining 53 per cent of the financial literacy gender gap can be attributed to gender differences in returns on these endowments.

The second and third panel of Table 8 show results of the detailed decomposition. We see that spelling as a proxy for educational attainment contributes about 18 per cent to the gender gap in financial literacy. Furthermore, happiness as a measure of individual well-being also eliminates the gap in financial literacy by 5 per cent. Though statistically insignificant, improved symptoms of depression would also result in reduced gender differences in financial literacy. Further, mobile phone ownership can significantly reduce the gender gap by about 13 per cent.

The second analysis only differs to the first one by controlling for wealth. We can see that this specification yields similar results and that mobile phone ownership keeps its explanatory power. This suggests that mobile phone ownership is not only another wealth measure but indicates something we interpret as openness to new ideas. Aterido et al. (2013) use a similar line of argumentation in order to explain the lower usage of formal banking services by women in sub-Saharan Africa.

On the bottom line, this decomposition analysis shows that 47 per cent of the financial literacy gender gap can be attributed to endowment effects. 21 per cent of this can particularly be linked to personality traits such as openness (13 per cent), happiness (5

per cent), and depression (3 per cent). The finding shows that a large part of the gender gap has its roots in social environments. We argue that the remaining coefficient effect also captures some of these cultural and societal circumstances in women's lives - a point, that is common in the literature on gender gaps in general. Scholars have argued that gender differences are broadly consistent with gender stereotypes across cultures (Nolen-Hoeksema, 1987; American Psychological Association, 1994; Costa Jr et al., 2001; Thayer et al., 2003). Eagly (2013) explains that perceived differences between men and women might result from adoption of gender roles, which predetermine appropriate conduct for each gender.

- set Table 8 about here -

6. Robustness

This robustness section augment our findings. Results are presented in the online Appendix.

First, we compare alternative financial literacy measures and confirm a positive relationship between financial literacy and household decision making. Similar to van Rooij et al. (2011), a financial literacy factor is derived using an iterated principle factor analysis, followed by the Bartlett method (Bartlett, 1937). The estimated factor score of the first factor acts as a proxy for financial literacy. We also use a dummy that is one if the respondent answered all financial literacy questions correctly. In comparison, Table A.9 shows a positive and mostly significant relationship.

Using probit instead of OLS regressions, we test whether the link between financial literacy and financial decision making is robust to changes in estimation strategy (see Table A.10). The marginal effects are slightly smaller but very similar to the coefficients of the linear probability model in Table 5, which is why we focus on OLS regressions in further robustness tests.

Further, we control for education instead of using a dummy indicating whether the person is able to spell a simply word in Kinyarwanda. Several of the questions used to measure financial literacy require the respondent to calculate percentages and to understand the principle of compound interest - both of which require more than basic literacy. That is why we control for educational attainment as robustness analysis, omitting primary education and less as the base category. Table A.11 strengthens our results and show that financial literacy remains positively related to decision making. As a result, the finding that higher financial literacy increases the likelihood that

women will participate in household decision making is not only capturing the effect of educational attainment but rather financial literacy that highly matters.

We diverge from homogeneous effects and estimate the link between financial literacy and financial decision making for different sub-samples: (Panel A) only married women, (Panel B) women who report that they do not have to ask for permission to attend or travel to a meeting, and (Panel C) those who need permission to do so. Results in Table A.12 are significant for married women and for women who do not have to ask for permission. Potentially caused by a small sample, the coefficient is positive but turns insignificant when looking at women who have to ask for permission.

Next, we augment our IV identification strategy. Tests and first stage results shown in Table A.13 and Table A.14, respectively, support the validity of our instrument. We also report results adding a second and commonly used instrument that is borderline not weak in Table A.8. Table A.15, shows a positive but insignificant correlation between financial literacy and distance to nearest school, which is why we focus on the group instrument throughout thus manuscript.

Table A.16 provides further robustness to our IV identification. The first column shows the original IV estimates. One potential challenge occurs when the group is only more financially literate because the instrumented individual is more financially literate. In column two, we aggregate financial literacy on the cell level that is between village and sector level. It is very unlikely that the average cell level is driven by only one person. The estimate on the financial decisions index is unchanged. This adds further support to our claim that the group level influences the individual level.

Another potential threat to our exclusion restriction is that women may not only learn about finances from the group, but can also adapt their and their husband's decision making to other women in the group. Household decision making, however, is a private process determined by all household members and not only the savings group member, which leads us to believe it is extremely unlikely that female savings group members reconfigure their decision-making behaviour because of other female members. To examine the robustness of our results to this possibility, in column three we take the group financial literacy average for male members only and use this as an instrument for woman's own financial literacy level. Again this alternative identification leads to no significant change in the estimated effect of financial literacy on the financial decisions index. The estimate on the expenditure decisions index is still positive but insignificant. This might be caused by a small sample because male and female members were randomly selected to enter our sample and men are typically underrepresented in these groups. Another way to mitigate this concern is to identify

a sample for whom learning about finances is difficult. The small number of elderly provide such a sample because the ability to learn new things might decrease with age. In column four, we see a change in significance, size and sign. Thus, our results appear robust to these potential challenges.

We also add robustness to the findings in Table 7 and change the measure of financial literacy. Table A.17 and A.18 show a negative and significant relationship between the female dummy and financial literacy in all regressions, even after adding further controls.

Finally as for the decomposition analysis, we show alternative results in Table A.19 using (i) a linear probability model with the financial literacy factor score, and (ii) a non-linear probability model with the discrete financial literacy dummy.[11] These analyses yield similar results as in Table 8.[12] If anything, the endowment effect is slightly reduced in the non-linear specification. A possible reason is that the dummy for only correct answers captures less variation and is too short-sighted. We also add group variables such as the age of the group, total number of members, yearly share out, and the default rate to the decomposition. Table A.20 shows that group characteristics, however, do not close the gender gap in financial literacy.

7. Conclusion

This article explores the relationship between financial literacy, gender and decision-making power within the household. Using both OLS and IV regression analyses, we first study whether financial literacy has an effect on women to participate in decision-making processes at home. Our findings indicate that women with higher financial literacy are more likely to report that they are involved in income, credit, investment and expenditure decisions. This result is consistent with the hypothesis that financial literacy is a resource of empowerment and enhances women's involvement in intra-household decision making.

Motivated by this and to deepen our understanding why women lack behind men in terms of financial literacy, we examine this gender gap in detail. Using a multivariate decomposition technique, we find that about 47 per cent of the gender gap is explained by different endowments between men and women. The largest part of this is made up of differences in education and personality traits. 53 per cent of the gap

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[11]For probit decomposition analysis, the mapping function, $F(.)$, is the Cumulative Distribution Function (CDF) of the standard normal distribution.

[12]This holds for both in total and in detail. The detailed results can be provided upon request.

can be attributed to gender differences in returns on these endowments. Similar to Bucher-Koenen et al. (2017), Filipiak and Walle (2015) and Grohmann et al. (2016), we argue that it is reasonable to believe that this coefficient effect captures some of the societal and cultural circumstances in women's lives that may hamper them to achieve higher financial literacy rates.

Clear policy lessons can be drawn from this research. First, it provides motivation to improve women's financial literacy, especially in developing countries. The decomposition analysis shows that improved educational levels should result in higher financial literacy levels. Moreover, a large part of financial literacy differences between men and women is associated with personality traits. Financial literacy trainings should, therefore, take into account gender differences in personality and tailor content and delivery methods accordingly. Further, our results inform policymakers by highlighting that personal characteristics contribute about half to the financial literacy gender gap and that also cultural and societal factors are relevant. It is, therefore, possible that cross country studies or studies that look at personality traits and gender roles in more detail will provide further insights into the origins of the gender gap in financial literacy.

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Table 1: Summary statistics of explanatory variables divided by gender

	Female		Male			
	Mean	SD	Mean	SD	Difference	p-Value
Socio-demographics						
Age	43.88	13.39	40.45	13.92	−3.431***	0.000
Spell	0.57	0.50	0.72	0.45	0.151***	0.000
Single	0.06	0.24	0.18	0.38	0.113***	0.000
Married	0.67	0.47	0.77	0.42	0.110***	0.000
Widowed	0.20	0.40	0.02	0.15	−0.178***	0.000
Divorced	0.07	0.25	0.03	0.16	−0.042***	0.006
Happiness	2.76	0.68	2.91	0.62	0.144***	0.001
Depression	0.38	0.49	0.27	0.45	−0.110***	0.000
Household						
HH size	4.96	1.97	5.05	2.10	0.093	0.465
Children (0-5 years)	0.64	0.79	0.83	0.90	0.191***	0.000
Children (6-12 years)	1.07	1.05	1.05	1.10	−0.021	0.757
Children (13-17 years)	0.68	0.92	0.59	0.93	−0.087	0.138
Income						
Expenditure (Q1)	0.27	0.45	0.17	0.38	−0.100***	0.000
Expenditure (Q2)	0.24	0.43	0.28	0.45	0.038	0.172
Expenditure (Q3)	0.25	0.44	0.24	0.43	−0.017	0.529
Expenditure (Q4)	0.23	0.42	0.31	0.46	0.080***	0.004
Assets						
Assets Index	−0.10	1.53	0.35	1.53	0.454***	0.000
Openness						
Owns Mobile Phone	0.42	0.49	0.66	0.47	0.241***	0.000

Note: $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$ denote statistical significance.

