Does group inclusion hurt financial inclusion? Evidence from ultra-poor members of Ugandan savings groups*

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Abstract

Millions of ultra-poor households in sub-Saharan Africa rely exclusively on savings groups to meet their financial needs. However, the ability of savings groups to fully meet these needs remains unclear. We randomly assign ultra-poor Ugandan households to savings groups containing different proportions of ultra-poor members. We find evidence that groups may be unable to satisfy the borrowing needs of their members. Furthermore, scarcity of loanable funds is more severe in poorer groups and affects disproportionately their poorest members. A trade-off emerges between the inclusion of ultra-poor households into a savings group and its ability to provide credit to these same ultra-poor households.

JEL classification: O12, O16

Keywords: Savings groups, VSLA, Financial inclusion, Microfinance, Self-help groups.

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1   Introduction

Savings groups are an innovative instrument for bringing financial inclusion to ultra-poor, vulnerable households who are usually not reached by traditional banking or microfinance interventions. Savings groups are community-based financial institutions in which individual savings are accumulated in a common pool stored in a safe box, and are lent out to requesting members. They are generally comprised of 20 to 30 members, who meet weekly over the operating cycle (typically lasting one year). At the end of the cycle all funds in the safe are shared among the group's members in proportion to the amount saved during the period of operation. Because they can be set up and maintained with minimal outside intervention, savings groups are spreading extremely fast in sub-Saharan Africa and other developing countries. In 2014, an estimated 10.5 millions households worldwide were members of savings groups, a tenfold increase relative to 2008.[1] In addition, savings groups are increasingly becoming an integral part of large-scale anti-poverty programs, where they are promoted in conjunction with conditional cash transfers or graduation-type programs.[2] These programs often create and organize groups in which the majority of the members are ultra-poor.

Despite the rise in popularity of savings groups, very little is know about what determines their capacity to meet the financial needs of its members, especially of those who are ultra-poor. Here we address this question by studying empirically how savings groups composition affects the behavior and welfare of their ultra-poor members. Our data come from a randomized evaluation of project SCORE, a large anti-poverty program in rural Uganda. SCORE officers identify households who are determined to be *vulnerable* because of their low socioeconomic status, and then facilitate the creation of savings groups that include these vulnerable participants as well as other members of the local community.[3] In our experiment, we randomly assigned vulnerable households targeted by the program to savings

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[1] From the Savings-Led Working Group (SLWG) of SEEP (available at www.seepnetwork.org/filebin/docs/SG_Member_Numbers_Worldwide.pdf). According to the same source in 2014, 1.2 million people belonged to savings groups in Uganda, where we conduct our intervention. Note that these statistics are likely to understate the true participation as they are constructed from data submitted by large NGOs, and therefore do not include groups trained by smaller organizations or independent agents. For example, Greaney, Kaboski, and Van Leemput (2016) estimate global participation in savings groups and self-help groups to 100 million (see Section 2.1 for the difference between savings groups and self-help groups.)

[2] For instance, both the Colombian and Dominican Republic's conditional cash transfer programs (Red Unidos and PROSOLI respectively) have introduced savings groups in their development programs (Salas, 2014). Graduation-type programs employing savings groups include project WINGS in Northern Uganda (Blattman, Green, Jamison, Lehmann, and Annan, 2015). Our study is also in partnership with a large antipoverty, graduation type program.

[3] The definition of vulnerability followed by project SCORE is multi-dimensional and not limited exclusively to economic vulnerability; it includes food insecurity and lacking social and family protections.

groups, in which the proportion of other targeted households is either 1/4 or 1/2. In both group types, the remaining fraction of the group is composed of self-selected members of the community, for a total membership of 27. These self-selected members are, on average, better off relative to our target vulnerable population: they report higher income, they are less likely to have a disabled household member, and they are less likely to report skipping meals. As a consequence, targeted households were randomly assigned to groups with higher or lower average socioeconomic status. We refer to groups comprised of many vulnerable participants as *dense* groups, and less vulnerable groups as *sparse* groups. We then carefully study the evolution of individual savings and borrowing of all members of the savings groups created for the study.

We find that, compared to sparse groups, dense groups generate 21% fewer total savings and disburse 33% fewer cumulative loans midway through the cycle. At the end of the cycle (i.e., eight to twelve months after group formation) performance metrics (cumulative savings, loans disbursed, return on savings, and default rates) are similar in both types of groups. We find differences at the individual level: in the middle of the cycle, targeted vulnerable households save 23% less and borrow 48% less when randomly placed in more vulnerable groups, with this effect fading out toward the end of the cycle. Because our targeted participants were randomly assigned to groups, this difference in savings and borrowing can be attributed to the intervention. In contrast, savings and borrowing from self-selected participants does not vary significantly with the treatment. We also show that, within our targeted population, those with worse socioeconomic characteristics decrease their savings and borrowing by a larger amount when placed in a dense group.

Taken together, these results can be explained by one mechanism: the fraction of vulnerable members of a savings group determines the group's ability to meet the demand for loans. Because savings accumulate slowly over time, loanable funds are initially scarce and borrowing is rationed in all groups. However, groups composed of poorer members take longer to accumulate funds and meet their underlying demand for loans. Therefore, in these groups rationing is both more severe and longer lasting than in sparse groups. Over time both types of groups accumulate funds and eventually satisfy the demand for loans of their vulnerable members.

Scarcity of funds can explain why targeted vulnerable households save less when placed in a dense groups. According to the rules of savings groups, a member who wishes to borrow must first save. Hence, whenever members expect fewer loanable funds to be available, they may decide to decrease the amount saved with the group, thereby reinforcing fund scarcity. Since less vulnerable members of our study groups are unaffected by the intervention, we

conclude that rationing is uneven and mostly affects those who are vulnerable.

We also consider a number of additional channels through which our intervention may have affected the functioning of the groups. Poorer groups may suffer from a lack of trust. Using data on within-groups social connection, we find that, indeed, members of dense groups are, on average, less connected to other group members that members of sparse groups. However, we also find that these difference cannot explain our treatment effects. We also consider the possibility that vulnerable members may be more likely to impose decisions that favor other vulnerable members; or that their demand for loans may be determined by the number of non-vulnerable members they interact with due to learning or aspirations. We find no evidence in support of these other channels.

Finally, we use the responses to interviews carried out sixteen months after the beginning of our intervention to study the short-term effect of the intervention on households' welfare. Members of dense groups are not significantly worse off in terms of total accumulated savings, asset ownership, household labor supply, and overall investments in productive activities. On the other hand, these households report a lower investment in housing and a higher probability of selling land compared to those in sparse groups. Overall, one year after the intervention, the effects of including a targeted vulnerable household in a dense group are negative but small. Note, however, that the long-run impact of our intervention may be significantly different from its short-run impact. Firstly, because savings groups start each new cycle with zero funds, temporary limits on fund availability may occur cycle after cycle. Secondly, there is already evidence that participation in financial groups improves social ties within members of the group (Pande, Field, and Feigenberg, 2013). To the extent that less vulnerable groups offer "better" social ties, participation in such groups may provide additional future gains. Thus, the benefit of participation in less vulnerable groups may require more than one year to fully accrue.

These findings have important policy implications. The presence of fund scarcity may hinder the ability of savings groups to deliver financial inclusion to underprivileged populations. From a policy design perspective, scarcity could be reduced by encouraging early savings (that can be lent out multiple times and ease the rationing of funds), allowing members to carry part of the savings accumulated with the group to a new saving cycle, or linking savings groups to the formal financial sector.[4] Furthermore, our paper shows that there is a trade off between financial inclusion of ultra-poor households and the ability of savings groups to provide credit to those same ultra-poor households. This has implications for

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[4] In recent years, Ugandan banks such as Barclays Bank, Opportunity Bank, Post Bank and Bank of Africa have developed lending products targeting specifically savings groups.

welfare programs that promote participation in savings groups. Ultra-poor members may be better served if the membership of their groups is opened up to a richer population.

The paper also holds a methodological contribution to the study of savings groups. Current practice in evaluating savings groups relies on end-of-cycle metrics. An important takeaway from our research is that savings groups that look very similar at the end of the cycle may perform very differently during the cycle. Hence, a proper evaluation of savings group performance must take into account metrics collected at various points during the cycle.

Relation to the literature The existing literature documents positive effects of participation in savings groups (for a complete list of these studies, see the review by Gash and Odell, 2013). For example, Beaman, Karlan, and Thuysbaert (2014) randomize at village level the creation of savings groups in Mali. They find that treated villages have higher savings (+30%), borrowing, consumption smoothing, food security, livestock holding compared to control villages. They also report that the wealthiest member of each village tend to select into savings groups. Ksoll, Lilleør, Lønborg, and Rasmussen (2015) find similar results employing a similar research design. Annan, Bundervoet, Seban, and Costigan (2013) randomize the timing of the provision of the savings group training, and find large effects of savings groups participation on household welfare. These works establish that savings groups' participation is overall beneficial to participating households. We instead focus on how the composition of a savings group determines its overall effectiveness at providing savings and credit to its members, especially those who are ultra-poor; we do not compare the benefit of participation in a savings group relative to no participation.

Our focus on group composition is close to Greaney, Kaboski, and Van Leemput (2016) and Cassidy and Fafchamps (2015). Cassidy and Fafchamps (2015) find some evidence that the (fully endogenous) process of group formation is able to match people who are willing to save with people who desire to borrow, where the propensity to save or borrow is measured in terms of present bias. However, they also find that people with similar professional background join the same groups. Greaney, Kaboski, and Van Leemput (2016) show that groups performance improves when savings groups training is paid by the group members rather than being provided for free. They argue that poorer households are more likely to default on their loans, and that entry costs (in the form of training fees) discourage them from joining a savings group. In contrast, the evidence from savings groups in our study indicates that ultra-poor members of savings groups are not more likely to default than other members. Furthermore, because of randomization into groups and because of

our unique member-level data, we are able to show directly that participants' saving and borrowing behavior respond to their group composition.[5]

More broadly, our study is related to the literature on financial inclusion. Several existing papers demonstrate that microentrepreneurs benefit from access to finance (see, for example, Banerjee, Duflo, Glennerster et al., 2015) and access to a safe way to store their money (see, for example, Dupas and Robinson, 2013). The evidence remains mixed for some segments of the population as discussed in Karim (2011) and Banerjee, Karlan, and Zinman (2015) with some evidence of negative effects from overindebtness from microfinance. As we show later, in our experiment vulnerable households enrolled in groups with different vulnerability profiles are differentially able to access credit from the group during the first months of operation of the groups. By comparing the welfare of vulnerable households enrolled in different types of savings groups, we can measure the effect of extending credit to vulnerable households, which are usually not reached by microfinance interventions.

Finally, our intervention highlights the importance of the group in shaping the choices of the individual. Hence, it shares some similarities with experimental studies of peer effects (see Sacerdote, 2014, for a recent review of the literature). However, our paper differs from that literature in several meaningful ways. First, peer-effect interventions usually fully randomize group assignment, and therefore eliminate any form of endogenous self-selection. This type of full randomization was simply unfeasible in our context. Second, most peer-effect experiments focus on schooling, and not on financial markets. In this regard, we are close to Pande, Field, and Feigenberg (2013), who study the impact of social interactions in microfinance groups in India. In their paper, they experimentally varied the frequency of interactions of microfinance groups, holding the composition of the group constant. In contrast, our intervention holds the frequency of group meetings constant, and experimentally vary the composition of the group.

The rest of the paper proceeds as follows: section 2 provides background information on how savings groups operate and project SCORE. Section 3 describes our intervention. Section 4 describes our empirical strategy. In Section 5 we describe how our intervention affected the composition of dense and sparse groups. In Section 6 we present our empirical results relative to the functioning of different types of groups, and the behavior of preselected vulnerable members of different types of groups. We discuss possible mechanisms behind these results in Section 7. In Section 8 we discuss the effects of our intervention on household

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[5] To our knowledge, Salas (2014) is the only other paper that studies the internal borrowing and savings behavior of group members, and analyzes the dynamics of borrowing and savings during a single cycle. Salas (2014) focuses on the behavioral response to a mental accounting intervention where members choose savings goals.

welfare. The last section concludes.

2 Background information

2.1 Savings groups

A savings group is community-based financial institution that collects savings from its members into a common pool, lend those funds back to its members, and typically operates over a limited period of time (the cycle). The most common type of savings group (and the one under analysis in our paper) is the Village Savings and Loans Association (VSLA), which was first introduced by CARE International in Niger in 1991. VSLAs operate in the following way. First, an association organizer (who can be a non-governmental organization worker or a private entrepreneur) recruits and trains potential members from the community (typically 20-30 people). Following the training period, the group agrees on the bylaws of the association, which include the length of the savings cycle, the interest rate charged on loans and the value of a *share*.

During each weekly meeting, each member saves with the group by purchasing shares from the group. The maximum number of shares that each person can purchase in a given meeting is five, which imposes an upper bound to the amount that can be saved with the group during a single meeting. Hence, unlike a ROSCA where savings contributions are fixed, in a VSLA each member chooses each week how much to save. Savings deposits are recorded in a group ledgers and in an individual booklet. All cash deposits are pooled and kept in a metal safe box, which is opened only when the group is in session. Members are not allowed to withdraw their savings during the cycle.

Borrowing starts three months after the beginning of the cycle. Individual loans are extended to group members subject to three constraints: the group must agree on the stated purpose of the loan; loan sizes are restricted to three times the amount saved by the borrower until that point; and disbursements should not exceed the amount available in the safe box. Loans must be repaid within three months, and the interest on the principal compounds monthly. Once the loan is paid back, the borrower is eligible to receive another loan.

Three months before the end of the cycle, loan disbursements end and outstanding loans are repaid. The last meeting is devoted to the *share out*: the content of the safe box is emptied and divided among the members of the group in a way that is proportional to the amount each person saved. A new cycle is eventually started. Between the end of the old cycle and the beginning of the new cycle the group composition may change and the rules

governing the group may be modified.[6]

Loans and share out provide participants with a sizable amounts of funds. As can be seen in Appendix Table B1, among vulnerable participants in our study groups, the single most common use (44% of loans and 39% of share out) is the payment of school fees. In addition, 35% of loans and 40% of share out amounts are used for some type of productive investment, including starting a new business, purchasing of farm inputs such as livestock and land, or other business investment. Loans are somewhat more likely than share out to be used for emergencies, such as a health incident or unemployment (22% versus 16%). Conversely, and quite predictably, households are almost twice as likely to report consuming their share out (29%) than their loans (16%).[7]

The VSLA model has been adopted and modified by other organizations, generating substantial heterogeneity in the types of savings groups currently existing. Most of these variations maintain the basic rules described above but modify the way the group is trained or accounts are kept.[8] We also make a distinction between savings groups and *self-help groups*. Self-help groups developed in India simultaneously to and independently from the VSLA model (and its variations). Typically, they do not return all funds to their members during share out, but instead distribute profits or dividends over time. For this reason, assuming a similar composition, savings groups and self-help groups are likely to generate very different levels of savings and loans.[9]

2.2 Conceptual framework

The primary role of a savings group is to channel funds from members who want to save to members who want to borrow. However, contrary to the way a frictionless credit market operates, the rules governing the functioning of a savings group do not guarantee that, in each period, supply will match demand of funds. In this section, we discuss the causes of

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[6] See Allen and Staehle (2007) and Allen and Panetta (2010) for the full description of the VSLA program guidelines.