Table 2: Summary statistics of decision making divided by gender

| | **Female** | | **Male** | | | |
	Mean	SD	Mean	SD	Difference	p-Value
Income self	0.41	0.49	0.29	0.45	−0.12***	0.000
Income both	0.46	0.50	0.63	0.48	0.18***	0.000
Income spouse	0.11	0.32	0.06	0.24	−0.06***	0.004
Income invo	0.87	0.33	0.92	0.27	0.05**	0.011
Credit self	0.41	0.49	0.27	0.44	−0.14***	0.000
Credit both	0.55	0.50	0.69	0.46	0.14***	0.000
Credit spouse	0.03	0.17	0.03	0.16	−0.00	0.799
Credit invo	0.96	0.19	0.96	0.19	−0.00	0.936
Invest self	0.42	0.49	0.27	0.45	−0.15***	0.000
Invest both	0.51	0.50	0.66	0.47	0.15***	0.000
Invest spouse	0.05	0.22	0.03	0.18	−0.02	0.182
Invest invo	0.93	0.25	0.93	0.25	−0.00	0.805
Food self	0.58	0.49	0.25	0.43	−0.33***	0.000
Food both	0.36	0.48	0.50	0.50	0.14***	0.000
Food spouse	0.05	0.21	0.21	0.41	0.16***	0.000
Food invo	0.93	0.25	0.74	0.44	−0.19***	0.000
Own health self	0.63	0.48	0.56	0.50	−0.07**	0.035
Own health both	0.31	0.46	0.37	0.48	0.05*	0.071
Own health spouse	0.05	0.21	0.06	0.24	0.01	0.448
Own health invo	0.94	0.23	0.93	0.25	−0.01	0.443
Own clothes self	0.61	0.49	0.56	0.50	−0.05	0.141
Own clothes both	0.33	0.47	0.39	0.49	0.05*	0.068
Own clothes spouse	0.05	0.22	0.04	0.20	−0.01	0.429
Own clothes invo	0.94	0.23	0.95	0.21	0.01	0.518
Energy self	0.50	0.50	0.33	0.47	−0.17***	0.000
Energy both	0.36	0.48	0.47	0.50	0.11***	0.001
Energy spouse	0.12	0.32	0.17	0.37	0.05**	0.026
Energy invo	0.86	0.35	0.80	0.40	−0.06***	0.005
Child's health self	0.42	0.49	0.12	0.33	−0.30***	0.000
Child's health both	0.54	0.50	0.81	0.40	0.27***	0.000
Child's health spouse	0.04	0.20	0.06	0.24	0.02	0.137
Child's health invo	0.95	0.21	0.93	0.26	−0.02	0.124
Child's clothes self	0.45	0.50	0.13	0.34	−0.32***	0.000
Child's clothes both	0.51	0.50	0.77	0.42	0.26***	0.000
Child's clothes spouse	0.04	0.19	0.09	0.29	0.05***	0.000
Child's clothes invo	0.96	0.20	0.90	0.30	−0.06***	0.000
Observations	1081		324		1405	

Note: *p < 0.10, **p < 0.05, ***p < 0.01 denote statistical significance.

Table 3: Distribution of financial literacy questions divided by gender

	Female (%)	Male (%)	Total (%)
Compound interest			
Less than RWF 10.200	7.68	6.48	7.40
Exactly RWF 10.200	5.64	2.16	4.84
More than RWF 10.200 (correct)	60.78	76.85	64.48
Don't know	25.90	14.51	23.27
Inflation			
Less (correct)	56.24	66.67	58.65
Same	3.70	4.01	3.77
More	17.58	19.14	17.94
Don't know	22.48	10.19	19.64
Risk diversification			
One crop	25.44	20.06	24.20
Multiple crops (correct)	73.27	78.70	74.52
Don't know	1.30	1.23	1.28
Borrowing decision			
RWF 60.000	32.93	28.09	31.81
RWF 50.000 + 15% (correct)	45.33	61.11	48.97
Don't know	21.74	10.80	19.22
Cross-question consistency			
Wrong: Interest and Inflation	55.23	42.59	52.31
Correct: Interest and Inflation	44.77	57.41	47.69

Note: The table shows results on each financial literacy question.

Table 4: Distribution of financial literacy questions divided by gender - extended

| | Female | | Male | | | |
	Freq.	Prop.	Freq.	Prop.	Difference	p-Value
All questions correct	234	0.2165	110	0.3395	−0.1230***	0.0000
Zero correct answers	75	0.0694	11	0.0340	0.0354**	0.0196
At least one don't know	375	0.3469	60	0.1852	0.1617***	0.0000
All don't know	6	0.0056	0	0.0000	0.0055	0.1792
Total Obs.	1081		324			
	Female		Male			
	Mean	SD	Mean	SD	Difference	p-Value
FL Index	2.3562	1.2217	2.8333	1.2253	−0.4772***	0.0000
FL Factor Score	-0.1092	1.2628	0.3644	1.1284	−0.4736***	0.0000
FL Dummy	0.2165	0.4120	0.3395	0.4743	−0.1230***	0.0000

Note: *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$ denote statistical significance.

Table 5: OLS results of financial literacy on decision making

	(1) Income involved β / SE	(2) Credit involved β / SE	(3) Investment involved β / SE	(4) Financial index β / SE	(5) Expenditure index β / SE
Financial literacy	0.020**	0.012**	0.017**	0.048***	0.075**
	(0.009)	(0.005)	(0.007)	(0.016)	(0.033)
Controls					
Age	0.012*	0.009**	0.015***	0.035**	0.039*
	(0.007)	(0.004)	(0.005)	(0.014)	(0.023)
Age^2	−0.000	−0.000**	−0.000**	−0.000**	−0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Spell	0.028	−0.000	0.011	0.023	0.099
	(0.025)	(0.015)	(0.018)	(0.047)	(0.089)
Married	−0.021	−0.020	−0.107***	−0.150**	0.015
	(0.046)	(0.024)	(0.032)	(0.076)	(0.249)
Widowed	0.085*	0.004	−0.075**	0.011	0.321
	(0.050)	(0.025)	(0.033)	(0.082)	(0.252)
Divorced	0.116**	−0.010	−0.069**	0.028	0.301
	(0.047)	(0.030)	(0.035)	(0.088)	(0.269)
HH size	−0.022**	−0.005	−0.016**	−0.043***	−0.051
	(0.009)	(0.004)	(0.006)	(0.014)	(0.038)
Children (0-5 years)	0.026	0.011	0.020	0.054*	0.048
	(0.018)	(0.009)	(0.013)	(0.028)	(0.047)
Children (6-12 years)	0.015	−0.007	0.022**	0.031	0.061
	(0.012)	(0.008)	(0.010)	(0.023)	(0.040)
Children (13-17 years)	0.012	0.003	0.010	0.023	0.044
	(0.014)	(0.006)	(0.009)	(0.020)	(0.037)
Expenditure (Q2)	0.044*	0.007	0.022	0.063	0.087
	(0.024)	(0.015)	(0.020)	(0.047)	(0.104)
Expenditure (Q3)	0.011	−0.008	−0.000	−0.006	−0.012
	(0.031)	(0.019)	(0.023)	(0.059)	(0.113)
Expenditure (Q4)	0.038	0.006	−0.016	0.026	0.105
	(0.031)	(0.019)	(0.026)	(0.058)	(0.108)
Asset index	−0.008	0.000	0.003	−0.005	−0.037
	(0.008)	(0.004)	(0.006)	(0.013)	(0.025)
Observations	1057	1057	1033	1033	859
R^2	0.063	0.025	0.042	0.063	0.062

Notes: The table reports coefficients of multivariate regressions with standard errors clustered at VSLA level in brackets. * p < 0.10, ** p < 0.05, *** p < 0.01 denote statistical significance.

Outcome variables in columns 1-3 are indicator variables equal to one if a woman has decision-making power in a given category. The index in column 4 counts the number of financial decisions (columns 1-3) women are involved in. The index in column 5 counts the number of expenditure decisions (indicator variables are shown in the Appendix).