[7] Fund use is self reported. Consumption here excludes expenditure in durables, negative shocks (health related or otherwise), and payment of school fees.

[8] See, for example, Savings and internal lending communities (SILC) promoted by Catholic Relief Services, and Oxfam's Saving for Change (SfC). However, some models also modify the way the share out is conducted (i.e., MUSO and Pact-WORTH model). These models are much less common than VSLA, SILC or SfC.

[9] For a more detailed discussion regarding the types of savings groups and the difference between savings groups and self help groups, see Allen and Panetta (2010), Ashe (2009), Vanmeenen (2010). Note that the distinction between self-help groups and savings groups described here is gaining popularity but is not universally adopted. For example, Greaney et al. (2016) study SILCs (which, according to our classification are savings groups) but call these groups "self-help groups". Blattman et al. (2015) also follow the same terminology when referring to VSLAs.

this potential mismatch, and how the composition of the savings group may affect it.[10]

The main reason for the potential mismatch between demand and supply of funds is that savings earn the same return independently on when they are contributed to the group, which creates the incentive to save as late as possible. This is inefficient because early savings are more beneficial to the group than late savings. Early savings can be lent our multiple times, and each time they are lent out they generate a return that can also be lent out. Note that this inefficiency is mitigated by two elements. The presence of an upper bound to the amount that can be saved during each period forces members who desire to save with the group more than this upper bound to spread their savings over multiple periods. In addition, for those who plan to borrow, early savings can be used to obtain multiple loans. Despite this, within a savings group funds may be scarce when they are most valuable, that is at the beginning of the cycle.

In case funds are scarce, there is no presumption that all members of a savings group are equally rationed, i.e., it is possible that some members are able to meet their demand for loans while others are not.[11] Because not everybody in the group may be rationed out of funds, the initial rules chosen by the group may lead to an inefficient generation funds. For example, as long as the majority of the group is able to meet his/her demand for loans, the group may decide to constrain the supply of funds to increase the return on savings.

The possibility of a mismatch between demand and supply of funds implies that, controlling for the cost of borrowing, the benefit of group participation depends on the group composition. For example, replacing a member with a low propensity to save with one with a high propensity to save may not affect the rules chosen by the group (because it does not affect who the "median" member is), but will increase the availability of funds and the probability that the demand for loans of its members is satisfied.

Finally, note that, because a group member who wishes to borrow must first save, we should expect a positive correlation between level of borrowings and level of savings. That is, in groups in which more loanable funds are available, the possibility of receiving larger loans should increase the savings level of potential borrowers. This mechanism is relevant because it tends to make scarcity of funds more severe. Also, in most groups, funds may be scarce during some periods (especially early on in the cycle) and abundant in others. In these cases, exogenously increasing the supply of savings will be beneficial to the group if scarcity is the most relevant case.

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[10] This framework is based on the theoretical model developed in Burlando, Canidio, and Selby (2016).

[11] There is no official rule or mechanism that determines the allocation of funds in case of scarcity, and each group may proceed in different ways.

2.3   Project SCORE

Our research project is in partnership with project SCORE, a joint program of four NGOs based in Uganda (AVSI, CARE, TPO, FHI360) that provide services to 125,000 vulnerable children and their households in 35 districts across Uganda. Project SCORE (Sustainable COmprehensive REsponses for vulnerable children and their families) was launched in the fall of 2011 with a USD 9 million USAID grant. Project SCORE is a set of interventions implemented over a period of 5 years having the following goals: to identify vulnerable children in ultra-poor households across communities in Uganda; to improve their socio-economic status, food security, and nutrition status; and to increase the availability and access to protective, legal and other critical services. Targeted households receive a number of interventions, including classes on advanced farming techniques, cooking, nutrition, business training and business development. Contrary to other comprehensive anti-poverty programs targeting ultra-poor households (such as the ones studied by Banerjee, Duflo, Goldberg et al., 2015, and Blattman et al., 2015) SCORE offers no transfers to targeted households, neither in money nor in kind.

The most important intervention carried out under SCORE enrolls beneficiaries into SCORE-created savings groups, which follow CARE's VLSA model. Such groups are formed by first registering SCORE recipients, and then enrolling other interested community residents. Crucially, SCORE requires that at least half the membership is composed of SCORE recipients. As a consequence, compared with VSLAs supported by other organizations, SCORE groups are generally more inclusive of vulnerable and marginal households.

Importantly, the four NGOs involved in program SCORE do not provide services directly. Rather, they outsource all interventions to a number of smaller community-based local organizations (which we refer to as Implementing Partners or IPs), which typically operate in only a few villages. 22 IPs participated in our research, giving rise to a large variation in the capabilities of the organizations carrying out the intervention. We will control for this variation in our empirical analysis.

3   The Intervention

Our experiment takes place in the context of an expansion of project SCORE to 90 mostly rural villages not previously served by the project. This expansion was spread throughout Uganda, involving 28 districts in the Western, Central, Eastern and Northern regions, starting in January 2013. The objective of the intervention is to randomly assign ultra-poor

households to groups composed of a higher or lower fraction of ultra-poor members.

Timeline and protocol   In each study village, SCORE representatives worked with local organizations and government officials to identify ultra-poor households with children. Identified households were further screened through a questionnaire, aimed at assessing their level of vulnerability and their eligibility for inclusion into project SCORE (see Appendix A for the full list of vulnerability indicators employed). Once enrolled, social workers carried out additional interviews to determine whether the household was interested in joining a VSLA. The enrollment process into the study stopped once SCORE identified 14 households per village who were willing to form a savings group. We refer to these households as the *preselected* study participants. All preselected participants enrolled were given access to other standard SCORE services.

Figure 1: Randomization strategy–Group formation stage
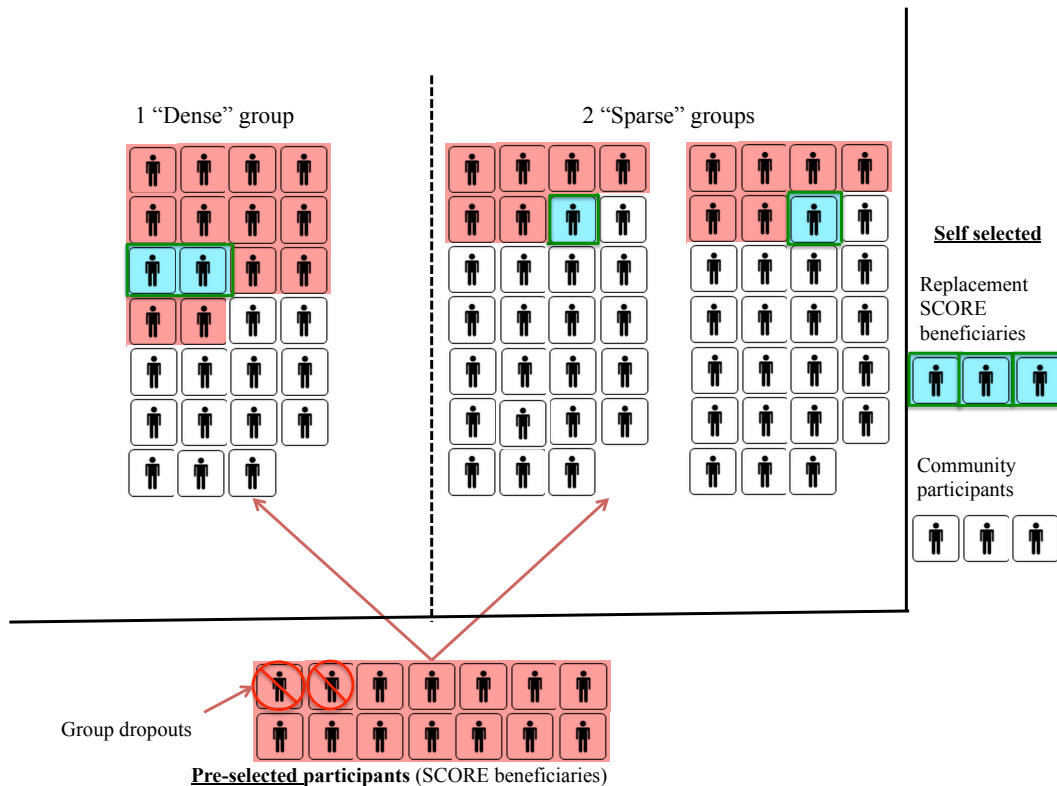
Using the information contained in the screening questionnaire, the research team ran-

domly assigned 32 villages to a *sparse treatment*, and the remaining 58 villages to a *dense treatment*.[12] In dense treatment villages, one VSLA was formed, comprised of 14 preselected participants. In sparse treatment villages, two separate VSLAs were formed, each comprised of seven preselected participants.[13] If one decided not to join their assigned savings group, they were replaced with another ultra-poor households enrolled in project SCORE.

The remaining members of each VSLA was made up by members of the local community, whom we refer to as *community participants*. The size of the group was capped at 27. Field officers enrolled community participants through a process of engagement which included presentations in local markets, churches, and community-based organizations. Note that both community participants and SCORE replacements joined during group formation and after randomization; for this reason, we pool them together in a *self-selected* category in our analysis. See Figure 1 for a schematic of the intervention. Group formation and group training took place between April and July 2013. Final membership, rules of operations, and length of cycle were formalized on the first day of the cycle after training concluded, and groups then operated for six months to one year before sharing out. The study concluded in December 2014. Figure 2 summarizes the timeline of the intervention.

Characteristics of study participants   Table 1 report the vulnerability profile of preselected households, constructed using the answers to the screening questionnaire used by SCORE. These ultra-poor households face significant challenges in their daily life. For instance, one fifth have a child involved in child labor, 15% have a member with a chronic disease, 40% have a member with disabilities, and 50% of them contain an orphan child. In addition, households in the sample report very limited economic resources, with an average monthly income of 41,000 UGX (approximately $15[14]). This is consistent with a very low reported consumption of little more than one meal per day. On the other hand, many (over 60%) of these households do have access to public infrastructure like latrines and well water. Table 1 column 2 reports the same characteristics for the self-selected members of our study groups. Along almost all vulnerability measures self-selected are significantly better off compared to preselected.[15] The remaining columns of Table 1 report that the vulnerability profile of members of dense and sparse groups are similar, indicating that the treatment

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[12] The smallest administrative unit in Uganda is the parish, which comprises several village. To avoid treatment spillovers, the study was limited to one village in each parish except for eleven larger parishes. In these larger parishes, geographically-distant villages were included in the study and assigned to the same treatment.

[13] The decision to sort preselected participant to the field officers in charge of forming the groups.

[14] Exchange rate in January 2013 was 2,660 UGX per dollar.

[15] The only exception is "access to safe source of water" (i.e. well water).

Table 1: Balance of treatment arms and summary statistics of preselected and self-selected group participants

VARIABLES	A. All group participants			B. Preselected only		
	Preselected Mean (St. Dev.)	Self-selected Mean (St.Dev.)	Difference (T-Stat.)	In Dense Mean (St. Dev.)	In Sparse Mean (St.Dev.)	Difference (T-Stat.)
Child labor (yes=1, no=0)	0.219	0.0826	0.136***	0.247	0.189	0.058
	(0.414)	(0.275)	(6.039)	(0.431)	(0.392)	(1.117)
Drug abuse at home (yes=1, no=0)	0.0951	0.0213	0.0738***	0.105	0.0577	0.0473
	(0.294)	(0.144)	(3.207)	(0.307)	(0.234)	(1.204)
Chronic disease (yes=1, no=0)	0.179	0.0712	0.108***	0.173	0.141	0.032
	(0.383)	(0.257)	(5.188)	(0.378)	(0.348)	(0.859)
Disability in household (yes=1, no=0)	0.409	0.297	0.113***	0.401	0.369	0.032
	(0.492)	(0.457)	(3.195)	(0.490)	(0.483)	(0.476)
Food insecure (yes=1, no=0)	0.708	0.509	0.199***	0.706	0.648	0.058
	(0.455)	(0.500)	(3.817)	(0.456)	(0.478)	(0.766)
Quality diet	2.214	2.383	-0.169	2.254	2.161	0.093
	(0.869)	(0.783)	(-1.628)	(0.873)	(0.794)	(0.707)
Number of daily meals	1.111	1.925	-0.814***	1.139	1.074	0.065
	(1.021)	(0.826)	(-5.654)	(1.029)	(1.019)	(0.253)
Informal employment (yes=1, no=0)	0.606	0.744	-0.139***	0.548	0.650	-0.102
	(0.489)	(0.436)	(-4.360)	(0.498)	(0.478)	(-1.340)
Household unemployed (yes=1, no=0)	0.144	0.0873	0.0566	0.157	0.143	0.014
	(0.351)	(0.282)	(1.530)	(0.364)	(0.350)	(0.272)
Orphaned child in hhld (yes=1, no=0)	0.515	0.320	0.195***	0.491	0.516	-0.025
	(0.500)	(0.467)	(5.159)	(0.500)	(0.500)	(-0.358)
Safe source of water (yes=1, no=0)	0.713	0.610	0.103*	0.674	0.627	0.047
	(0.453)	(0.488)	(1.879)	(0.469)	(0.484)	(0.403)
Access to latrines (yes=1, no=0)	0.753	0.896	-0.143***	0.769	0.765	0.004
	(0.431)	(0.305)	(-3.833)	(0.421)	(0.425)	(0.0834)
Income per capita (UGX)	7,157	9,923	-2,766***	7,456	6,481	975
	(8,915)	(14,056)	(-3.034)	(9,676)	(7,770)	(0.842)
Assessor scale	1.920	1.493	0.428***	1.906	1.965	-0.059
	(0.602)	(0.775)	(7.159)	(0.611)	(0.527)	(-0.948)
Number of hhld members	6.530	6.415	0.115	6.338	6.634	-0.296
	(2.724)	(3.274)	(0.442)	(2.656)	(2.736)	(-1.205)
Vulnerability index	0.473	-0.403	0.877***	0.557	0.369	0.188
	(1.245)	(1.192)	(6.252)	(1.264)	(1.179)	(1.070)
Dense	0.655	0.402		1	0	
P-value of F-test:						
All coefficients jointly significant (all preselected)						0.6534
All coefficients jointly significant (only preselected enrolled in VSLA – no dropouts)						0.5943

Columns A. Sample includes all preselected and self-selected participants of study savings groups.
Columns B. Sample includes preselected only (enrolled in groups and group dropouts).
Quality diet is a numerical score (0-3) with one point assigned to each different category of food eaten by children in the household.
Assessor scale is numerical score (0 to 3) of vulnerability based on the direct observation of the assessor. Higher values is more vulnerable.
Total score is overall score of vulnerability. Higher values are more vulnerable.
See appendix A for a detailed description of all indicators.
All T-statistics of differences are clustered at the village level. *** p<0.01, ** p<0.05, * p<0.1
Reported p-values of F-tests of joint significance of regression of characteristics on treatment dummy. The first p-value includes data from preselected dropouts. The second p-value excludes group dropouts.