Table 6: IV results of financial literacy on decision making

	(1) Income involved β / SE	(2) Credit involved β / SE	(3) Investment involved β / SE	(4) Financial index β / SE	(5) Expenditure index β / SE
Financial literacy	0.059*	0.028	0.063**	0.142**	0.328***
	(0.033)	(0.018)	(0.029)	(0.064)	(0.124)
Controls					
Age	0.012*	0.009**	0.015***	0.034**	0.037
	(0.006)	(0.004)	(0.005)	(0.013)	(0.024)
Age^2	-0.000	$-0.000**$	$-0.000**$	$-0.000**$	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Spell	0.005	-0.009	-0.017	-0.035	-0.053
	(0.030)	(0.017)	(0.025)	(0.057)	(0.118)
Married	-0.013	-0.017	$-0.096***$	$-0.128*$	0.047
	(0.046)	(0.023)	(0.033)	(0.076)	(0.251)
Widowed	0.097*	0.009	$-0.058*$	0.046	0.392
	(0.052)	(0.024)	(0.033)	(0.086)	(0.262)
Divorced	0.129***	-0.005	-0.052	0.064	0.364
	(0.048)	(0.029)	(0.034)	(0.089)	(0.274)
HH size	$-0.022**$	-0.005	$-0.015**$	$-0.042***$	-0.056
	(0.009)	(0.004)	(0.006)	(0.014)	(0.039)
Children (0-5 years)	0.024	0.010	0.018	0.049*	0.039
	(0.018)	(0.009)	(0.013)	(0.028)	(0.052)
Children (6-12 years)	0.013	-0.008	0.019*	0.025	0.052
	(0.012)	(0.008)	(0.010)	(0.024)	(0.042)
Children (13-17 years)	0.011	0.002	0.008	0.020	0.040
	(0.014)	(0.006)	(0.009)	(0.020)	(0.041)
Expenditure (Q2)	0.037	0.004	0.013	0.046	0.045
	(0.025)	(0.016)	(0.021)	(0.049)	(0.105)
Expenditure (Q3)	-0.004	-0.014	-0.017	-0.041	-0.102
	(0.033)	(0.020)	(0.028)	(0.064)	(0.121)
Expenditure (Q4)	0.028	0.002	-0.028	0.002	0.041
	(0.032)	(0.019)	(0.027)	(0.060)	(0.108)
Asset index	-0.008	0.000	0.003	-0.006	-0.035
	(0.008)	(0.004)	(0.006)	(0.014)	(0.025)
Observations	1057	1057	1033	1033	859
R^2	0.046	0.015	-0.002	0.029	-0.027
F-Statistic	61.228	61.228	57.894	57.894	52.532

Notes: The table reports coefficients of instrumental variable regressions with standard errors clustered at VSLA level in brackets. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ denote statistical significance.

Outcome variables in columns 1-3 are indicator variables equal to one if a woman has decision-making power in a given category. The index in column 4 counts the number of financial decisions (columns 1-3) a woman is involved in. The index in column 5 counts the number of expenditure decisions a woman is involved in (indicator variables are shown in the Appendix).

The instrument used is the average group index of financial literacy excluding the individual considered.

Table 7: OLS results on financial literacy

	β / SE	β / SE	β / SE	β / SE	β / SE
Sociodemographics					
Female	−0.295***	−0.292***	−0.270***	−0.303***	−0.278***
	(0.070)	(0.070)	(0.071)	(0.070)	(0.071)
Age	0.030**	0.026*	0.014	0.015	0.015
	(0.014)	(0.014)	(0.017)	(0.017)	(0.017)
Age^2	−0.000***	−0.000**	−0.000	−0.000	−0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Spell	0.622***	0.571***	0.574***	0.552***	0.511***
	(0.073)	(0.074)	(0.074)	(0.073)	(0.075)
Married	0.045	−0.030	−0.163	−0.144	−0.120
	(0.118)	(0.118)	(0.124)	(0.122)	(0.123)
Widowed	−0.166	−0.156	−0.248	−0.226	−0.221
	(0.153)	(0.155)	(0.166)	(0.164)	(0.166)
Divorced	−0.053	−0.066	−0.180	−0.127	−0.120
	(0.166)	(0.164)	(0.168)	(0.161)	(0.162)
Happiness	0.168***	0.138**	0.147***	0.140**	0.140**
	(0.054)	(0.056)	(0.056)	(0.055)	(0.055)
Depression	−0.115*	−0.091	−0.097	−0.072	−0.072
	(0.068)	(0.069)	(0.069)	(0.069)	(0.068)
Income					
Expenditure (Q2)		0.158*	0.158*	0.140	0.132
		(0.094)	(0.094)	(0.092)	(0.092)
Expenditure (Q3)		0.327***	0.312***	0.264***	0.243**
		(0.093)	(0.094)	(0.094)	(0.095)
Expenditure (Q4)		0.216**	0.201**	0.104	0.075
		(0.099)	(0.100)	(0.101)	(0.102)
Assets					
Asset index		0.034	0.034	0.017	−0.006
		(0.023)	(0.023)	(0.023)	(0.024)
Household					
HH size			−0.015	−0.019	−0.017
			(0.025)	(0.026)	(0.026)
Children (0-5 years)			0.067	0.070	0.071
			(0.043)	(0.043)	(0.043)
Children (6-12 years)			0.083**	0.092**	0.094**
			(0.038)	(0.037)	(0.037)
Children (13-17 years)			0.044	0.045	0.039
			(0.044)	(0.044)	(0.044)
Employment					
Civil servant				0.301	0.291
				(0.271)	(0.263)
Indep. occupation				0.178***	0.173**
				(0.068)	(0.068)
Dep. occupation				−0.443***	−0.439***
				(0.102)	(0.101)
Housewife				−1.424***	−1.409***
				(0.242)	(0.245)
Studies				0.082	−0.026
				(0.944)	(0.939)
Retired				−0.355	−0.423
				(0.514)	(0.497)
Without work				−0.699	−0.732
				(0.507)	(0.502)
Openness					
Mobile phone					0.186***
					(0.070)
Observations	1401	1380	1371	1371	1371
R^2	0.159	0.170	0.174	0.197	0.201

Notes: The table reports coefficients of multivariate regressions with standard errors clustered at VSLA level in brackets. * p < 0.10, ** p < 0.05, *** p < 0.01 denote statistical significance.

The outcome variable is the financial literacy index which is generated by giving one point for each financial literacy question answered correctly. Happiness and Depression are scores on a scale designed to measure mental well-being.

Table 8: Full decomposition results of financial literacy

	without Assets			with Assets	
	Coefficient	Share		Coefficient	Share
Overall					
Male	2.833***		Male	2.833***	
Female	2.363***		Female	2.363***	
Difference	0.470***	100.000	Difference	0.470***	100.000
Endowment Eff.	0.223***	47.331	Endowment Eff.	0.223***	47.403
Coefficient Eff.	0.248***	52.669	Coefficient Eff.	0.247***	52.597
Endowment Eff.					
Age	−0.053	−11.208	Age	−0.050	−10.685
Age^2	0.064	13.612	Age^2	0.063	13.290
Single	0.008	1.614	Single	0.008	1.701
Married	0.006	1.286	Married	0.005	1.054
Divorced	0.001	0.156	Divorced	0.001	0.129
Widowed	0.019	4.017	Widowed	0.018	3.878
Spell	0.084***	17.878	Spell	0.084***	17.771
Children (6-12)	−0.001	−0.247	Children (6-12)	−0.001	−0.245
Happy	0.023*	4.961	Happy	0.023*	4.825
Depression	0.013	2.720	Depression	0.013	2.659
Mobile phone	0.059**	12.542	Mobile phone	0.053**	11.280
			Asset index	0.008	1.747
Coefficient Eff.					
Age	1.313	279.224	Age	0.912	193.894
Age^2	−0.614	−130.616	Age^2	−0.461	−98.103
Single	−0.029	−6.229	Single	−0.026	−5.565
Married	−0.033	−7.027	Married	−0.052	−11.065
Divorced	0.016	3.457	Divorced	0.018	3.844
Widowed	−0.005	−1.011	Widowed	−0.005	−1.045
Spell	0.048	10.231	Spell	0.008	1.650
Children (6-12)	0.034	7.276	Children (6-12)	0.029	6.201
Happy	−0.460	−97.848	Happy	−0.566	−120.427
Depression	−0.032	−6.757	Depression	−0.024	−5.024
Mobile phone	0.035	7.513	Mobile phone	−0.084	−17.827
			Asset index	0.034*	7.203
Constant	−0.026	−5.542	Constant	0.465	98.862