Figure 2: Timeline
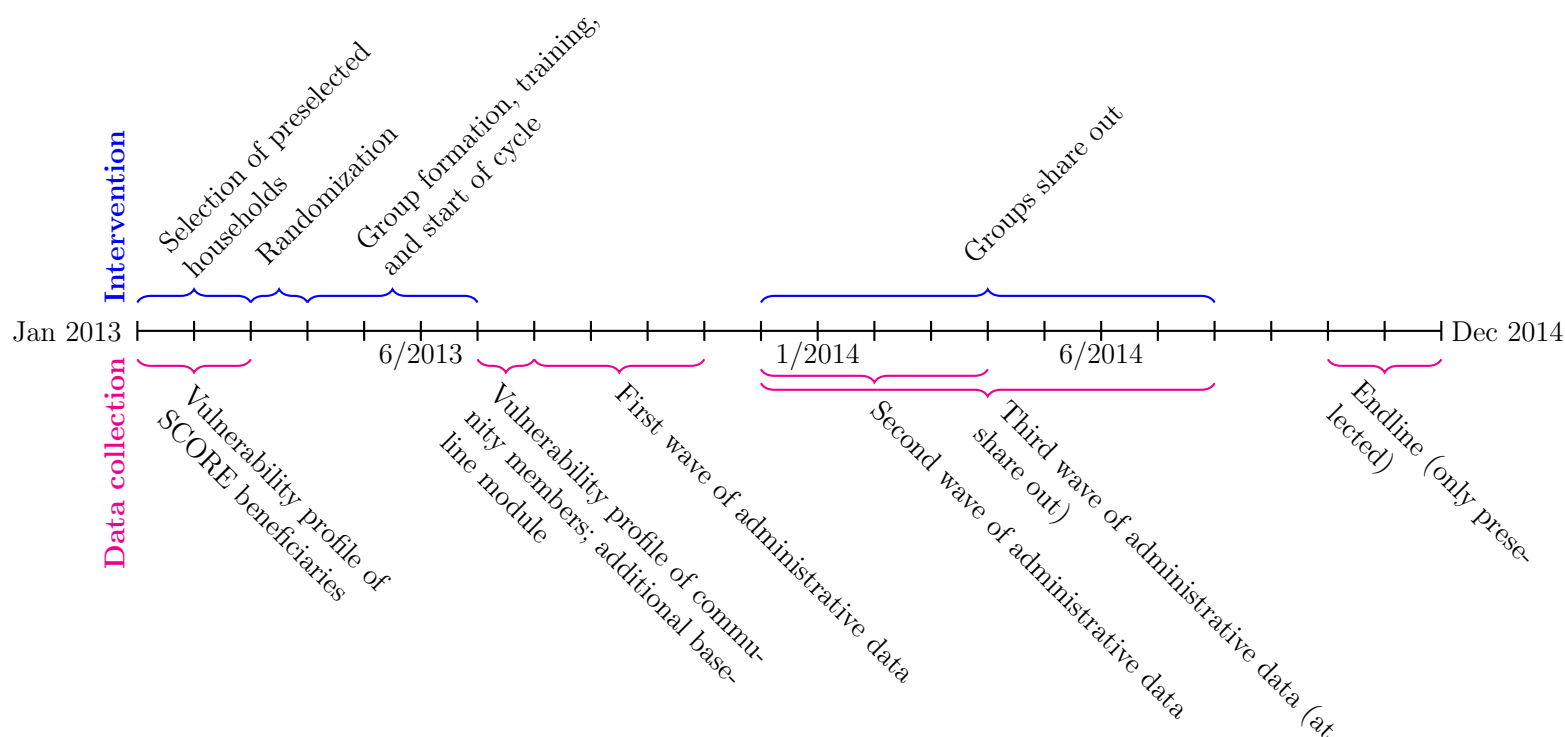
arms are balanced as intended.

Group formation process   Table 2, panel A describes the group formation process. 56 dense group (out of the expected 58) and 60 sparse (out of 64) were formed. Setting up sparse groups took an average of 15 extra days (81 days on average from randomization to first day of operations, relative to the 66 days needed in dense groups). The makeup of the groups follows the intended assignment (50% SCORE beneficiaries in dense and 25% in sparse groups).

Panel B describes movements in and out of the group. Only 79% of preselected households enrolled into a study savings group, indicating significant turnover in the initial membership. Appendix Table B2 shows that the probability of enrollment is uncorrelated with treatment assignment, but households who are food insecure, host orphan children, or have chronically ill members are more likely to remain enrolled.

Panel C shows the availability of financial institutions (VSLAs, credit unions, banks) in dense and sparse villages. These statistics come from a census of financial institutions in

Table 2: Group formation statistics

	Total	Dense VSLAs	Sparse VSLAs
Panel A: Group Composition			
Number of VSLAs (planned)	122	58	64
Number of VSLAs formed (actual)	116	56	60
Fraction formed	95.1%	96.6%	93.8%
Time to form (days since randomization)	74.2	66.1	81.8
Number of SCORE beneficiaries enrolled	1,158	765	422
Number of non-beneficiaries enrolled	1,940	771	1,256
Fraction composed of SCORE beneficiaries	37.4%	49.8%	25.1%
Panel B: Dropouts and substitutes			
Pre-selected participants	1,234	798	436
Pre-selected participants not enrolled (dropped out)	264	164	100
Fraction of pre-selected who dropped out	21.4%	20.6%	22.9%
Panel C: Access to financial services in community			
Number of VSLAs in village	4.28	4.1	4.59
Number of formal Credit Union (SACCOs) in parish	0.34	0.37	0.26
Number of formal banks in parish	0.01	0.03	0
Number of MFIs	0	0	0

Notes: Drop out participants were assigned to a VSLA but never formally enrolled. This excludes enrolled participants who were assigned a savings booklet and a personal ID number but eventually dropped out. Panel C includes statistics from a community survey carried out one year after the start of the intervention. Statistics reported are average number of branches in 88 study villages (for VSLAs) excluding one outlier (with 100 VSLAs reported); and the average number of banks, SACCO and MFI branches in the 74 parishes. Recall the parish is a larger administrative unit than the village.

study villages carried out in 2014. Most villages have a number of savings groups operating, and the total number of VSLAs (including our study groups) is similar across the two types of villages. Regression analysis, reported in Appendix B Table B3, confirms that the difference in the number of groups between dense and sparse villages is not statistically significant. Dense and sparse areas have also similar population and access to other formal financial services (i.e., banks, MFIs or SACCOs). In other words, our intervention did not change the availability of financial services in sparse villages relative to dense villages.

3.1 Data

Our data consists of baseline and endline household surveys collected during one-on-one interviews of study participants, and financial records from three audits of group finances carried out during the first cycle of operation.

Baseline data   Our baseline information includes the variables from the screening tool used to determine the vulnerability of prospective SCORE beneficiaries. The tool contains questions on the household's socioeconomic status (income per capita, food security, access to safe water and latrines) and the well-being of the children belonging to the household (including disability and history of physical or mental abuse). Appendix A has a full description of the variables and the indicators collected in the screening tool and used in this paper.

The vulnerability screening tool was administered to all SCORE beneficiaries enrolled in study groups. To complete the group vulnerability profile, enumerators administered the same questionnaire to community participants shortly after groups formed. Using the pre-intervention data from beneficiaries and post-intervention data from community participants, we construct a profile of baseline characteristics for groups in the two treatment arms.[16]

Data collectors also administered an additional baseline module to all community participants as well as a sample of SCORE beneficiaries. This module included questions on within-group social connections, such as the number of family members or neighbors who are members of their same VSLA. The respondents also listed the names of people whom they "seek advice from", "give advice to," "visit at their home". They also reported whether any of the people mentioned is also participating in their VSLA.

VSLA administrative records   Information on savings and borrowing behavior for all groups participants comes from administrative records collected by SCORE field officers

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[16] While applying the "baseline" terminology may be a slight abuse of language in this context, it is unlikely that the treatment had an effect on vulnerability immediately after the groups were formed.

during their regular financial audit of VSLAs. The assessment of study groups was carried out following standard procedures in SCORE: field officers reviewed transactions and record-keeping, reconciled discrepancies between cash ledgers and savings booklets, and finally reported audited figures in a standard audit form. The information collected included savings, borrowing, and repayments of each member up to the audit date; whether the borrower was in arrears; and whether the member dropped out of the group during the evaluation period. The visits were conducted approximately every four months, giving rise to three waves of data collection: after approximately 4 months of operation (*wave I*), after approximately 8 month of operation (*wave II*), and at the end of the operating cycle of the group (*share out*).[17] Auditors also reported the interest rate charged on loans and the value of the share.

Table 3 provides summary statistics of financial transactions from the financial audits. Most groups chose interest rates on loans equal to 3%, 5% and 10% (average 8.6%, mode 10%). Two groups (in dense villages) chose an interest of 20% per month. Share values average 888 UGX ($0.35), with most groups choosing either 500 UGX or 1,000 UGX, and five groups 2,000 UGX. Groups members earned a return of 13% for every shilling saved with their respective VSLA.

The rest of the table describes the data collected during the three audit periods. Average cumulative savings of all participants grow slowly, reaching 100,000 UGX (approximately $40) by the end of the cycle. Likewise, average cumulative loans increase from 41,000 UGX ($15.40) during the first audit wave to 166,000 UGX ($62) by the end of the cycle. The average member obtained 2.7 loans by the end of the cycle. By the time of the first wave of data collection, almost 70% of members had obtained at least one loan, and the proportion increases to almost 90% by the end of the cycle.

Only 1.5% of loans were considered past due in the first audit wave one, 8.3% in the second, and 3% by the end of the cycle. Note that having an outstanding loan at share out does not imply a default on a loan, as groups seize the savings of borrowers with unpaid loans at share out. Hence, the actual defaults (always partial) are much fewer than 3%. Overall, the groups are effective at preventing defaults and late repayments.

Finally, the data suggest that funds are scarce within the group. This is illustrated in Figure 3, which shows that the overall funds-utilization rate (total cumulative loans over total cumulative savings) increases over time, starting from 1.3 and reaching approximately 1.5. That is, loans disbursed in each period grow faster than savings contributed in each

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[17] Seventeen groups chose an abbreviated cycle; for those groups, the last two audits are very similar or identical.

Table 3: Summary Statistics–Group characteristics and audit data

	(1) Mean	(2) St. Dev.
Group Characteristics		
Pre-selected participants	0.302	0.459
SCORE beneficiaries	0.369	0.483
Interest rate	8.686	2.779
Share price	888.2	307.3
Audit Wave I		
Number of meetings (to date)	17.99	7.294
Savings per person (to date)-UGX	41,868	35,762
Average number of shares purchased per person per meeting	2.659	1.767
Member borrowed at least once	0.681	0.466
Number of loans per person	1.420	1.346
Average amount borrowed per person (to date)--UGX	68,338	116,943
Member has loans past due	1.503	2.859
	0.0159	0.125
Audit Wave II		
Number of meetings (to date)	34.57	13.32
Savings per person (to date)-UGX	86,226	60,835
Average number of shares purchased per person per meeting	2.578	2.277
Member borrowed at least once	0.806	0.396
Number of loans per person	2.357	1.637
Average amount borrowed per person (to date)--UGX	132,274	205,087
Member has loans past due	0.0826	0.275
Audit Wave III-End of cycle		
Number of meetings (to date)	46.67	9.072
Savings per person (to date)-UGX	98,790	64,926
Average number of shares purchased per person per meeting	2.500	1.514
Member borrowed at least once	0.893	0.309
Number of loans per person	2.675	1.900
Average amount borrowed per person (to date)--UGX	166,398	256,350
Member has loans past due	0.0309	0.173
Member enrolled in dense VSLA	0.477	0.500
Number of VSLAs formed	116	

Data from audits of savings groups. Each observation is a member of the group; includes both
preselected who joined the group and self selected.

period. This is possible because as past loans are repaid to the group (with interest) they
can be lent out again. This is suggestive of scarcity, because when extra funds are introduced
into the group (in the form of loans repayment), they are quickly lent out again.