Notes: *p < 0.10, **p < 0.05, ***p < 0.01 denote statistical significance.
Due to rounding shares may not add up.
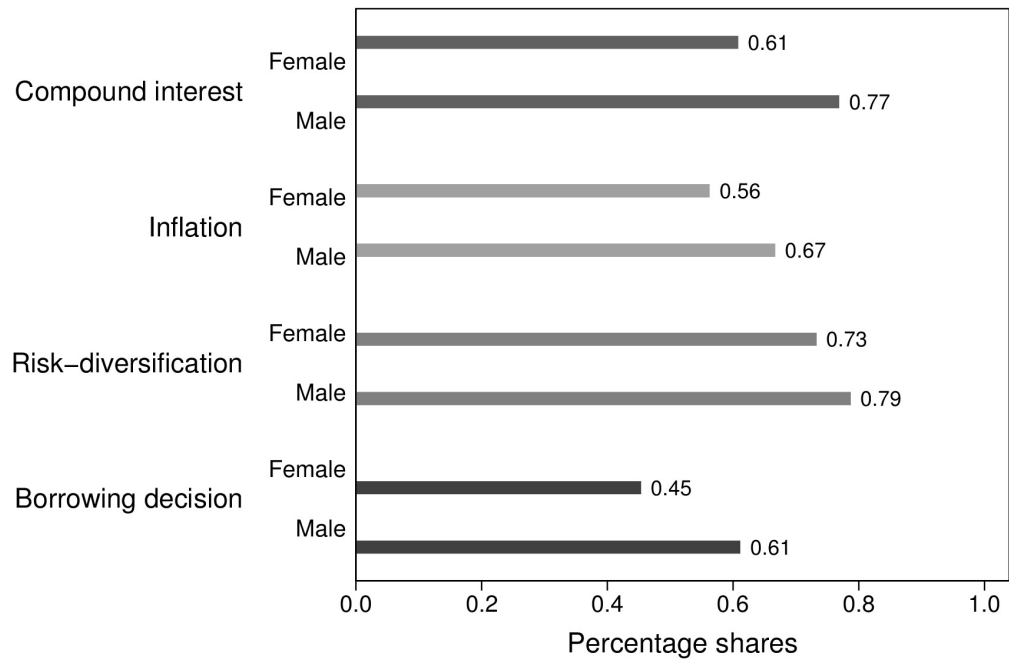
Figure 1: Gender differences in financial literacy

A. Online Appendix

Online Appendix to complement:

Financial literacy and Intra-household Decision Making: Evidence from Rwanda

not intended for publication in main text

Table A.1: Distribution of financial literacy responses by socio-demographics

	Compound interest		Inflation		Risk-diversification		Borrowing	
	Correct	DK	Correct	DK	Correct	DK	Correct	DK
Age								
<35	72.61	15.43	63.48	11.96	74.57	1.09	56.96	10.65
35 - 54	67.03	20.66	62.46	16.56	73.82	1.10	50.16	17.19
55 - 64	53.88	34.25	43.84	34.25	77.17	0.91	38.36	29.68
65 +	31.52	54.35	43.48	44.57	72.83	4.35	26.09	51.09
Gender								
Female	60.78	25.90	56.24	22.48	73.27	1.30	45.33	21.74
Male	76.85	14.51	66.67	10.19	78.70	1.23	61.11	10.80
Education								
Primary and less	63.69	23.89	59.18	19.47	75.34	1.11	48.38	19.56
Secondary and more	87.50	1.92	78.85	2.88	83.65	0.96	58.65	6.73
Other	60.61	33.33	48.48	21.21	75.76	0.00	54.55	12.12
Marital status								
Single	75.20	14.40	53.60	12.00	76.00	1.60	64.80	8.80
Widowed	46.64	40.81	43.50	35.43	70.85	1.79	30.94	38.57
Divorced	57.14	29.19	48.81	26.19	63.10	1.19	55.95	20.24
Married	67.73	20.21	63.71	16.49	76.08	1.13	50.52	15.98
Employment								
Farmer (indep.)	63.40	23.73	57.54	20.46	73.49	1.34	47.74	19.98
Independent occupation	73.51	16.79	67.16	12.69	79.85	0.75	54.58	13.81
Dependent occupation	46.88	39.06	37.50	31.25	70.31	1.56	46.88	28.13
Without occupation	28.57	71.43	14.29	85.71	71.43	14.29	28.57	71.43

Note: The acronym DK stands for 'Don't know'.

Table A.2: OLS results for women's sole decision making

	(1) Income self β / SE	(2) Credit self β / SE	(3) Investment self β / SE	(4) Financial index β / SE	(5) Expenditure index β / SE
Financial literacy (no controls)	−0.065***	−0.072***	−0.067***	−0.204***	−0.197***
	(0.012)	(0.012)	(0.012)	(0.035)	(0.071)
Observations	1081	1081	1054	1054	877
R^2	0.026	0.032	0.027	0.031	0.009
Financial literacy (controls)	−0.002	−0.013	−0.009	−0.020	0.065
	(0.009)	(0.009)	(0.009)	(0.024)	(0.058)
Observations	1057	1057	1033	1033	859
R^2	0.559	0.589	0.550	0.628	0.425

Notes: The table reports coefficients of multivariate regressions with standard errors clustered at VSLA level in brackets. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ denote statistical significance.

Outcome variables in columns 1-3 are indicator variables equal to one if a woman has sole decision-making power in a given category. The index in column 4 counts the number of financial decisions (columns 1-3) a woman decides alone. The index in column 5 counts the number of expenditure decisions a woman decides alone.

Table A.3: OLS results for expenditure decisions

	(1) Food involved	(2) Own health involved	(3) Own clothing involved	(4) Energy involved	(5) Children health involved	(6) Children clothing involved
	β / SE	β / SE	β / SE	β / SE	β / SE	β / SE
Financial literacy	0.015**	0.018***	0.014**	0.015*	0.005	0.006
	(0.007)	(0.007)	(0.006)	(0.009)	(0.007)	(0.007)
Controls						
Age	0.018***	0.012**	0.008**	0.022***	0.011*	0.010
	(0.005)	(0.005)	(0.004)	(0.006)	(0.007)	(0.007)
Age^2	−0.000***	−0.000**	−0.000	−0.000***	−0.000	−0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Spell	0.017	−0.009	0.007	0.045*	0.014	0.013
	(0.018)	(0.018)	(0.017)	(0.026)	(0.019)	(0.018)
Married	0.100*	−0.019	−0.077**	0.022	0.020	−0.010
	(0.053)	(0.043)	(0.037)	(0.057)	(0.051)	(0.044)
Widowed	0.131**	0.026	−0.042	0.139**	0.048	0.023
	(0.052)	(0.043)	(0.039)	(0.061)	(0.050)	(0.046)
Divorced	0.130**	0.038	−0.036	0.149**	0.047	−0.000
	(0.053)	(0.041)	(0.040)	(0.058)	(0.051)	(0.049)
HH size	−0.020***	−0.008	−0.003	−0.023**	−0.011	−0.006
	(0.007)	(0.007)	(0.006)	(0.009)	(0.007)	(0.006)
Children (0-5 years)	0.016	0.006	0.013	0.023	0.011	0.006
	(0.012)	(0.012)	(0.011)	(0.016)	(0.010)	(0.010)
Children (6-12 years)	0.014	0.007	0.008	0.021*	0.003	0.005
	(0.009)	(0.008)	(0.009)	(0.012)	(0.008)	(0.009)
Children (13-17 years)	0.010	0.001	0.015**	0.003	−0.001	0.003
	(0.009)	(0.009)	(0.007)	(0.015)	(0.008)	(0.007)
Expenditure (Q2)	0.018	0.037*	0.023	0.009	0.015	−0.012
	(0.020)	(0.020)	(0.019)	(0.029)	(0.020)	(0.020)
Expenditure (Q3)	0.018	0.020	−0.011	−0.001	0.003	−0.018
	(0.022)	(0.022)	(0.022)	(0.029)	(0.022)	(0.021)
Expenditure (Q4)	0.011	0.019	0.009	0.010	0.031	0.020
	(0.024)	(0.024)	(0.022)	(0.032)	(0.022)	(0.019)
Asset index	−0.001	0.004	−0.008	−0.014	−0.003	0.000
	(0.006)	(0.005)	(0.006)	(0.009)	(0.006)	(0.005)
Observations	1056	1057	1057	1055	863	862
R^2	0.081	0.040	0.043	0.077	0.023	0.022

Notes: The table reports coefficients of multivariate regressions with standard errors clustered at VSLA level in brackets. * p < 0.10, ** p < 0.05, *** p < 0.01 denote statistical significance.

Outcome variables in columns 1-6 are indicator variables equal to one if a woman has decision-making power in a given category.