Endline data   Approximately one and a half years from the date of groups formation, we
conducted an endline survey of all preselected households that were originally assigned to

Figure 3: Average savings-to-loan ratios
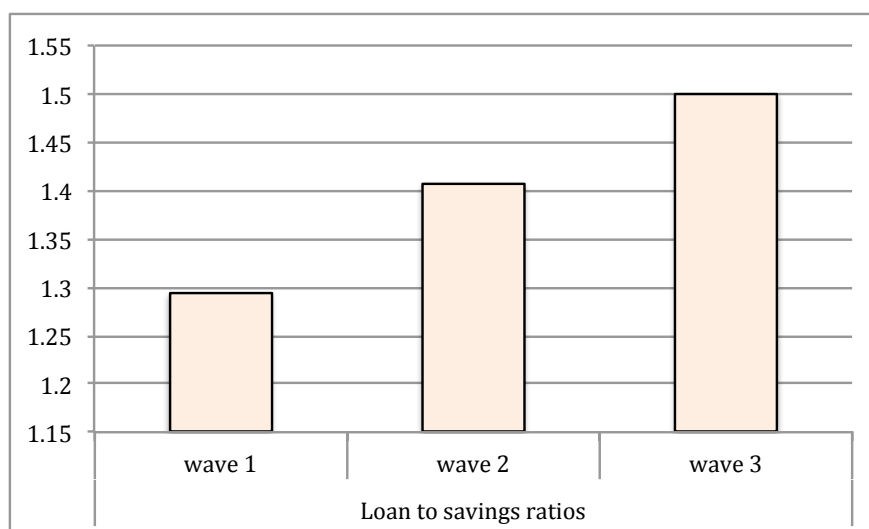
a savings group.[18] The objective of the endline survey was to measure the effect of partic-
ipation of preselected households into sparse and dense VSLAs on household welfare. The
questionnaire covered asset ownership, food security, savings behavior, investment behavior,
and satisfaction with various aspects of the savings group. The tracking team was able to
find and survey 983 households, representing 77% of the original sample of study partici-
pants. Web Appendix Table X regresses the baseline vulnerability indicators on whether the
household was tracked at endline. It finds that the probability of being found is higher for
households having a member with a chronic disease and for households hosting orphaned
children. Differential attrition is a concern: using the nonattrited sample, a regression of
the treatment dummy on the set of baseline characteristics shows some imbalance for two
vulnerability indicators (use of child labor and informal employment), even though the F-
test of the regression is not statistically significant. We rebalance the sample in the analysis
using weighted least squares (WLS) as discussed in the next section.

4   Empirical strategy

Our empirical analysis has three main steps. We first establish whether the composition of
dense and sparse groups differ. Having established that the intervention created dense groups
that are poorer, we then use data from financial audits of the groups to study the savings

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[18] We were unable to administer the endline survey to the self-selected participants of our study savings
groups due to budget limitations.

and borrowing behavior of the preselected members (i.e. the randomly assigned population) of these savings groups. Lastly, we use endline data to study the effect of the intervention on the welfare of the preselected.

Differences between dense and sparse groups   The first task is to compare the composition of dense and sparse groups. Because dense groups have a higher proportion of targeted program participants, and because the targeted participants score highly in vulnerability, our expectation is that members of dense groups are, on average, more vulnerable. Whether that is true in practice depends, crucially, on the characteristics of the self-selected population, and on whether these characteristics vary by the type of group. For instance, the two types of groups may be very similar (despite the randomization) if self-selected participants in dense groups are less vulnerable than those in sparse groups.

Using the vulnerability data we collected on both self-selected and preselected households, we thus regress vulnerability characteristic y for participant i in group g on her group assignment:

$$x_{ig} = \alpha_0 + \alpha_1 Dense_g + \alpha_2 Preselected_{ig} + \alpha_3 Dense_g \times Preselected_{ig} + \omega_{ig}, \qquad (1)$$

where $Dense_g$ is an indicator variable that identifies the assignment to a dense group, and $Preselected_{ig}$ is the indicator that identifies preselected from self-selected participants. The coefficient α_1 describes systematic differences between self-selected participants in the two types of groups;[19] α_2 describes differences between preselected and self-selected in sparse groups, and the coefficient α_3 is the difference-in-difference estimator. Due to randomization, we expect α_3 to be zero.

Ultimately, we expect the treatment to affect the financial performance of the group in some systematic way. To establish how group-level outcomes differ across treatment arms, we estimate

$$y_g = \alpha_g Dense_g + X_g \beta_1 + \epsilon_g, \qquad (2)$$

where y_g is an outcome (aggregate cumulative savings, aggregate cumulative borrowing, return on savings, and default rates) measured during audit wave t; $Dense_g$ identifies groups assigned to the dense treatment, α_g is the coefficient that describes the difference in outcomes between dense groups relative to sparse groups, and X_g is a group level control matrix,

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[19] It is important to emphasize that the results in equation (1) are only indicative of differential selection along observable criteria. Self selected participants in dense groups may differ along other unobservable characteristics, such as their demand for savings or credit.

which may include the number of VSLA meetings at audit wave t, interest rate, share price, implementing partner fixed effect and a constant.

Individual account behavior   Aggregate responses to the treatment captured by (2) can be thought of as the result of two effects: one arising from observed and unobserved compositional differences of the two groups, and one arising from participants behaving differently in dense groups and in sparse groups. While we cannot directly measure the former, due to random assignment we can measure the latter. Consider preselected person i in group g, and denote her individual-level outcome of interest at audit wave t (cumulative savings, borrowings, late repayment, and so on) by y_{igt}^{pre}. The empirical specification is

$$y_{ig}^{pre} = \alpha Dense_g + X_g \beta_1 + \epsilon_{ig}^{pre}, \tag{3}$$

where X_g are group-level controls from (2) and $Dense_g$ identifies groups assigned to the dense treatment. The key coefficient of interest is the intent to treat estimator, α. It describes the difference in saving and borrowing behavior of a person who is randomly assigned to a dense group as opposed to a sparse group. Because of random assignment, the preselected participants should not have observed or unobserved differences in their willingness to save or to borrow. Any difference between dense and sparse (captured by the coefficient α) measures the individual members' causal response to their group assignment.

    A few additional technical notes on estimating equations (1)-(3) are required. First, due to noncompliance, we do not consider the realized fraction of vulnerable members of a VSLA, but rather we use the randomization assignment as our intervention measure. Second, it is likely that outcomes are autocorrelated within each village, and therefore errors are clustered at the village level. Finally, to deal with outliers and data entry mistakes, we trim the top 1% of individual savings, borrowings, and borrowing-to-savings ratio in each audit round dataset.[20].

Effects on welfare   We complete the paper by discussing the effect of our intervention on household welfare. Lacking data on self-selected, we focus our attention on those members who were randomly assigned to groups (the preselected). For each outcome y_{ig}^{pre}, we estimate equation (3) on the full sample of preselected, including those who did not join their assigned VSLA. As before, the coefficient α is the intent to treat estimator. Because the sample

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[20] Estimates are larger in magnitude and more likely to be significant if trimming is not used; see tables in the Web Appendix

includes preselected households who declined to join their group, our regression does not control for group characteristics. In addition, we also report the estimate of α obtained by limiting the sample to those preselected who joined their assigned VSLA. Significant effort was exerted in finding all preselected participants, including dropouts. This meant that interview teams revisited study areas multiple times in search of respondents, over a period of time that covered four months. A month-of-interview dummy is included to capture seasonal differences due to different interview periods. Despite our best efforts, as discussed earlier there is evidence of differential attrition between the two treatment arms. We use the approach in DiNardo et al. (1996) to "rebalance" the treatment arms. In practice, we use baseline characteristics to generate predicted probabilities of not being found in the endline, and use these as weights in a weighted least square (WLS) estimation model. This method is similar to inverse probability weights (see Imbens and Wooldridge, 2009) and is employed in other RCT studies to address attrition (e.g., Banerjee, Duflo, Glennerster et al., 2015). Since the differential attrition problem is not severe, results from WLS are very similar to unweighted OLS.[21] In addition, to account for the possibility of falsely identifying significant effects when considering multiple outcomes, we report significance levels adjusted with the Benjamini-Hochberg step-up method (Benjamini and Hochberg, 1995).

5   Group composition

Our intervention was successful at generating different vulnerability profiles in dense and sparse groups. Table 4 shows that, on average, the vulnerability index is significantly higher for participants of dense groups, who are more likely to skip meals, have higher subjective measures of vulnerability as reported by assessors, and have access to a safe source of water. Members of dense groups are, on average, poorer and more vulnerable compared to the members of sparse groups.

Table 5 estimates equation (1). The coefficient on *Preselected* confirms that preselected are more vulnerable than self-selected, while the coefficient on *Dense* shows that the self-selected in dense groups are slightly worse off compared to self-selected in sparse groups. This is fully explained by the fact that many self-selected participants are vulnerable replacements for preselected who dropped out of the group. In Appendix Table B4 we demonstrate that, at least among observable characteristics, community members joining sparse groups are

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[21] OLS results, as well as tests for common support of the predicted probabilities, are available from the authors upon request.

Table 4: Vulnerability profile at baseline: dense vs sparse

VARIABLES	Disability in household	Drug abuse at home	Child labor	Orphaned child in hhld	Food insecure	Informal employment	Casual work
Dense VSLA	0.026	0.036	0.076**	0.056	0.072*	-0.110***	0.062**
	-0.032	-0.039	-0.032	-0.034	-0.041	-0.032	-0.024
Observations	2735	2470	2469	2474	2686	2741	2741
R-squared	0.132	0.062	0.102	0.094	0.17	0.141	0.162
VARIABLES	Household unemployed	Safe source of water	Access to latrines	Assessor scale	Income per capita	Number of hhld members	Vulnerability index
Dense VSLA	0.052***	0.131**	-0.027	0.156***	-213	-0.314	0.443***
	-0.016	-0.064	-0.025	-0.051	-783	-0.232	-0.097
Observations	2741	2385	2761	2474	2718	2749	2438
R-squared	0.117	0.354	0.098	0.086	0.121	0.037	0.154

Regressions on sample of VSLA participant households only (preselected plus self-selected) and including IP fixed effects. Sample of preselected interviewed prior to group formation; sample of self-selected interviewed after group formation. Quality diet is a numerical score (0-3) with one point assigned to each different category of food eaten by children in the household. Assessor scale is numerical score (0 to 3) of vulnerability based on the direct observation of the assessor. Higher values is more vulnerable. Total score is overall score of vulnerability. Higher values are more vulnerable. See Appendix A for all other definitions. Errors clustered at the village level in parentheses *** p<0.01, ** p<0.05, * p<0.1

similar to those joining dense groups.[22]

6 Results

6.1 Group-level performance

We first use the data from the three audit waves to study the effects of the intervention on the aggregate performance of the study groups. We look at the rules chosen by the group, aggregate savings and borrowing, return on savings, and default rates.

Share price and interest rates At the group formation stage, members must decide on the interest rate and on the share price. Qualitative interviews suggest that groups make this decision with very limited information on what would be a reasonable rule, and many

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[22] This result may sound surprising, because in villages assigned to the sparse treatment roughly three times as many community members joined our study VSLAs relative to villages assigned to the dense treatment. However, our intervention did not increase the total number of VSLAs operating in sparse villages relative to dense villages (see Table 2). It may be that our intervention only affected the sorting of households across different VSLAs (some of which are not part of our study).

Table 5: Vulnerability profile at baseline: preselected vs self-selected

VARIABLES	Disability in household	Drug abuse at home	Child labor	Orphaned child in hhld	Food insecure	Informal employment	Casual work
Preselected	0.098*	0.043*	0.138***	0.203**	0.167**	-0.108**	0.114***
	(0.050)	(0.024)	(0.042)	(0.078)	(0.080)	(0.051)	(0.042)
Dense	0.023	0.010	0.066**	0.061	0.045	-0.063*	0.046*
	(0.037)	(0.025)	(0.031)	(0.042)	(0.054)	(0.033)	(0.026)
Preselected X Dense	-0.034	0.039	-0.033	-0.092	-0.009	-0.066	-0.010
	(0.059)	(0.040)	(0.052)	(0.081)	(0.093)	(0.062)	(0.054)
Observations	2,735	2,470	2,469	2,474	2,686	2,741	2,741
R-squared	0.138	0.083	0.128	0.116	0.192	0.163	0.179

VARIABLES	Household unemployed	Safe source of water	Access to latrines	Assessor scale	Income per capita	Number of hhld members	Vulnerability index
Preselected	0.015	0.018	-0.113***	0.480***	-3,083***	0.153	0.702***
	(0.027)	(0.077)	(0.034)	(0.079)	(1,119)	(0.429)	(0.159)
Dense	0.024	0.103	-0.005	0.099	166	-0.242	0.278**
	(0.024)	(0.065)	(0.021)	(0.077)	(1,030)	(0.266)	(0.116)
Preselected X Dense	0.061	0.070	-0.006	-0.069	444	-0.236	0.066
	(0.041)	(0.096)	(0.061)	(0.114)	(1,749)	(0.446)	(0.215)
Observations	2,741	2,385	2,761	2,474	2,718	2,749	2,438
R-squared	0.124	0.358	0.120	0.161	0.132	0.038	0.213

Regressions on sample of VSLA participant households only (preselected plus self-selected) and including IP fixed effects. Sample of preselected interviewed prior to group formation; sample of self-selected interviewed after group formation. Quality diet is a numerical score (0-3) with one point assigned to each different category of food eaten by children in the household. Assessor scale is numerical score (0 to 3) of vulnerability based on the direct observation of the assessor. Higher values is more vulnerable. Total score is overall score of vulnerability. Higher values are more vulnerable. See Appendix A for all other definitions. Errors clustered at the village level in parentheses *** p<0.01, ** p<0.05, * p<0.1

groups adjust the rules in the following cycle.[23] In Table 6 we show that our intervention had no effect on the rules chosen by the groups, with the exception of a small difference in the proportion of groups that chose a share price of 1,000 UGX or above.

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[23] 45% of groups increased their share price in the subsequent cycle, which suggests that the share price chosen in year one may have been suboptimal. On the other hand, only 7% of groups adjusted the interest rate.

Table 6: Impact of the intervention on interest rate and share prices

VARIABLES	(1) Share Price (UGX)	(2) Share Price at least 1000	(3) Interest rate	(4) Interest rate at least 10%
Dense VSLA	38.507	0.142*	0.281	-0.068
	(70.712)	(0.083)	(0.570)	(0.057)
Constant	961.493***	0.858***	9.719***	1.068***
	(70.712)	(0.083)	(0.570)	(0.057)
Observations	116	116	116	116
R-squared	0.411	0.433	0.673	0.811

Table reports coefficients on dense treatment from group level regressions. Dependent variable is column title. Implementing partner fixed effects included. Heteroskedasticity-robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Aggregate savings, aggregate borrowings, return on savings and defaults Table 7 reports the estimation of coefficient α_g in equation (2), using data from wave I (panel A), wave II (panel B), and at share out (Panel C), where the outcomes of interest are aggregate cumulative savings and borrowings, rate of return on loans, and late repayment of loans. For each outcome variable, we report three separate specifications. Column 1 reports regressions without controls; column 2 includes implementing partner (IP) fixed effects and number of meetings at time of audit; and column 3 adds rules fixed effects. Our preferred specifications control for the IP and the number of meetings. This is because groups depend crucially on the expertise of the IPs to create groups, obtain proper training, choose interest rates and share values, ensure that meetings follow rules, and verify that accounts are kept correctly. We thus expect that savings and borrowing rates differ significantly across IPs. Our sample includes IPs with different capabilities and expertise in forming and managing groups, and our intervention is not balanced across IPs, which implies that IPs ability could be different across the two treatment arms. In addition, controlling for the number of meetings absorbs the variability in outcomes associated with different data collection times over the lending cycle.[24] Whether one should include share price and interest rate dummies in the regression is more debatable. On the one hand, the choice of rules may be considered as a channel through which the intervention affects group outcomes. In this case, it is best to exclude rule dummies and allow the dense variable to pick up the overall effect. On the other hand, including the dummies is necessary if one is interested in the effect of the intervention net of

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[24] The intervention did not systematically affect the number of meetings in the cycle.

the cost of borrowing. We report both sets of estimates, and note that, in general, estimates with rule dummies are more conservative.

Panel A shows that, shortly after groups are formed, there are no statistically significant differences in cumulative savings or lending between the two treatment arms. The result does not vary in the specification that excludes interest rate and price level controls (column 2) or includes them (column 3). This is not entirely surprising because the data were collected after, on average, four months of operation, and significant differences are not yet evident.

The situation is markedly different in the second wave of data collection (panel B). Looking at the last two columns, estimates indicate that dense groups accumulated over 400,000 UGX fewer savings, representing 19% of the 2.1 million UGX saved by sparse groups on average. They also disbursed almost 900,000 UGX less relative to sparse groups. While the coefficient on loans in column 3 is not precisely estimated (p-value: 0.126), the implied magnitude of this difference is large, being 27% of the 3.3 million UGX average cumulative lending in sparse groups.

Differences in cumulative savings and loans disbursed narrow remarkably by share out (panel C). Point estimates from column 2 indicate that dense groups accumulated 150,000 UGX fewer total savings (US$56, or 5.7% of the 2.6 million UGX average cumulative savings in dense groups). They also disbursed approximately 350,000 fewer shillings in loans (US$130, or 8.5% of the 4.1 million cumulative loans). Neither result is statistically significant. Controlling for IP, interest rates and prices (column 3), the coefficient estimates become even smaller, and differences in loans all but vanish. However, due to large confidence bands, we also cannot reject the possibility that our estimates are similar to those in panel B. The rest of panel C looks at other end-of-cycle outcomes. Return on savings earned at share out and a measure of default are similar across the two types of groups.[25]

In summary, differences in the composition of sparse and dense groups translated into differences in the ability to generate savings and provide loans to the groups members. These differences are more pronounced during the central part of the groups' operating cycle. The incentive to save (given by the return on savings and the probability of default of other members) is the same between the two types of groups.[26]

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[25] Return on savings is measured as $r\frac{B}{S}$, where r is the interest rate on loans, B is aggregate end-of-cycle borrowing and S is aggregate end-of-cycle savings. Default is measured at the individual member level, as as an indicator for whether the person failed to repay a loan completely by the end of the cycle.

[26] The result on defaults (which we proxy by the share of loans in arrears at the end of the cycle) is in contrast with Greaney et al. (2016), who argue theoretically that poorer people are more likely to default on their loans, and therefore groups composed of a larger fraction of poor households will have lower repayment rates.

Table 7: Impact of group composition on total group savings and lending amounts

Dep var: row title Coefficient on dense reported	(1)	(2)	(3)
Panel A: Wave I			
Cumulative savings	136,008	5,320	10,695
	(125,510)	(113,836)	(118,074)
Mean in sparse	998,108	998,108	998,108
Cumulative loans	248,178	-75,379	-70,100
	(262,756)	(201,632)	(204,994)
Mean in sparse	1,444,961	1,444,961	1,444,961
Number of groups	115	115	115
Panel B: Wave II			
Cumulative savings	98,315	-434,835*	-411,560*
	(190,389)	(237,704)	(241,299)
Mean in sparse	2,148,276	2,148,276	2,148,276
Cumulative loans	-522,022	-898,596*	-863,769
	(400,436)	(532,599)	(569,741)
Mean in sparse	3,307,929	3,307,929	3,307,929
Number of groups	102	102	102
Panel C: End of cycle			
Cumulative savings	1,515	-147,372	-111,116
	(195,773)	(207,185)	(200,480)
Mean in sparse	2,594,447	2,594,447	2,594,447
Cumulative loans	-342,564	-350,351	-85,379
	(450,878)	(506,318)	(491,213)
Mean in sparse	4,104,421	4,104,421	4,104,421
Return on savings	-0.976	-1.184	-0.633
	(1.269)	(1.159)	(1.063)
Has loans past due	0.009	0.006	0.005
	(0.006)	(0.009)	(0.011)
Number of groups	110	110	110
F-test results: wave II dense coefficient = end of cycle coeff			
Savings (p-value)	0.50	0.23	0.24
Loans (p-value)	0.75	0.31	0.19
N. meetings	NO	YES	YES
IP f.e.	NO	YES	YES
Rules f.e.	NO	NO	YES

Table reports coefficients on dense treatment from group level regressions, as in equation (2). Each cell is a separate regression. Cumulative savings and cumulative loans in UGX, aggregated from individual savings and loans after trimming top 1% of savings, loans and loan to savings ratios. Return on savings (panel C) calculated at shareout. Default regressions (Panel C) run at the individual (i.e., member of VSLA) level. "Has loans past due" is dummy for whether the participant failed to repay a loan in its entirety by shareout. Rules fixed effects include dummies for the interest rate and the share price. Number of groups differ in each wave because not all groups were audited in each wave. Heteroskedasticity robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

6.2 Individual savings and borrowing behavior

We next turn to the savings and borrowing decisions of study participants. Table 8 reports estimates of equation (3) on individual-level cumulative savings and cumulative loans of preselected participants. Because of random assignment, these estimates are the causal impact of assignment to a dense group on realized savings and borrowing. As in Table 7, we report three separate specifications: one with no controls, one with IP fixed effects and number of meetings, and one adding rule dummies. We focus our attention on the last two specifications.

Panel A reports savings and borrowing as recorded during the first audit wave. Assignment to a dense group has no effect on the savings decision of preselected members, but it does decrease their level of borrowing (14,000 fewer shillings, corresponding to $5.25, or 28% of average borrowing among preselected in sparse groups, significant at 10% level). By the second audit visit, differences are more evident, both on the saving and borrowing side. Cumulative savings (resp. cumulative borrowing) is 17,000 to 21,000 UGX (resp. 54,000 to 64,000 UGX) lower among those who were assigned to dense groups. These are large differences: a reduction in accumulated savings of 17,000 UGX (US$ 6.40) corresponds to 22% of mean savings in sparse groups, and a reduction in accumulated loans of 54,000 UGX (US$20.30) corresponds to 42% of mean cumulative loans in sparse groups.

Similarly to the aggregate results, the gap in individual savings and borrowing levels narrows significantly by share out. Controlling only for IP and dates, in dense groups cumulative savings are 15,400 UGX (US$5.80, or 16% of mean cumulative savings in dense groups) lower and cumulative borrowing is 42,750 UGX (US$16, or 28% of mean borrowing in dense groups) lower. When rules are taken into account, estimates fall by half and become significantly noisier. In this last case, we can reject that the coefficient on "cumulative loans" in panel C is the same as in panel B, which implies that preselected in dense "catch up" with preselected in sparse between wave II and share out.

Table 9 reports coefficient estimates from regressions (3) with other sets of end-of-cycle outcomes. Columns 1 and 2 report the loan-to-savings ratio and show that borrowers in dense groups may have more difficulty leveraging their savings. Columns 3 and 4 show that the intervention did not affect the decision to become a borrower, although it may have reduced the number of loans (columns 5 and 6) and not just the average size of those loans (columns 7 and 8). Columns 9 and 10 report the fraction of loans in arrears. As in the aggregate, we find no difference across types of groups in this measure. The last two

Table 8: Impact of group composition on savings and borrowing; Preselected only

Dep var: row title Coeff on dense reported	(1)	(2)	(3)
Panel A: Wave I			
Cumulative savings	5,509	-2,484	-2,404
	(6,512)	(4,131)	(4,084)
Observations	940	930	930
Mean outcome in sparse	33578	33578	33578
Cumulative loans	2,187	-14,439*	-13,871*
	(11,927)	(7,496)	(7,255)
Observations	942	932	932
Mean outcome in sparse	49201	49201	49201
Panel B: Wave II			
Cumulative savings	3,782	-21,139***	-17,617**
	(8,353)	(7,245)	(7,959)
Observations	839	805	805
Mean outcome in sparse	77322	77322	77322
Cumulative loans	-39,631*	-63,799***	-54,236***
	(19,912)	(14,047)	(14,938)
Observations	848	805	805
Mean outcome in sparse	129338	129338	129338
Panel C: End of cycle			
Cumulative savings	-2,109	-15,390**	-9,545
	(9,654)	(7,216)	(8,269)
Observations	897	897	897
Mean outcome in sparse	94613	94613	94613
Cumulative loans	-26,915	-42,750***	-20,149
	(20,878)	(12,506)	(21,898)
Observations	897	897	897
Mean outcome in sparse	152402	152402	152402
F-test results: wave II dense coefficient = end of cycle			
Savings (p-value)	0.48	0.63	0.31
Loans (p-value)	0.52	0.14	0.02
N. meetings	NO	YES	YES
IP f.e.	NO	YES	YES
Rules f.e.	NO	NO	YES

Regressions on the sample of preselected participants only. Each cell reports the coefficient on the assignment to a dense group. Dependent variables are in UGX. Rules fixed effects include interest rate and share price dummies. Errors clustered at the village level in parenthesis *** p<0.01, ** p<0.05, * p<0.1

columns construct a measure of the money received at share out (i.e. the share-out value),[27] finding that the average share out in dense groups is 17,625 UGX (US$6.25, or 16.2% of the average value) lower than in sparse groups. In general, we find that most results are sensitive to the inclusion of share price and interest rate, and after controlling for these rules one can conclude that performance at share out was no worse in dense groups than in sparse groups.

Finally, Table 10 replicates Table 8 using the sample of self-selected participants. Across all specifications and reporting periods, we see that neither savings nor borrowing levels differ significantly between self-selected members of sparse and dense groups. This result cannot be interpreted causally, because self-selected participants are by definition not subject to random assignment. It is, however, consistent with the idea that the effect of our intervention is stronger on the most vulnerable households.

6.3   Robustness tests and other results

We run a number of alternative specifications for tables 7 and 8 (see web appendix tables IV to IX). Results remain unchanged when the sample includes all SCORE beneficiaries or trimmed data, when we control for baseline characteristics or month of data collection (to control for seasonality), when we only consider IPs supervising both dense and sparse groups, when we only consider VSLAs for which we have three separate waves of data collection, when we exclude the two groups that set a high interest rate (20%), when using WLS to rebalance characteristics of preselected in dense and sparse.

We explore heterogeneity of impacts on borrowing and savings at share out in Table 11. Looking at the interaction term, we see that food insecure households see a larger drop in borrowing while households with disabilities save less when assigned to a dense group. At least along some dimensions of vulnerability, thus, the effect of the intervention is stronger on households who are more vulnerable. Finally, for certain categories of participants, the negative effect of inclusion in a dense rather than a sparse group on their borrowing levels is significant also at share out.

7   Mechanisms

Our empirical investigation can be summarized into three main points. First, our attempt to generate groups with different vulnerability profiles largely succeeded: members of dense

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[27] Our audit data do not contain direct measurement of share out. Our proxy for share out to individual i is constructed using the formula $(1 + r\frac{B}{S})s_i$, where s_i is total end-of-cycle savings for person i, B and S are aggregate borrowing and savings, and r is the interest on loans.

Table 9: Other individual outcomes within savings groups; Preselected only

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	Loan to savings ratio		Has at least one loan		Number of loans	
Dense VSLA	-0.215*	-0.132	-0.035	-0.021	-0.295*	-0.093
	(0.128)	(0.147)	(0.041)	(0.040)	(0.165)	(0.183)
Interest rate =5%		0.298		0.116***		0.979
		(0.377)		(0.030)		(0.711)
Interest rate =10%		-0.038		0.112**		1.279*
		(0.344)		(0.050)		(0.642)
Interest rate =20%		-0.691		0.068		-0.396
		(0.431)		(0.067)		(1.023)
Share =1,000 UGX		-0.123		-0.002		0.148
		(0.146)		(0.042)		(0.546)
Share =2,000 UGX		-0.406		0.193***		0.515
		(0.518)		(0.051)		(0.597)
Observations	896	896	896	896	844	844
R-squared	0.085	0.095	0.135	0.148	0.380	0.399
IP f.e.	YES	YES	YES	YES	YES	YES
Mean outcome in sparse	1.666	1.666	0.900	0.900	2.744	2.744

VARIABLES	(7)	(8)	(9)	(10)	(11)	(12)
	Average loan size		Has loans past due		Shareout value	
Dense VSLA	-15,398**	-8,412	-0.000	-0.000	-17,625**	-9,631
	(6,816)	(7,623)	(0.012)	(0.014)	(7,802)	(9,578)
Interest rate =5%		-15,912**		0.037*		29,868
		(7,607)		(0.021)		(23,668)
Interest rate =10%		-28,785***		0.014		49,629*
		(10,429)		(0.021)		(27,084)
Interest rate =20%		-110,925***		0.025		-41,678
		(17,506)		(0.049)		(29,922)
Share =1,000 UGX		5,635		-0.006		27,622***
		(9,072)		(0.006)		(8,312)
Share =2,000 UGX		32,090*		-0.021		84,984***
		(18,736)		(0.088)		(21,966)
Observations	754	754	917	917	897	897
R-squared	0.190	0.222	0.119	0.121	0.264	0.314
IP f.e.	YES	YES	YES	YES	YES	YES
Mean outcome in sparse	60534	60534	0.0157	0.0157	107,191	107,191

Individual regressions on the sample of preselected participants only using data from the last wave of group audit data. Column title is the dependent variable. All regressions estimated using OLS. Loan to savings ratio is cumulative loans divided by cumulative savings for each individual. Has one loan is an indicator variable equal to 1 if a person obtained one loan or more, and zero if the person never borrowed. Number of loans is cumulative number of individual loans. Average loan size is the cumulative loan divided by the number of loans. Has loan past due is an indicator variable equal to one if a person failed to repay all loans in their entirety by shareout. Shareout value is the estimated shareout value--see main text for the equation. All regressions include number of meetings And implementing partner fixed effects. Standard errors clustered at the village level in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 10: Impact of group composition on savings and borrowing; Self-selected only