Table A.4: Group IV results for expenditure decisions

	(1) Food involved β / SE	(2) Own health involved β / SE	(3) Own clothing involved β / SE	(4) Energy involved β / SE	(5) Children health involved β / SE	(6) Children clothing involved β / SE
Financial literacy	0.029	0.058**	0.074**	0.069	0.045*	0.052**
	(0.026)	(0.026)	(0.030)	(0.043)	(0.026)	(0.025)
Controls						
Age	0.018***	0.012**	0.008*	0.022***	0.011	0.009
	(0.005)	(0.005)	(0.004)	(0.006)	(0.007)	(0.007)
Age^2	−0.000***	−0.000*	−0.000	−0.000***	−0.000	−0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Spell	0.009	−0.033	−0.029	0.013	−0.011	−0.015
	(0.023)	(0.025)	(0.025)	(0.035)	(0.024)	(0.023)
Married	0.103*	−0.010	−0.065*	0.033	0.025	−0.003
	(0.053)	(0.043)	(0.038)	(0.057)	(0.050)	(0.044)
Widowed	0.136**	0.039	−0.022	0.156**	0.059	0.036
	(0.053)	(0.044)	(0.042)	(0.065)	(0.052)	(0.047)
Divorced	0.134**	0.051	−0.016	0.166***	0.057	0.012
	(0.053)	(0.042)	(0.041)	(0.059)	(0.052)	(0.049)
HH size	−0.020***	−0.008	−0.002	−0.023**	−0.012	−0.007
	(0.007)	(0.007)	(0.006)	(0.009)	(0.007)	(0.007)
Children (0-5 years)	0.015	0.004	0.010	0.020	0.010	0.005
	(0.012)	(0.013)	(0.011)	(0.017)	(0.011)	(0.010)
Children (6-12 years)	0.013	0.005	0.004	0.018	0.002	0.003
	(0.010)	(0.009)	(0.010)	(0.012)	(0.008)	(0.009)
Children (13-17 years)	0.010	−0.000	0.014*	0.001	−0.002	0.002
	(0.009)	(0.010)	(0.008)	(0.015)	(0.008)	(0.007)
Expenditure (Q2)	0.016	0.029	0.012	−0.001	0.008	−0.020
	(0.021)	(0.020)	(0.018)	(0.029)	(0.021)	(0.021)
Expenditure (Q3)	0.013	0.005	−0.035	−0.022	−0.011	−0.035
	(0.024)	(0.024)	(0.024)	(0.031)	(0.025)	(0.023)
Expenditure (Q4)	0.007	0.008	−0.007	−0.004	0.021	0.009
	(0.024)	(0.024)	(0.021)	(0.033)	(0.022)	(0.020)
Asset index	−0.001	0.004	−0.009	−0.015*	−0.003	0.000
	(0.006)	(0.005)	(0.006)	(0.009)	(0.005)	(0.005)
Observations	1056	1057	1057	1055	863	862
R^2	0.077	0.000	−0.047	0.046	−0.026	−0.050
F-Statistic	61.428	61.228	61.228	62.331	51.035	51.391

Notes: The table reports coefficients of instrumental variable regressions with standard errors clustered at VSLA level in brackets. * p < 0.10, ** p < 0.05, *** p < 0.01 denote statistical significance.

Outcome variables in columns 1-6 are indicator variables equal to one if a woman has decision-making power in a given category.

The instrument used is the average group index of financial literacy excluding the individual considered.

Table A.5: Financial literacy and urban characteristics

	Individual level β / SE	Group level β / SE
Distance to market	0.159	0.132
	(0.136)	(0.148)
Distance to sector office	0.281	0.315
	(0.299)	(0.320)
Distance to school	0.031	0.078
	(0.153)	(0.171)
Distance to health centre	−0.002	0.053
	(0.145)	(0.154)
Distance to taxi	−0.281	−0.283
	(0.179)	(0.195)
Distance to SACCO	0.092	0.084
	(0.354)	(0.379)
Distance to Bank	−0.804***	−0.791***
	(0.267)	(0.288)
Observations	1330	224
R^2	0.060	0.058

Notes: The table shows beta coefficients of multivariate regression results with standard errors clustered at the sector level in brackets. The outcome variable is the financial literacy index which is generated by giving one point for each financial literacy question answered correctly. The individual level displays the results for the variable used as IV (group cluster average excluding the respondent). The group level displays the results for the group average including all selected group respondents. The distance variables are sector means of binary variables stating 0 if the corresponding object is more than 30 minutes away and 1 if the corresponding object is less than 30 minutes away from the household. This information has been gathered from the second FinScope survey in 2012 (FinScope, 2013). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ denote statistical significance.

Table A.6: Comparing high and low financially literate groups

	Overall Mean	High FL Mean	Low FL Mean	Regression Difference	p-Value
Demographics					
Age	43.88	43.75	44.34	−0.58	0.59
Age squared	2104.95	2092.56	2148.00	−55.44	0.59
Spell	0.57	0.58	0.52	0.07	0.10
Single	0.06	0.07	0.05	0.02	0.32
Married	0.67	0.67	0.66	0.01	0.89
Widowed	0.20	0.20	0.21	−0.01	0.78
Divorced	0.07	0.07	0.08	−0.01	0.53
Household					
HH size	4.97	4.91	5.15	−0.24	0.17
Children (0-5 years)	0.64	0.62	0.73	−0.11	0.04
Children (6-12 years)	1.07	1.07	1.09	−0.02	0.76
Children (13-17 years)	0.68	0.66	0.72	−0.06	0.41
Wealth					
Expenditure (Q1)	0.27	0.26	0.32	−0.06	0.16
Expenditure (Q2)	0.24	0.25	0.22	0.03	0.41
Expenditure (Q3)	0.25	0.27	0.19	0.08	0.01
Expenditure (Q4)	0.23	0.22	0.27	−0.05	0.20
Assets Index	−0.10	−0.13	−0.03	−0.10	0.45

Notes: Due to rounding columns may not sum up 1.

Table A.7: Sensitivity to additional covariates

Financial decisions index

	OLS	OLS	OLS	OLS	IV	IV	IV	IV
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Financial literacy	0.036**	0.048***	0.049***	0.048***	0.169***	0.161**	0.150**	0.142**
	(0.016)	(0.016)	(0.016)	(0.016)	(0.064)	(0.063)	(0.062)	(0.064)
Demographics		✓	✓	✓		✓	✓	✓
Household			✓	✓			✓	✓
Wealth				✓				✓
R^2	0.005	0.053	0.064	0.063	−0.069	0.006	0.025	0.029
Obs.	1054	1052	1046	1033	1054	1052	1046	1033

Expenditure decisions index

	OLS	OLS	OLS	OLS	IV	IV	IV	IV
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Financial literacy	0.065**	0.080**	0.080**	0.075**	0.360***	0.369***	0.356***	0.328***
	(0.030)	(0.034)	(0.034)	(0.033)	(0.125)	(0.127)	(0.122)	(0.124)
Demographics		✓	✓	✓		✓	✓	✓
Household			✓	✓			✓	✓
Wealth				✓				✓
R^2	0.006	0.056	0.060	0.062	−0.124	−0.059	−0.044	−0.027
Obs.	877	876	872	859	877	876	872	859

Notes: Standard errors in parentheses. *p < 0.10, **p < 0.05, ***p < 0.01 denote statistical significance.

Table A.8: OLS and IV results comparison

| | Financial literacy as variable of interest | | | |
| | Financial decisions index (N = 1033) | | Expenditure decisions index (N = 859) | |
	No FE (1)	FE (2)	No FE (3)	FE (4)
Single equation model (OLS)	0.048*** (0.016)	0.034* (0.020)	0.075** (0.033)	0.023 (0.036)
Two equation models Excluded instruments				
Group average	0.142** (0.064) [52.41]	0.031* (0.017) [151072.85]	0.328*** (0.124) [51.00]	0.022 (0.029) [145161.07]
Group average and distance	0.146** (0.065) [25.48]	0.035** (0.017) [71814.33]	0.302** (0.123) [25.63]	0.025 (0.030) [68526.62]

Notes: Standard errors in parentheses. $^*p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$ denote statistical significance. F statistics of weak identification test in brackets.

Table A.9: OLS results with alternative financial literacy measures

	(1) Income involved β / SE	(2) Credit involved β / SE	(3) Investment involved β / SE	(4) Financial index β / SE	(5) Expenditure index β / SE
FL Index	0.020** (0.009)	0.012** (0.005)	0.017** (0.007)	0.048*** (0.016)	0.075** (0.033)
Observations R^2	1057 0.063	1057 0.025	1033 0.042	1033 0.063	859 0.062
FL Factor Score	0.013 (0.008)	0.009** (0.005)	0.017** (0.006)	0.039** (0.015)	0.041 (0.030)
Observations R^2	1057 0.061	1057 0.022	1033 0.042	1033 0.060	859 0.057
FL Dummy	0.050** (0.025)	0.020 (0.013)	0.040** (0.017)	0.108** (0.043)	0.182** (0.079)
Observations R^2	1057 0.063	1057 0.021	1033 0.041	1033 0.060	859 0.060

Notes: The table reports coefficients of multivariate regressions with standard errors clustered at VSLA level in brackets. * p < 0.10, ** p < 0.05, *** p < 0.01 denote statistical significance.

Outcome variables in columns 1-3 are indicator variables equal to one if a woman has decision-making power in a given category. The index in column 4 counts the number of financial decisions (columns 1-3) a woman is involved in. The index in column 5 counts the number of expenditure decisions a woman is involved in.

Table A.10: Probit results of financial literacy on decision making

	(1) Income involved Mfx / SE	(2) Credit involved Mfx / SE	(3) Investment involved Mfx / SE
Financial literacy	0.017**	0.008***	0.015***
	(0.043)	(0.063)	(0.054)
Controls			
Age	0.010	0.006***	0.012***
	(0.038)	(0.042)	(0.034)
Age^2	−0.000	−0.000***	−0.000***
	(0.000)	(0.000)	(0.000)
Spell	0.023	0.001	0.008
	(0.125)	(0.209)	(0.145)
Married	−0.030	−0.018	−0.106***
	(0.205)	(0.312)	(0.338)
Widowed	0.138**	0.028	−0.066*
	(0.347)	(0.441)	(0.394)
Divorced	0.173**	−0.011	−0.074*
	(0.434)	(0.422)	(0.418)
HH size	−0.019***	−0.004	−0.014***
	(0.042)	(0.053)	(0.042)
Children (0-5 years)	0.020	0.007	0.017
	(0.084)	(0.122)	(0.104)
Children (6-12 years)	0.012	−0.005	0.018**
	(0.061)	(0.092)	(0.075)
Children (13-17 years)	0.009	0.001	0.009
	(0.071)	(0.086)	(0.077)
Expenditure (Q2)	0.038	0.003	0.013
	(0.145)	(0.239)	(0.192)
Expenditure (Q3)	0.003	−0.006	−0.006
	(0.160)	(0.248)	(0.194)
Expenditure (Q4)	0.030	0.003	−0.017
	(0.155)	(0.260)	(0.197)
Asset index	−0.005	0.000	0.004
	(0.039)	(0.055)	(0.045)
Observations	1057	1057	1033
Pseudo R^2	0.107	0.095	0.089

Notes: The table reports marginal effects of probit regressions with standard errors clustered at VSLA level in brackets. * p < 0.10, ** p < 0.05, *** p < 0.01 denote statistical significance.

Outcome variables in columns 1-3 are indicator variables equal to one if a woman has decision-making power in a given category.

Table A.11: OLS results with education instead of ability to spell a simple word

	(1) Income involved β / SE	(2) Credit involved β / SE	(3) Investment involved β / SE	(4) Financial index β / SE	(5) Expenditure index β / SE
Financial literacy	0.017**	0.012**	0.018***	0.044***	0.083***
	(0.008)	(0.005)	(0.007)	(0.015)	(0.031)
Controls					
Age	0.015**	0.012**	0.017***	0.043***	0.044*
	(0.008)	(0.005)	(0.006)	(0.016)	(0.026)
Age^2	−0.000*	−0.000**	−0.000***	−0.000**	−0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Secondary education and more	0.090***	−0.009	0.017	0.090	0.126
	(0.032)	(0.024)	(0.032)	(0.064)	(0.124)
Married	−0.014	−0.021	−0.115***	−0.151*	0.037
	(0.046)	(0.025)	(0.034)	(0.079)	(0.261)
Widowed	0.078	0.002	−0.082**	−0.005	0.325
	(0.050)	(0.026)	(0.035)	(0.085)	(0.265)
Divorced	0.104**	−0.015	−0.079**	0.002	0.282
	(0.047)	(0.032)	(0.037)	(0.092)	(0.286)
HH size	−0.024***	−0.006	−0.017**	−0.047***	−0.056
	(0.009)	(0.005)	(0.006)	(0.015)	(0.039)
Children (0-5 years)	0.023	0.010	0.021	0.051*	0.041
	(0.018)	(0.009)	(0.014)	(0.028)	(0.046)
Children (6-12 years)	0.020*	−0.007	0.022**	0.036	0.068*
	(0.012)	(0.009)	(0.011)	(0.024)	(0.040)
Children (13-17 years)	0.018	0.000	0.009	0.025	0.063
	(0.014)	(0.006)	(0.009)	(0.021)	(0.039)
Expenditure (Q2)	0.037	0.006	0.024	0.053	0.124
	(0.025)	(0.016)	(0.021)	(0.048)	(0.105)
Expenditure (Q3)	0.003	−0.001	0.010	−0.000	−0.008
	(0.031)	(0.018)	(0.023)	(0.055)	(0.111)
Expenditure (Q4)	0.015	0.009	−0.016	0.003	0.070
	(0.032)	(0.018)	(0.027)	(0.058)	(0.110)
Asset index	−0.008	0.002	0.005	−0.002	−0.026
	(0.008)	(0.004)	(0.006)	(0.014)	(0.026)
Observations	981	981	957	957	803
R^2	0.062	0.027	0.045	0.062	0.063

Notes: The table reports coefficients of multivariate regressions with standard errors clustered at VSLA level in brackets. * p < 0.10, ** p < 0.05, *** p < 0.01 denote statistical significance.

Outcome variables in columns 1-3 are indicator variables equal to one if a woman has decision-making power in a given category. The index in column 4 counts the number of financial decisions (columns 1-3) women are involved in. The index in column 5 counts the number of expenditure decisions.

Table A.12: OLS results using different sub-samples

	Panel A: Only married women				
	(1) Income involved β / SE	(2) Credit involved β / SE	(3) Investment involved β / SE	(4) Financial index β / SE	(5) Expenditure index β / SE
Financial literacy	0.016 (0.012)	0.014** (0.007)	0.021** (0.009)	0.051** (0.023)	0.087** (0.043)
Observations	705	705	686	686	632
R^2	0.019	0.017	0.043	0.027	0.039
	Panel B: Travel or attend meetings without permission				
	(1) Income involved β / SE	(2) Credit involved β / SE	(3) Investment involved β / SE	(4) Financial index β / SE	(5) Expenditure index β / SE
Financial literacy	0.028*** (0.010)	0.012** (0.006)	0.013* (0.007)	0.052*** (0.018)	0.050 (0.039)
Observations	510	510	506	506	385
R^2	0.128	0.051	0.038	0.096	0.091
	Panel C: Travel or attend meetings only with permission				
	(1) Income involved β / SE	(2) Credit involved β / SE	(3) Investment involved β / SE	(4) Financial index β / SE	(5) Expenditure index β / SE
Financial literacy	0.028 (0.017)	0.013 (0.012)	0.018 (0.015)	0.060 (0.036)	0.101 (0.069)
Observations	387	387	376	376	335
R^2	0.064	0.042	0.065	0.064	0.064

Notes: The table reports coefficients of multivariate regressions with standard errors clustered at VSLA level in brackets. * p < 0.10, ** p < 0.05, *** p < 0.01 denote statistical significance.

Outcome variables in columns 1-3 are indicator variables equal to one if a woman has decision-making power in a given category. The index in column 4 counts the number of financial decisions (columns 1-3) a woman is involved in. The index in column 5 counts the number of expenditure decisions a woman is involved in.

Table A.13: Summary of the empirical power of the instrument(s)

	Financial decisions		Expenditure decisions	
	(1) Group average	(2) Group average & Distance	(3) Group average	(4) Group average & Distance
All women				
Weak instrument test[a]	✓	✓	✓	✓
Over-identification test[b]		✓		✓
Exogeneity test[c]	✓	✓	✗	✓
Married women				
Weak instrument test[a]	✓	✓	✓	✓
Over-identification test[b]		✓		✓
Exogeneity test[c]	✓	✗	✓	✓

Notes: a ✓ indicates that the joint F-statistic for the excluded instruments in the first stage equation is greater than 10; ✗ indicates that it is not. b ✓ indicates that we do not reject the over-identification test at the 0.05 significance level; ✗ indicates that we reject the test. c ✓ indicates that we do not reject exogeneity at the 0.05 significance level; ✗ indicates that we reject the test.