Dep var: row title	(1)	(2)	(3)
Coeff on dense reported			
Panel A: Wave I			
Cumulative savings	7,429	-1,053	383
	(7,151)	(4,485)	(4,276)
Observations	2,122	2,106	2,106
Mean outcome in sparse	38684	38684	38684
Cumulative loans	17,716	-2,241	-1,000
	(14,857)	(7,653)	(7,747)
Observations	2,125	2,109	2,109
Mean outcome in sparse	55812	55812	55812
Panel B: Wave II			
Cumulative savings	6,670	-12,671	-8,212
	(9,773)	(9,662)	(9,748)
Observations	1,947	1,902	1,902
Mean outcome in sparse	82097	82097	82097
Cumulative loans	-6,944	-20,813	-16,974
	(20,069)	(22,660)	(24,265)
Observations	1,965	1,902	1,902
Mean outcome in sparse	123349	123349	123349
Panel C: End of cycle			
Cumulative savings	7,339	2,454	4,194
	(10,330)	(7,303)	(7,209)
Observations	2,000	2,000	2,000
Mean outcome in sparse	94784	94784	94784
Cumulative loans	4,610	8,895	16,608
	(22,296)	(16,369)	(18,851)
Observations	2,002	2,002	2,002
Mean outcome in sparse	148937	148937	148937
N. meetings	NO	YES	YES
IP f.e.	NO	YES	YES
Rules f.e.	NO	NO	YES

Regressions on the sample of preselected participants only. Each cell reports the coefficient on the assignment to a dense group. Dependent variables are in UGX. Rules fixed effects include interest rate and share price dummies. Errors clustered at the village level in parenthesis *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 11: Heterogeneous treatment effects; Preselected only

Dep var:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Cumulative savings (at shareout)					Cumulative loans (at shareout)				
Interaction variables:	Low income	Bad situation	Disability	Food insecure	Highly vulnerable	Low income	Bad situation	Disability	Food insecure	Highly vulnerable
Dense	-12,059	-9,796	-2,420	-7,697	-8,220	-16,689	-18,706	-14,478	11,181	-24,145
	(9,200)	(8,654)	(8,650)	(10,472)	(8,577)	(28,239)	(23,965)	(25,308)	(22,679)	(21,890)
Low income	-9,303					672.8				
	(5,976)					(18,331)				
Dense X low income	3,448					-11,926				
	(6,806)					(22,722)				
Bad situation		4,109					3,255			
		(8,846)					(18,530)			
bad situation		3,086					-5,754			
		(11,722)					(29,400)			
Disability			12,456					11,785		
			(8,981)					(24,136)		
Dense X			-22,295**					-15,999		
			(9,947)					(24,420)		
Food insecure				-1,721					18,744	
				(9,107)					(19,005)	
food insecure				-2,133					-41,743*	
				(10,853)					(24,842)	
Highly vulnerable					1,195					-5,179
					(5,153)					(21,194)
highly vulnerable					-2,757					8,556
					(6,628)					(28,576)
Observations	897	895	895	893	897	897	895	895	893	897
R-squared	0.293	0.290	0.296	0.292	0.290	0.219	0.218	0.219	0.223	0.218
P-value of F-test: Indicated vulnerability estimate=0 in dense groups										
	0.340	0.557	0.0127	0.294	0.248	0.115	0.319	0.184	0.240	0.607

Regressions on preselected participants only using end of cycle data. Controls include number of meetings in the cycle, IP fixed effects and rule dummies. Interaction variables are: below preselected median income (columns 1 and 7), being identified as living "in a bad situation" or "in a critical situation" by the assessor (columns 2 and 8), Having a disabled person in the household (columns 4 and 9) and scoring above median in the vulnerability index (columns 5 and 10). Other interaction variables presented in web appendix tables VIII and IX. Standard errors clustered at the village level in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

groups are, on average, more vulnerable than members of sparse groups. Second, dense groups accumulated savings and disbursed loans at a slower pace than sparse groups during the initial part of the cycle. Finally, being placed in a more vulnerable group caused randomly assigned vulnerable members to save and borrow less in the middle of the cycle. By some indications, they may have partially "caught up" by the end of the cycle. In this section, we provide a discussion of the possible mechanisms at play.

7.1   Scarcity of funds

One explanation that is consistent with the results presented so far is the presence of differential scarcity of funds between dense and sparse groups. More specifically, if preselected vulnerable households are more likely to be net borrowers than self-selected households, then dense groups generate fewer loanable funds. As a consequence, preselected members of dense groups are unable to fully meet their borrowing needs. Over time, because of the addition of new savings and the repayment of old loans, both types of groups generate sufficient funds to meet the demand for loans of its members. The difference between groups, as well as the difference in behavior between preselected in dense and sparse, thus may fade over time. Note also that differences in savings behavior in the two treatment arms cannot be explained by differences in the return on savings, because the return on savings is the same in dense and sparse groups (see Table 7). However, to the extent that a member of a VSLA needs to save before she can borrow, the fact that preselected in dense also save less compared to preselected in sparse may be driven by the fact that they expect to borrow less. This leads to an interesting amplification effect: expecting funds to be scarce, members decrease their level of savings, making funds scarcity even more severe.

Our results suggest that the burden of rationing may be shared unevenly among the groups members. The fact that self-selected members do not seem to react to increases in loanable funds suggests that they may be meeting their demand for loans in both types of groups.[28] On the other hand, preselected members react dramatically to a change in group's composition, implying they are rationed out when placed in dense groups. Note also that this effect is stronger for more vulnerable preselected. Overall, it seems that when funds are scarce, groups privilege less vulnerable households in their allocation of funds, and rationing affects disproportionately vulnerable members.[29]

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[28] A caveat applies because we do not control the process of self selection.

[29] This is consistent with the direct observation of the authors. Informal discussions with some VSLA members suggest that, in case of scarcity of funds, priority is given to individuals based on their cumulative savings with the group.

Importantly, our explanation relies on preselected vulnerable household being net borrowers relative to other group participants, so that when their number increases the degree of funds scarcity in a VSLA becomes more severe. We cannot test this hypothesis directly, because we do not observe the demand for loans of our study participants but only their *realized* borrowing—which is a function of their demand and the degree of scarcity. However, the lower the degree of scarcity, the closer realized demand will be to actual demand. If the degree of funds scarcity in sparse groups is sufficiently low, we should observe that the level of net borrowing (i.e. realized borrowing minus savings) of preselected on sparse groups is above that of the other members of their groups.

Table 12 provides evidence consistent with this. In this table we regress four measures of financial outcomes at share out (savings, borrowing, loan to savings ratio, and net borrowings) on the preselected indicator and savings group fixed effect. In sparse groups preselected net borrowing are positive and larger than that of self selected. In dense groups, where scarcity is more severe, the net borrowing of preselected and self selected are similar. To the extent that the self-selected satify their demands for loans in both types of groups, these observations are consistent with the latent demand for loans of preselected being larger than that of self-selected.

Another piece of evidence in support for this mechanism comes from the fact that there were some significant differences in satisfaction with the availability of loans across treatment arms. As part of our endline data collection, we asked respondents to report their satisfaction level with the functioning of their group. Table 13 estimates the difference in satisfaction between preselected members of dense and sparse groups. Relative to preselected members of sparse groups, preselected members of dense groups are significantly less likely to be satisfied of the amount borrowed by others (column 4). This is driven entirely by individuals who think that others were borrowing too much, rather than borrowing too little (columns 5 and 6), which is consistent with our preferred mechanism, i.e., preselected are rationed out of resources in dense groups. Preselected in dense also report being more satisfied than preselected in sparse relative to the way records are kept (column 1), but this result is not significant once we adjust the standard errors to account for multiple hypothesis testing. Overall, preselected in dense report a lower satisfaction that preselected in sparse. We can see that in column 11, which combines measures of satisfaction in one normalized index. On average, placement in a dense group reduces satisfaction by a large and significant 0.35 standard deviations.[30]

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[30] The precision of the result is driven by dissatisfaction with borrowing by others documented in columns 4-6. Interestingly, however, the coefficient estimate remains very similar (-0.30) if we exclude that measure

Table 12: Mechanisms: Net borrowing positions within groups

	(1)	(2)	(3)	(4)
Sample of preselected and self-selected	Savings (UGX)	Borrowing (UGX)	Loan to savings ratio	UGX Net borrowing (Loans- Savings)
A. All groups				
Preselected	-6,752**	-4,270	0.020	2,464
	(3,119)	(7,065)	(0.047)	(6,061)
Observations	2,897	2,899	2,896	2,897
B. Sparse groups only				
Preselected	-1,134	12,719*	0.088	13,821**
	(4,411)	(6,788)	(0.068)	(6,040)
	1,502	1,504	1,501	1,502
C. Dense groups only				
Preselected	-11,008***	-17,147	-0.031	-6,139
	(3,951)	(10,483)	(0.069)	(9,341)
	1,395	1,395	1,395	1,395
P-value of F-test: Coefficient in dense = Coefficient in sparse				
	0.0169	0.007	0.0961	0.0391
Mean for self-selected	97,750	150,798	1.642	53,032
VSLA f.e.	YES	YES	YES	YES

Each cell is the result of an OLS regression on preselected status dummy, inclusive of group fixed effects. All outcomes measured at endline. Errors clustered at the village level in parenthesis. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

7.2   Group cohesion

An alternative and plausible explanation is that our results are driven by differences in initial levels of social cohesion and trust within the group. For example, at first members may not be sure whether others will repay their loans, or whether the people in charge of keeping the safe will not to steal the money. Over time, they learn that their fellow members are trustworthy and start both saving and borrowing more. The speed at which they learn about their fellow members may be determined by the initial within-group social network structure. If fewer initial social connections exist in dense groups, trust may evolve more slowly there.

To check this possibility, we use data on initial social connections from a subsample of participants, and check whether social connections vary across treatment types. We thus estimate equation (1) on social connection variables: the number of relatives and neighbors

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from the index, although the p-value of the coefficient increases to 0.106. It should be noted that participants report extremely high levels of satisfaction (over 90% of participants reporting being neutral or satisfied) with all aspects of the group activities. It is possible that such high reported satisfaction is driven not only by the value attached to participation in group activities, but also by reporting bias which, if present, would attenuate estimated differences between dense and sparse towards zero.

Table 13: Self-reported measures of satisfaction with group; Preselected only at endline

Indicator variables for:	(1) Good Record quality	(2) Good Group attendance	(3) Amt saved by others	(4) Amt borrowed by others	(5) Others borrow too much	(6) Others borrow too little
			Respondent is satisfied with:		Respondent thinks that:	
Sample: Preselected in savings groups only						
dense	0.0575**	-0.0163	-0.0279	-0.0496***	0.0399**	0.00286
	(0.0265)	(0.0224)	(0.0224)	(0.0186)	(0.0180)	(0.00515)
Adjusted significance level	.	.	.	10%	No	No
Observations	731	733	727	729	729	729
R-squared	0.092	0.172	0.102	0.107	0.073	0.165
Mean of outcome in sparse	0.952	0.952	0.948	0.980	0.00	0.0195

Indicator variables for:	(7) Loan allocation	(8) Insurance allocation	(9) Own savings	(10) Expected more at shareout	(11) Index of satisfaction
	Respondent is satisfied with:				
Sample: Preselected in savings groups only					
dense	-0.0260	-0.0198	-0.0211	0.0118	-0.345**
	(0.0189)	(0.0194)	(0.0303)	(0.0512)	-0.147
Adjusted significance level	.	.	.	.	No
Observations	730	729	733	658	648
R-squared	0.131	0.099	0.168	0.195	0.233
Mean of outcome in sparse	0.957	0.983	0.899	0.288	-0.0302

Weighted least squares regression with attrition weights on preselected only. Each regression includes month of interview dummy and household controls (I.e. vulnerability variables). Dependent Variables:

Column 1 and 2: Indicator equal to 1 if respondent believed that records or attendance were satisfactory, and zero otherwise.

Columns 3, 4, 7, 8 and 9: indicators equal to one if respondent is "satisfied" or "neutral", and zero if respondent is "dissatisfied".

Columns 5 and 6: indicator is one if respondent was dissatisfied with amount borrowed by others and indicated that others borrowed too much or too little.

Column 10: Indicator equal to 1 if expected more money at shareout, 0 if expected less or same.

Column 11: index from principal component analysis of satisfaction indicators from columns 1, 2, 5, 6, 7 and an indicator for expecting the same or more at shareout. The index is normalized to have a mean of zero and a standard deviation of 1. Errors clustered at the village level in parenthesis.

Adjusted significance level uses Benjamini-Hochberg step-up method; family of regressors includes columns 1-4 and 7-10. Columns 5, 6 and 11 are unadjusted.

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

in the group (columns 1 and 2), and the number of participants who are visited at home, who are given advice, to whom advice is sought (columns 3-5).[31] Note that the first two measures are predetermined and time invariant: the fact that the information was collected after groups are formed is irrelevant. The latter set of measures, instead, may have been affected by the treatment in ambiguous ways. For instance, a person who has many friends in the savings group may report a large number of household visits, but so would a person who has few acquaintances and is trying to create them.

Tooking at the first two columns, of panel A, the coefficient on *Preselected* is negative and significant, indicating that the preselected have fewer baseline connections than self-selected. Coefficients on *Dense* indicates that there are differences in the connection between self-selected across treatments: those in dense groups are less likely to report having neighbors. This is consistent with them having fewer opportunities to join with acquaintances, as the number of slots available are fewer in dense groups. Finally, there do not appear to be significant differences in the number of relatives and acquaintances for the preselected. Panel B pools preselected and self selected from the same group. On average, members of dense groups report having fewer connections with other group members.

Does the fact that dense groups are less connected explain our main results? In Table 15 we replicate Table 8 while controlling for individual- and group-level measures of social connections. We first report the estimates of equation (3) (without social network regressors) in column 1. Treatment effects are similar to those in table 8. The remaining columns include socialization regressors. While significance levels differ, taken together, the regressions suggest that the initial social network structure of a group influences lending and borrowing in interesting ways. Borrowing and savings by preselected participants increase with the number of own connections, but decrease with the groups' average. This is consistent with a form of "competition for loans" in which personal connections allow members to borrow more, but less so if other group's members have a lot of personal connections as well.

Importantly, note that the inclusion of our measures of socialization have a very limited impact on the coefficient estimates on dense. Thus, while within-group social networks seem to be important in the allocation of loans and the savings decisions, it cannot explain the difference in behavior generated in our experiment.

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[31] The use of social connections data requires some caution, as the sample of respondents is not unbalanced across treatments. To partially address this problem, we run WLS using the predicted likelihood of being interviewed. See web appendix for a detailed description of the method and an explanation of how this approach does not completely eliminate the imbalance.