Table A.14: First stage results for group IV approach

	(1) Financial literacy index β / SE
Group average financial literacy	0.384***
	(0.052)
Controls	
Age	0.003
	(0.021)
Age^2	−0.000
	(0.000)
Spell	0.583***
	(0.081)
Married	−0.169
	(0.157)
Widowed	−0.279
	(0.196)
Divorced	−0.276
	(0.194)
HH size	0.013
	(0.029)
Children (0-5 years)	0.045
	(0.052)
Children (6-12 years)	0.050
	(0.042)
Children (13-17 years)	0.021
	(0.050)
Expenditure (Q2)	0.120
	(0.098)
Expenditure (Q3)	0.287***
	(0.098)
Expenditure (Q4)	0.217**
	(0.105)
Asset index	0.021
	(0.025)
Observations	1057
F-Statistic	21.07

Notes: The table reports regression results for the first stage of the group IV regression. $p < 0.10$, $p* < 0.05$, $p** < 0.01$ denote statistical significance. The outcome variable is the financial literacy index which is generated by giving one point for each financial literacy question answered correctly.

Table A.15: First stage results for distance IV approach

	(1) Financial literacy index β / SE
Distance to nearest school	6.276
	(7.841)
Controls	
Age	0.003
	(0.021)
Age^2	-0.000
	(0.000)
Spell	0.594***
	(0.084)
Married	-0.164
	(0.164)
Widowed	-0.277
	(0.205)
Divorced	-0.280
	(0.211)
HH size	0.011
	(0.031)
Children (0-5 years)	0.029
	(0.056)
Children (6-12 years)	0.051
	(0.044)
Children (13-17 years)	0.023
	(0.054)
Expenditure (Q2)	0.194*
	(0.107)
Expenditure (Q3)	0.404***
	(0.108)
Expenditure (Q4)	0.291**
	(0.115)
Asset index	0.012
	(0.026)
Observations	1030
F-Statistic	11.32

Notes: The table reports regression results for the first stage of the group IV regression. $p < 0.10$, $p* < 0.05$, $p** < 0.01$ denote statistical significance. The outcome variable is the financial literacy index which is generated by giving one point for each financial literacy question answered correctly.

Table A.16: Additional robustness for group IV

	Original IV group average	IV Cell average	IV Male group average	Placebo: Only elderly
	Financial decisions index			
	(1)	(2)	(3)	(4)
Financial literacy	0.142**	0.174**	0.152*	−0.376
	(0.064)	(0.086)	(0.092)	(0.336)
R^2	0.029	0.002	0.039	−0.075
Weak ident. (F Stat)	52.41	34.36	20.09	3.46
Obs.	1033	1033	591	38
	Expenditure decisions index			
	(5)	(6)	(7)	(8)
Financial literacy	0.328***	0.120	0.216	−0.245
	(0.124)	(0.148)	(0.190)	(0.188)
R^2	−0.027	0.059	0.024	0.497
Weak ident. (F Stat)	51.00	32.28	15.85	3.35
Obs.	859	859	495	17

Notes: Standard errors clustered at VSLA level in parentheses. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$ denote statistical significance.

Table A.17: OLS results on FL Factor Score

	β / SE	β / SE	β / SE	β / SE	β / SE
Sociodemographics					
Female	−0.294***	−0.296***	−0.273***	−0.305***	−0.278***
	(0.074)	(0.075)	(0.075)	(0.075)	(0.076)
Age	0.023	0.019	0.004	0.005	0.005
	(0.014)	(0.014)	(0.017)	(0.018)	(0.018)
Age^2	−0.000**	−0.000**	−0.000	−0.000	−0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Spell	0.676***	0.634***	0.636***	0.617***	0.571***
	(0.074)	(0.074)	(0.075)	(0.074)	(0.076)
Married	0.132	0.066	−0.077	−0.059	−0.032
	(0.115)	(0.114)	(0.118)	(0.115)	(0.115)
Widowed	−0.061	−0.050	−0.140	−0.117	−0.112
	(0.153)	(0.155)	(0.165)	(0.163)	(0.165)
Divorced	0.084	0.066	−0.054	−0.006	0.002
	(0.166)	(0.165)	(0.169)	(0.161)	(0.162)
Happiness	0.183***	0.150**	0.161***	0.154***	0.154***
	(0.057)	(0.058)	(0.058)	(0.058)	(0.057)
Depression	−0.029	−0.010	−0.016	0.006	0.007
	(0.071)	(0.072)	(0.073)	(0.072)	(0.072)
Income					
Expenditure (Q2)		0.147	0.148	0.133	0.125
		(0.093)	(0.093)	(0.092)	(0.092)
Expenditure (Q3)		0.310***	0.294***	0.256**	0.231**
		(0.099)	(0.099)	(0.099)	(0.101)
Expenditure (Q4)		0.206*	0.187*	0.110	0.077
		(0.105)	(0.105)	(0.106)	(0.106)
Assets					
Asset index		0.022	0.021	0.006	−0.019
		(0.024)	(0.025)	(0.024)	(0.026)
Household					
HH size			−0.017	−0.022	−0.020
			(0.026)	(0.027)	(0.027)
Children (0-5 years)			0.070*	0.073*	0.074*
			(0.042)	(0.042)	(0.042)
Children (6-12 years)			0.098**	0.107***	0.109***
			(0.039)	(0.039)	(0.038)
Children (13-17 years)			0.060	0.063	0.056
			(0.044)	(0.045)	(0.044)
Employment					
Civil servant				0.203	0.192
				(0.266)	(0.256)
Indep. occupation				0.117*	0.112
				(0.069)	(0.068)
Dep. occupation				−0.446***	−0.442***
				(0.108)	(0.107)
Housewife				−1.287***	−1.270***
				(0.191)	(0.200)
Studies				0.363	0.242
				(0.664)	(0.659)
Retired				−0.292	−0.368
				(0.429)	(0.418)
Without work				−0.726	−0.763*
				(0.459)	(0.456)
Openness					
Mobile phone					0.209***
					(0.070)
Observations	1401	1380	1371	1371	1371
R^2	0.169	0.177	0.182	0.200	0.205

Notes: The table reports coefficients of multivariate regressions with standard errors clustered at VSLA level in brackets. * p < 0.10, ** p < 0.05, *** p < 0.01 denote statistical significance.

The outcome variable is a factor score composed of the four financial literacy questions. Happiness and Depression are scores on a scale designed to measure mental well-being.

Table A.18: OLS results on FL Dummy

	β / SE	β / SE	β / SE	β / SE	β / SE
Socio-demographics					
Female	−0.077***	−0.075***	−0.072***	−0.084***	−0.082***
	(0.025)	(0.026)	(0.026)	(0.026)	(0.026)
Age	0.015**	0.014**	0.009	0.011	0.011
	(0.006)	(0.006)	(0.007)	(0.007)	(0.007)
Age^2	−0.000***	−0.000***	−0.000	−0.000*	−0.000*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Spell	0.114***	0.109***	0.112***	0.105***	0.102***
	(0.025)	(0.026)	(0.026)	(0.026)	(0.026)
Married	0.034	0.025	−0.009	−0.001	0.001
	(0.046)	(0.047)	(0.050)	(0.050)	(0.050)
Widowed	−0.055	−0.047	−0.073	−0.066	−0.066
	(0.063)	(0.064)	(0.068)	(0.068)	(0.068)
Divorced	−0.008	−0.006	−0.036	−0.020	−0.020
	(0.067)	(0.067)	(0.070)	(0.069)	(0.069)
Happiness	0.016	0.005	0.006	0.005	0.005
	(0.018)	(0.019)	(0.019)	(0.019)	(0.019)
Depression	−0.056**	−0.049*	−0.051*	−0.039	−0.039
	(0.026)	(0.027)	(0.027)	(0.026)	(0.026)
Income					
Expenditure (Q2)		0.039	0.038	0.031	0.030
		(0.035)	(0.035)	(0.035)	(0.035)
Expenditure (Q3)		0.085**	0.083**	0.066*	0.063*
		(0.035)	(0.036)	(0.035)	(0.035)
Expenditure (Q4)		0.051	0.054	0.017	0.014
		(0.036)	(0.036)	(0.036)	(0.036)
Assets					
Asset index		0.003	0.004	−0.000	−0.002
		(0.008)	(0.008)	(0.008)	(0.009)
Household					
HH size			−0.013	−0.015	−0.015
			(0.010)	(0.010)	(0.010)
Children (0-5 years)			0.022	0.024	0.024
			(0.017)	(0.018)	(0.018)
Children (6-12 years)			0.036**	0.040***	0.040***
			(0.015)	(0.015)	(0.015)
Children (13-17 years)			0.016	0.016	0.015
			(0.018)	(0.017)	(0.017)
Employment					
Civil servant				0.158*	0.158*
				(0.093)	(0.093)
Indep. occupation				0.068***	0.068***
				(0.025)	(0.025)
Dep. occupation				−0.151***	−0.151***
				(0.041)	(0.041)
Housewife				0.000	0.000
				(.)	(.)
Studies				0.323	0.314
				(0.247)	(0.247)
Retired				0.000	0.000
				(.)	(.)
Without work				0.000	0.000
				(.)	(.)
Openness					
Mobile phone					0.016
					(0.026)
Observations	1401	1380	1371	1360	1360
R^2					

Notes: The table reports coefficients of multivariate regressions with standard errors clustered at VSLA level in brackets. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ denote statistical significance.

The outcome variable is a dummy that is one if all financial literacy questions were answered correctly. Happiness and Depression are scores on a scale designed to measure mental well-being.

Table A.19: Linear and non-linear decomposition results

	without Assets		with Assets	
	Coefficient	Share	Coefficient	Share
Financial literacy factor score		**OLS Estimates**		
Male	0.365***		0.365***	
Female	−0.103*		−0.103*	
Difference	0.468***	100.000	0.468***	100.000
Endowment Eff.	0.222***	47.378	0.222***	47.389
Coefficient Eff.	0.246**	52.622	0.246***	52.611
Financial literacy dummy		**Probit Estimates**		
Male	0.340***		0.340***	
Female	0.217***		0.217***	
Difference	0.123***	100.000	0.123***	100.000
Endowment Eff.	0.050***	40.915	0.050***	40.989
Coefficient Eff.	0.073**	59.085	0.073**	59.011

Notes: *p < 0.10, **p < 0.05, ***p < 0.01 denote statistical significance.
Due to rounding shares may not add up.

Table A.20: Decomposition results adding group variables

	without Assets		with Assets	
	Coefficient	Share	Coefficient	Share
Endowment Eff.				
Socio-demographics	0.031	6.409	0.028	5.905
Education	0.103***	21.555	0.104***	21.591
Personality	0.092***	19.137	0.094***	19.597
Group characteristics	−0.001	−0.272	−0.001	−0.272
Coefficient Eff.				
Socio-demographics	0.710	147.815	0.603	125.702
Education	0.059	12.222	0.041	8.506
Personality	−0.799*	−166.328	−0.921*	−191.778
Group characteristics	−1.900	−395.760	−1.770	−368.612
Constant	2.185	455.222	2.301	479.362
Summary				
Male	2.872***		2.872***	
Female	2.392***		2.392***	
Difference	0.480***	100.000	0.480***	100.000
Endowment Eff.	0.225***	46.829	0.225***	46.820
Coefficient Eff.	0.255***	53.171	0.255***	53.180

Notes: *p < 0.10, **p < 0.05, ***p < 0.01 denote statistical significance.
Due to rounding shares may not add up.
Group variables are: age of the group, number of members, yearly share out, and the default rate.
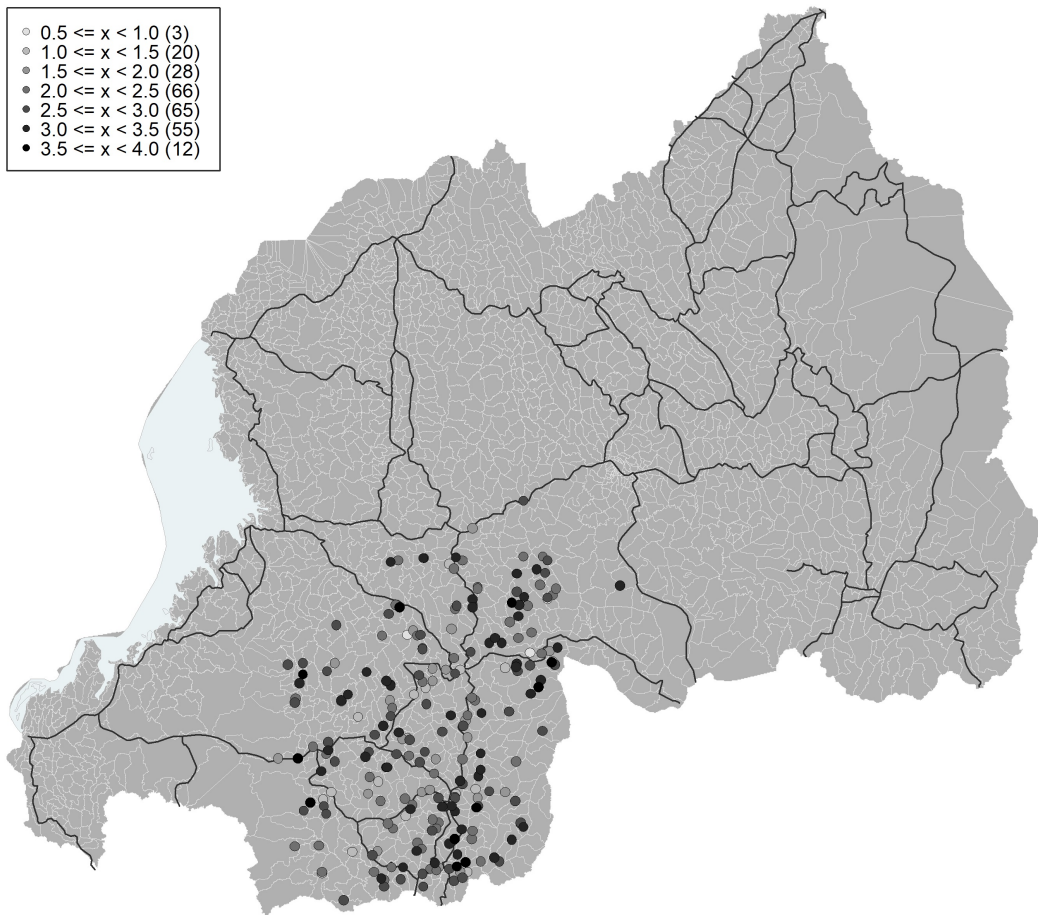
Figure A.1: Geographical distribution of financial literacy group averages
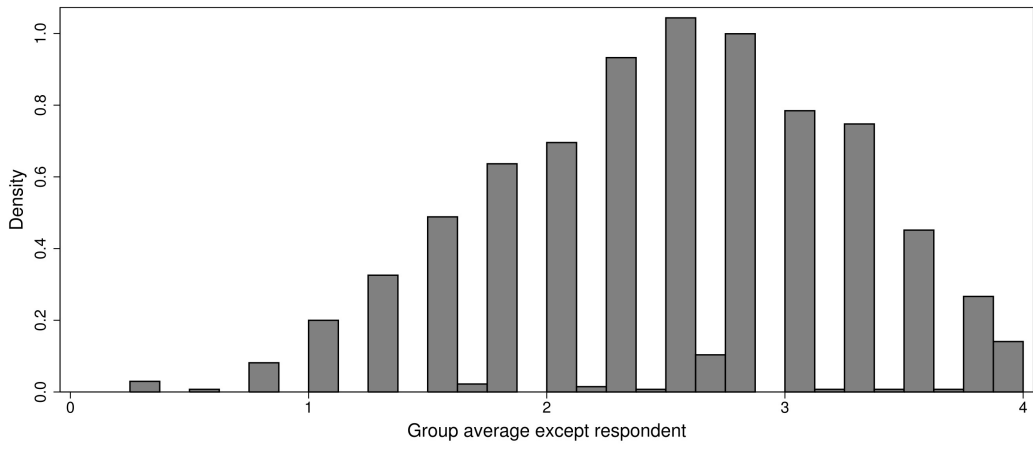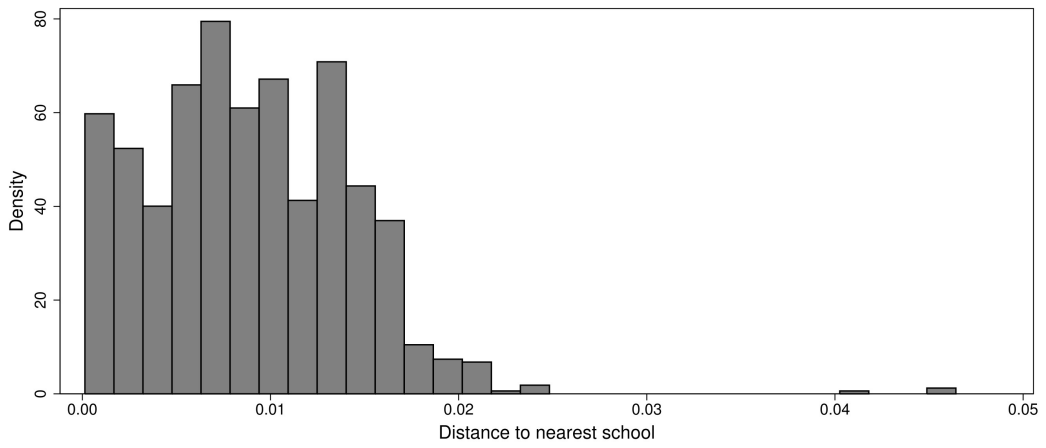
Figure A.2: Histogram group instrument

Figure A.3: Histogram distance instrument