Table 14: Mechanisms: Social connections at baseline

Dep var: number of connections in group	(1) Relatives	(2) Neighbors	(3) Visits someone's home	(4) Seeks advice	(5) Gives advice	(6) At least one connection from columns 3-5	(7) At least one connection from columns 1-5
Panel A: Differences across group type and selection							
Preselected	-0.240*	-0.697***	-0.060	0.027	-0.053	-0.055	-0.133***
	(0.136)	(0.142)	(0.125)	(0.079)	(0.094)	(0.044)	(0.036)
Dense	-0.281	-0.564*	-0.170	-0.005	-0.093	-0.044	-0.028
	(0.175)	(0.312)	(0.146)	(0.088)	(0.105)	(0.059)	(0.040)
Preselected X Dense	0.149	0.371	0.305	0.061	0.114	0.089	0.010
	(0.204)	(0.222)	(0.183)	(0.115)	(0.129)	(0.065)	(0.050)
Observations	2,270	2,269	2,298	2,298	2,298	2,298	2,299
R-squared	0.135	0.100	0.163	0.146	0.105	0.201	0.174
Panel B: Difference by group type							
Dense VSLA	-0.290*	-0.627*	-0.008	0.043	-0.045	-0.012	-0.077*
	(0.152)	(0.314)	(0.134)	(0.073)	(0.083)	(0.054)	(0.041)
Observations	2,270	2,269	2,298	2,298	2,298	2,298	2,299
R-squared	0.133	0.091	0.158	0.144	0.104	0.200	0.152
Mean outcome in sparse	1.336	2.345	1.047	0.563	0.482	0.628	0.886

Regressions on sample of VSLA participants who were interviewed after group formation and inclusive of IP fixed effects. Observations weighted by the likelihood of being interviewed (see web appendix). Weighted means reported in last column. Errors clustered at the village level in parentheses.

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

7.3   Differences in the demand for loans

It is also possible that our intervention affected the demand for loans of preselected. For example, preselected in sparse groups may be more likely than those in dense groups to learn from a self-selected member how to run a business, and therefore are more likely to demand a loan to the group. Similarly, group participation may have an impact on the group members social network, and on the business opportunities available to them. These mechanisms, however, are hard to reconcile with the fact that the difference between the borrowing levels of preselected in sparse and dense disappears over time. They should operate during the entire cycle and, if anything, should become stronger the longer groups members interact with one another. Hence, while these mechanisms may affect the latent demand for loans, whether this demand is satisfied depends on the degree of funds scarcity.

Finally, members participating in other SCORE activities may act as a coalition and influence the groups' decision process. As a consequence, dense groups may operate in ways that are more favorable to vulnerable members. As discussed previously, the intervention had little effect on the rules adopted by the group. Furthermore, looking at loans usage data,

Table 15: Mechanisms: the role of social connections

Column titles are covariates: Number of average connections in		No social covariates	Neighbors	Relatives	Visits someone's home	Seeks advice	Gives advice
Panel A: Wave I							
Cumulative savings	Dense	-89	-298	-269	404	250	722
		(4,490)	(4,667)	(4,488)	(4,471)	(4,427)	(4,598)
	Average socialization	-250	-462	1,551	4,190	-287	
		(1,489)	(1,493)	(3,733)	(5,882)	(5,929)	
	Own socialization	152	8	405	184	1,581	
		(558)	(456)	(1,128)	(1,417)	(1,604)	
Cumulative loans	Dense	-17,700*	-22,830***	-19,717**	-17,036*	-18,391**	-16,706*
		(9,344)	(8,390)	(9,225)	(9,379)	(9,106)	(9,208)
	Average socialization	-6,703	-5,609*	-6,079	11,010	-487	
		(4,168)	(2,847)	(13,828)	(17,343)	(14,846)	
	Own socialization	1,892	1,119	-1,981	-2,245	7,872	
		(1,279)	(1,376)	(3,203)	(4,535)	(4,863)	
Panel B: Wave II							
Cumulative savings	Dense	-15,438	-11,754	-15,824	-15,331	-15,339	-16,497
		(12,348)	(11,254)	(12,347)	(12,306)	(12,031)	(12,100)
	Average socialization	3,871	-1,024	-19,686**	-9,718	-21,131	
		(3,892)	(2,797)	(8,676)	(16,568)	(12,765)	
	Own socialization	138	-457	675	3,672	3,930	
		(1,492)	(1,190)	(2,559)	(3,306)	(3,535)	
Cumulative loans	Dense	-62,744***	-63,406***	-70,427***	-63,877***	-66,234***	-64,147***
		(22,279)	(21,311)	(21,785)	(21,359)	(21,925)	(22,523)
	Average socialization	-1,147	-19,311**	-32,857*	-3,755	-7,660	
		(7,556)	(9,439)	(17,299)	(30,358)	(26,461)	
	Own socialization	2,137	3,070	2,806	17,010	17,961*	
		(2,341)	(2,904)	(6,722)	(11,483)	(10,418)	
Panel C: End of cycle							
Cumulative savings	Dense	-3,698	-5,825	-5,389	-3,542	-2,148	-4,637
		(9,689)	(9,998)	(9,628)	(9,743)	(9,612)	(9,787)
	Average socialization	-2,557	-4,158	-15,449*	-18,449	-25,681**	
		(3,028)	(3,200)	(7,917)	(13,098)	(10,911)	
	Own socialization	-364	-586	2,370	3,416	2,875	
		(1,323)	(1,252)	(2,144)	(3,013)	(2,967)	
Cumulative loans	Dense	-39,539	-46,485**	-43,106*	-39,586	-39,394*	-36,282
		(24,364)	(23,087)	(24,167)	(24,718)	(23,019)	(24,132)
	Average socialization	-11,054	-9,372	-32,794*	8,795	14,237	
		(8,424)	(7,837)	(19,115)	(33,142)	(33,987)	
	Own socialization	5,774**	3,586	673	17,440	15,590	
		(2,828)	(3,159)	(7,148)	(10,487)	(10,196)	

"Average socialization" is the weighted group-level average of "own socialization". Dates, IP, and rules controls included. All regressions estimated using WLS, with weights being the predicted probability of being interviewed with the social connections module. Standard errors clustered at the village level in parentheses. *** p<0.01, ** p<0.05, * p<0.1

we find no difference in the projects started by preselected in sparse and in dense. Because the group should agree with the purpose of each loan, this evidence again suggests that the fraction of vulnerable in a group does not affect the group's decisions.

8   Welfare effects

The final task of the study is to explore whether ultra-poor households fare better when they join less vulnerable savings groups. Whether this is the case is likely to depend on the mechanisms discussed above. In a sparse group, vulnerable households are better able to access loans when encountering shocks or investment opportunities. Sparse groups may also provide access to better social networks and more opportunities to be inspired or learn from successful peers. For all these reasons, our preselected participants assigned to sparse groups may report different outcomes—rates of business and household investment, consumption, labor supply—than those assigned to dense groups. We check whether this is the case by estimating equation (3) on endline households' characteristics, and report the results in Appendix B Tables B7 to B9. In each table, panel A reports estimates from the full sample of preselected, while panel B limits the sample to VSLA members only. In general, estimates in panel B are larger and more likely to be significant than those from panel A, consistent with treatment effects operating through participation in VSLAs.

Table B5 studies the effect of the intervention on households' investments. VSLA members enrolled in a dense group invested a lower amount in housing improvements during the previous year (column 1). On the other hand, the assignment to a dense group has no predictive power over investment in productive assets or activities such as farming (column 2), new microenterprises creation (column 3), or land cultivation (columns 6-8). While productive activities seem unaffected by the intervention, a potential benefit of joining a sparse group over a dense group is protection against unlikely but expensive shocks. In favor of this view, we find that members of dense groups are more likely to report having sold land in the previous year (column 5). Consistent with the view that the intervention did not spur increases in production, Table B6 reports regressions on weekly hours worked in the previous month and finds no differences in work hours or earnings between the two treatment arms. Table B7 finds no significant effect of the intervention on savings amounts or asset accumulation.

We also asked the respondents to explain whether members of their households participate in other social groups (Table B8). We find that group assignment did not have a differential effect on the probability of joining farm training programs (known locally as farmers field schools or FFS), women groups, financial groups such as ROSCAs, insurance groups, or other

types of social groups. On the other hand, those assigned to dense groups are significantly more likely to be members of other savings groups. This is consistent with the idea that preselected in dense groups are less able than preselected in sparse groups to meet their demand for loans, and respond by joining other VSLAs. Overall, social group participation outside of the study VSLA is not significantly more prevalent in either type of treatment group (column 7).

Finally, while our survey instrument lacked a consumption module, we had a food insecurity module (Table B9). Across the five measures of food insecurity, estimates are negative for participants of dense groups. However, all of these measures are insignificant.

Overall, the endline results paint a nuanced effect of the intervention. For the most part, being assigned to a dense rather than a sparse group has small but significant negative effects. Relative to preselected in dense groups, preselected in sparse groups were able to make additional investments in their housing structure, and perhaps avoided (relatively rare) dramatic events such as selling land. They are also less likely to participate in other VSLAs. We find no evidence that a "better" social group inspires ultra-poor participants to work more, to invest in productive activities, or to participate in other social groups (with the exception of other VSLAs).

It is important to keep in mind two things. First, the endline evaluation was done relatively shortly after groups were formed. It may therefore miss the impact of the intervention if the benefit from being in a less vulnerable group (i.e., less constrained access to loans, better social networks) take some time to fully realize. Second, the estimates presented here are differences between the two treatment arms, and tell us nothing about the benefit of participation into a savings group.

9   Conclusion

This paper shows that the ability of a savings group to provide credit to its members – especially those who are vulnerable – depends on its composition. Initially, demand for loans is likely to be larger than the availability of funds. Groups accumulate funds over time and may eventually able to meet this demand. However, the speed of funds accumulation (and the duration of rationing) depends on the composition of savings groups. Whenever the proportion of ultra-poor, vulnerable members of the group increases, fund scarcity increases, savings accumulation slows and the group is less able to meet demand for loans.

Our results open several questions and potential concerns. First, our study may suggest that groups composed exclusively of self-selected members are better able to satisfy the

demand for loans of their members. If this is the case, however, one concern is that fully self-selected groups may contain few ultra-poor vulnerable members, which would imply a trade off between financial inclusion of ultra-poor households and the well functioning of a savings group. On the brighter side, we also believe that, if such trade off exists, it can be made less stringent by improving the rules of functioning of a savings group. For example, savings groups could reward early savings, and/or auction off scarce funds (similarly to what is done in bidding ROSCAs), or obtain liquidity through bank loans. Addressing these questions and concerns is left for future work.

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A   Appendix: Vulnerability Measures

- Indicators that are specific to households with children:

    child labor: whether the child has been involved in child labor.

    drug abuse: whether the child ever been involved in drug consumption (petroleum sniffing, glue sniffing, etc).

    quality diet: child usually (i.e. at least 3 times a week) eats three categories of food: "energy food" (rich in carbohidrates); "bodybuilding food" (rich in protein), and "protective foods" (fruits and vegetables). Indicator is 0-3 scale, with one point assigned to each category.

    number of daily meals: "How many times does the child have meals in a day?"

    orphaned child in household: whether there is an orphan (maternal, paternal or both) in the household.

- Indicators that are relevant to all households:

    chronic disease: whether the child, any of the parents/guardians has a chronic disease (HIV/AIDS, sickle cells, Epilepsy, etc).

    disability: whether the child, any of the parents/guardians is deaf, blind or has other physical or mental disabilities.

    food insecure: "Are there times when your household goes without meals due to failure to get food?" answer is "yes".

    informal employment and casual labor: "What is your household's main source of income?" answer is "informal employment" or "casual labor"

    household unemployment: "What is your household's main source of income?" answer is "unemployed" or "remittances"

    safe source of water: "What is the main source of drinking water for members of your household?" answers are "Piped, bore-hole, harvesting" (coded as safe) and "surface" (coded as not safe).

    access to latrines: "Do you have Latrine facilities?" answers are "yes (private or shared)" and "no".

    income per capita: Self-reported household income divided by the number of household members.

    assessor scale: assessor's general impression of the household. Coded 0 ("good situation–can manage without support"), 1 ("fair situation–can be considered for support"), 2 ("Bad situation–should be considered for support") and 3 ("critical situation–eligible for support").

    household size: "How many people live in your household?"

    vulnerability index: First component of principal component analysis of: household disability, child labor, drug abuse at home, income per capita, food insecure, assessor scale, informal employed, not employed, access to latrines, household size.

B Appendix: Additional Tables

Table B1: Uses of VSLA loans and share out

Listed responses

	Loan use	% who used it		Shareout use	% who used it
1	Pay school fees or other educational expenses	44.15	1	Pay school fees or other educational expenses	39.1
2	Investment in existing business	15.01	2	Consumption	17.51
3	Health problem	13.61	3	Buy livestock	16.19
4	Consumption	11.83	4	Investment in existing business	10.79
5	Other temporary difficulties	7.63	5	Health problem	9.69
6	Buy farm input (fertilizer, seeds, etc.)	7.51	6	Buy household durable	9.03
7	Start new business	6.87	7	Repay an old debt	7.38
8	Repay an old debt	4.83	8	Buy farm input (fertilizer, seeds, etc.)	6.39
9	Buy household durable	4.07	9	Other temporary difficulties	5.51
10	Buy livestock	3.31	10	Start new business	4.41
11	Buy stock for resale	2.29	11	Home improvement, repair or construction	4.07
12	Home improvement, repair or construction	2.16	12	Acquire other durables	2.64
13	Marriage, funeral, other ceremony	2.16	13	Buy stock for resale	1.54
14	Buy or rent land	0.76	14	Marriage, funeral, other ceremony	1.1
15	Acquire other durables	0.64	15	Buy or rent land	1.1
16	Unemployment	0.38	16	Gift and loans to family, friends	0.44
17	Gift and loans to family, friends	0.13	17	Unemployment	0.44
18	Other	0.25	18	Other	2.09

Aggregate responses

internal: share out; external: loans

- ■ Any type of investment (Investment in existing business + buy farm input + start new business + buy livestock + buy stock for resale + buy or rent land)
- ■ Any type of shock (health problems + other temporary difficulties + unemployment)
- ■ Consumption (consumption + household durables + other durables)
- ■ Risk sharing (Marriage, funeral, other ceremony + gift and loans)
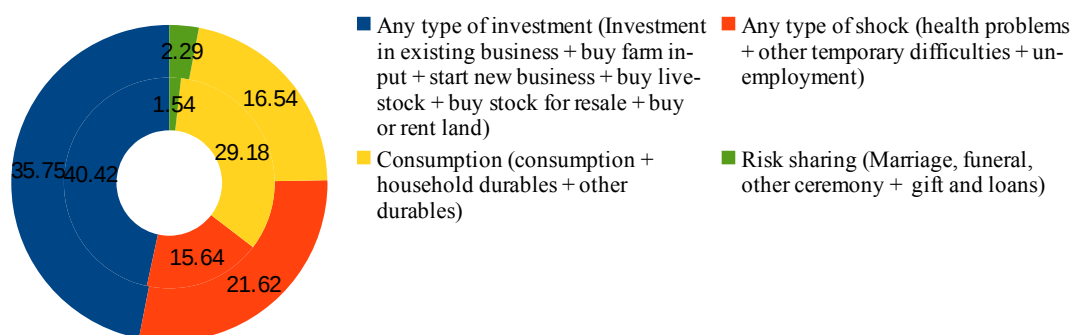
Table B2: Determinants of VSLA membership–Preselected only

Dep var: Enrolled in a study VSLA	(1)	(2)	(3)
Dense VSLA	0.0238		0.0285
	(0.0247)		(0.0248)
Child labor		-0.0497	-0.0520
		(0.0322)	(0.0322)
Drug abuse at home		0.0585	0.0547
		(0.0414)	(0.0415)
Chronic disease		0.0891**	0.0877**
		(0.0364)	(0.0363)
Disability in household		0.0220	0.0200
		(0.0338)	(0.0339)
Food insecure		0.0842***	0.0825***
		(0.0317)	(0.0315)
Quality diet		-0.0155	-0.0161
		(0.0160)	(0.0160)
Number of daily meals		-0.0106	-0.0111
		(0.0116)	(0.0116)
Informal employment		0.0612**	0.0650**
		(0.0288)	(0.0289)
Household unemployed		-0.000665	0.000510
		(0.0396)	(0.0394)
Orphaned child in hhld		0.0679**	0.0682**
		(0.0268)	(0.0268)
Access to latrines		-0.0521	-0.0535
		(0.0386)	(0.0385)
Income per capita		-2.86e-07	-1.68e-07
		(3.60e-06)	(3.61e-06)
Assessor scale		-0.0164	-0.0172
		(0.0303)	(0.0303)
Total vulnerability score		0.00103	0.00110
		(0.00201)	(0.00201)
HHMembers		0.0135	0.0133
		(0.00941)	(0.00940)
Vulnerability index		-0.0140	-0.0117
		(0.0427)	(0.0428)
Constant	0.771***	0.614***	0.597***
	(0.0202)	(0.167)	(0.167)
Observations	1,234	1,223	1,223
R-squared	0.001	0.044	0.045

Notes: Regression is linear probability model. Sample of preselected only. Heteroskedasticity-robust standard errors in parenthesis.
Results are robust to probit specification or inclusion of IP fixed effects.
*** p<0.01, ** p<0.05, * p<0.1

Table B3: Financial access in study villages after one year

VARIABLES	(1) Parish Population	(2) Number of SACCOS in parish	(3) SACCOs per 1000 people in parish	(4) Number of VSLAs in village	(5) Number of Non-SCORE VSLAs in village	(6) Number of SCORE VSLAs in village
Dense village	-964.3	0.0714	0.0184	-0.487	-0.103	-0.384
	(668.0)	(0.115)	(0.0437)	(0.577)	(0.548)	(0.250)
Constant	4,681***	0.250***	0.0750**	4.594***	2.406***	2.188***
	(526.0)	(0.0774)	(0.0302)	(0.419)	(0.400)	(0.187)
Observations	88	88	88	88	88	88
R-squared	0.023	0.004	0.002	0.007	0.000	0.024

Unit of observation in all regressions is the village. Parishes are the smallest administrative unit and are composed of multiple villages. Savings groups are counted within the village while other financial institutions like SACCOs are counted within the parish. SACCOs are local credit unions. Linerar regression results shown; results are robust to Poisson estimation. Heteroskedasticity-robust standard errors in parenthesis.
*** p<0.01, ** p<0.05, * p<0.1

Table B4: Vulnerability profile at baseline: beneficiaries vs non-beneficiaries

VARIABLES	Disability in household	Drug abuse at home	Child labor	Orphaned child in hhld	Food insecure	Informal employment	Casual work
Beneficiary	0.113**	0.052**	0.129***	0.232***	0.194**	-0.152**	0.136***
	(0.048)	(0.025)	(0.038)	(0.069)	(0.076)	(0.061)	(0.046)
Dense	0.022	0.012	0.059*	0.040	0.028	-0.038	0.030
	(0.039)	(0.025)	(0.035)	(0.044)	(0.062)	(0.038)	(0.029)
Beneficiary X Dense	-0.041	0.019	-0.022	-0.064	-0.002	-0.070	0.002
	(0.058)	(0.036)	(0.048)	(0.074)	(0.095)	(0.071)	(0.060)
Observations	2,735	2,470	2,469	2,474	2,686	2,741	2,741
R-squared	0.141	0.081	0.128	0.132	0.205	0.182	0.191
Mean dep. beneficiaries in sparse	0.260	0.00765	0.0459	0.271	0.485	0.791	0.0999

VARIABLES	Household unemployed	Safe source of water	Access to latrines	Assessor scale	Income per capita	Number of hhld members	Vulnerability index
Beneficiary	0.040	0.008	-0.116***	0.522***	-4,014***	0.272	0.887***
	(0.029)	(0.072)	(0.035)	(0.078)	(1,245)	(0.398)	(0.196)
Dense	0.013	0.085	-0.001	0.024	186	-0.196	0.163
	(0.029)	(0.067)	(0.025)	(0.089)	(1,196)	(0.288)	(0.142)
Beneficiary X Dense	0.055	0.091	0.000	0.013	977	-0.331	0.106
	(0.045)	(0.091)	(0.060)	(0.117)	(1,861)	(0.413)	(0.243)
Observations	2,741	2,385	2,761	2,474	2,718	2,749	2,438
R-squared	0.130	0.359	0.122	0.200	0.139	0.038	0.256
Mean dep. beneficiaries in sparse	0.0861	0.617	0.900	1.441	10386	6.430	-0.527

Regressions on sample of VSLA participant households only (preselected plus self-selected) and including IP fixed effects. Sample of preselected interviewed prior to group formation; sample of self-selected interviewed after group formation. Quality diet is a numerical score (0-3) with one point assigned to each different category of food eaten by children in the household. Assessor scale is numerical score (0 to 3) of vulnerability based on the direct observation of the assessor. Higher values is more vulnerable. Total score is overall score of vulnerability. Higher values are more vulnerable. See Appendix A for all other definitions. Errors clustered at the village level in parentheses *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table B5: Household investments at endline; Preselected only

VARIABLES	(1) investments in housing (UGX)	(2) investments in farming (UGX)	(3) Started new enterprise	(4) Purchased land	(5) Sold land	(6) Land cultivation last season	(7) Land cultivation this season	(8) Land cultivation change
Panel A: All preselected								
dense	-10,252	3,173	0.00279	-0.00486	0.0340**	0.0264	-0.00745	-0.0203
	(8,688)	(1,982)	(0.0274)	(0.0165)	(0.0142)	(0.131)	(0.152)	(0.0918)
Adjusted significance level					15%			
Observations	965	976	810	973	973	971	973	969
R-squared	0.058	0.090	0.158	0.061	0.082	0.259	0.303	0.131
Mean of outcome in sparse	19585	1600	0.131	0.0346	0.0131	1.189	1.205	0.0156
Panel B: Preselected in savings groups only								
dense	-27,539**	3,307	0.00141	-0.00640	0.0437**	0.0322	-0.0991	-0.118
	(11,038)	(2,259)	(0.0312)	(0.0156)	(0.0184)	(0.157)	(0.145)	(0.0835)
Adjusted significance level	10%				10%			
Observations	780	788	640	786	787	785	786	783
R-squared	0.073	0.106	0.159	0.072	0.112	0.283	0.325	0.145
Household controls	YES	YES	YES	YES	YES	YES	YES	YES
Mean of outcome in sparse	24567	1582	0.131	0.0243	0.0127	1.223	1.250	0.0275

Weighted least squares regression with attrition weights on preselected only. Each regression includes month of interview dummy. Household controls are vulnerability controls. All regressions with IP fixed effects.

Investment in housing is the total amount invested in housing materials over the value of 25,000 UGX in the previous 12 months. Farming investments include expenditures on chemical fertilizer, seeds, pesticides, or herbicides in the previous six months. Purchased and sold land: indicators for purchases or sales of land in the previous year. Started new enterprise: indicator for whether the household started a new business in the previous year. Land cultivation is measured in acres.

Errors clustered at the village level in parentheses. "Adjusted significance level" is the significance level after adjusting for multiple comparisons using the Benjamini-Hochberg step-up method, where regressions in columns 1-5 are one family and columns 6-8 is another family. We report only 1%, 5%, 10%, 15% adjusted significance levels.

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

Table B6: Household labor supply and income at endline; Preselected only

VARIABLES	(1) Indicator: Household works	(2) Log hours (Respondent)	(3) Log hours (Spouse)	(4) Log hours (Household)	(5) Per capita income
Panel A: All preselected					
dense	-0.00942	0.00554	-0.123	-0.00268	-1,279
	(0.0356)	(0.0768)	(0.149)	(0.0919)	(2,452)
Adjusted significance level					
Observations	851	625	394	673	639
R-squared	0.235	0.242	0.350	0.259	0.178
Mean of outcome in sparse	0.859	33.87	39.10	57.84	15032
Panel B: Preselected in savings groups only					
dense	0.0102	-0.0235	-0.0428	-0.0732	1,288
	(0.0441)	(0.0925)	(0.179)	(0.109)	(3,087)
Adjusted significance level					
Observations	665	473	309	512	484
R-squared	0.257	0.271	0.383	0.280	0.184
Household controls	YES	YES	YES	YES	YES
Mean of outcome in sparse	0.848	34.34	38.80	59.22	12913

Weighted least squares regression with attrition weights on preselected only. Each regression includes month of interview dummy. Household controls are vulnerability controls, plus age age squared and education level of respondent. Log hours and household income are as reported by main respondent. All regressions with IP fixed effects. "Adjusted significance level" is the significance level after adjusting for multiple comparisons using the Benjamini-Hochberg step-up method, with regressions from columns 1-5 are in the same regression family. We report only 1%, 5%, 10%, 15% adjusted significance levels. Errors clustered at the village level in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table B7: Household savings at endline; Preselected only

Dep. Var: forms of savings	(1) Formal financial account	(2) Mobile money account	(3) Other SGs	(4) Other type of group	(5) At home	(6) Value of total savings (UGX)	(7) Livestock index	(8) Asset index
Panel A: All preselected								
dense	-0.0574*	-0.0134	0.0350	0.0271	-0.0357	-5,633	0.186	0.270
	(0.0317)	(0.0423)	(0.0258)	(0.0427)	(0.0469)	(10,606)	(0.124)	(0.222)
Adjusted significance level							No	No
Observations	962	958	948	948	904	836	976	976
R-squared	0.182	0.130	0.221	0.276	0.264	0.075	0.183	0.184
Mean of outcome in sparse	0.138	0.181	0.108	0.208	0.319	27935	-0.118	-0.189
Panel B: Preselected in savings groups only								
dense	-0.0717*	-0.0208	0.0106	0.0498	-0.0231	-10,661	0.237	0.202
	(0.0377)	(0.0438)	(0.0218)	(0.0537)	(0.0566)	(12,759)	(0.144)	(0.253)
Adjusted significance level							No	No
Observations	774	773	763	763	722	684	788	788
R-squared	0.191	0.154	0.228	0.325	0.234	0.086	0.198	0.214
Individual controls	YES	YES	YES	YES	YES	YES	YES	YES
Mean of outcome in sparse	0.142	0.169	0.116	0.181	0.289	28403	-0.119	-0.238

Weighted least squares regression with attrition weights on preselected only. Each regression includes month of interview dummy. Household controls are vulnerability controls. Columns 1-5 are indicator variables for whether the household made a savings deposit in the account in the previous year. Savings amounts (column 6) computed from reported savings in bank accounts, mobile money accounts, savings group accounts, savings at home, and other sources. Livestock index is the first factor of a principal component analysis of 9 livestock variables. Asset index is the first factor of a principal component analysis of 24 household items owned by the household. All regressions with IP fixed effects. Errors are clustered at the village level. "Adjusted significance level" is the significance level after adjusting for multiple comparisons using the Benjamini-Hochberg step-up method, where regressions in columns 1-6 are in the same family of outcomes. We report only 1%, 5%, 10%, 15% adjusted significance levels. *** p<0.01, ** p<0.05, * p<0.1

Table B8: Household participation in external social groups

VARIABLES	(1) Score FFS	(2) non-Score FFS	(3) Women group	(4) Financial group	(5) VSLA nonscore	(6) Other group	(7) Any group
Panel A: All preselected							
dense	0.00816	-0.00140	0.000900	0.0492	0.0988***	0.0247	0.0999*
	(0.0339)	(0.0459)	(0.0349)	(0.0367)	(0.0343)	(0.0192)	(0.0574)
Adjusted significance level					5%		No
Observations	976	976	976	976	976	976	976
R-squared	0.127	0.114	0.164	0.346	0.199	0.125	0.209
Mean of outcome in sparse	0.0887	0.107	0.0907	0.188	0.100	0.0293	0.530
Panel B: Preselected in savings groups only							
dense	-0.0100	0.0143	-0.0505	0.0424	0.0990***	0.0204	0.0490
	(0.0406)	(0.0486)	(0.0441)	(0.0413)	(0.0285)	(0.0237)	(0.0631)
Adjusted significance level					1%		No
Observations	788	788	788	788	788	788	788
R-squared	0.137	0.129	0.205	0.395	0.227	0.127	0.221
Household controls	YES	YES	YES	YES	YES	YES	YES
Mean of outcome in sparse	0.0922	0.106	0.104	0.194	0.0922	0.0348	0.549

Weighted least squares regression with attrition weights on preselected only. Each regression includes month of interview dummy. Household controls are vulnerability variables. Dependent variables are indicators for whether a member of the household participantes in a social group. All regressions with IP fixed effects. "Adjusted significance level" is the significance level after adjusting for multiple comparisons using the Benjamini-Hochberg step-up method, with regressions from columns 1-6 in the same regression family. We report only 1%, 5%, 10%, 15% significance levels. Column 7 is unadjusted. Errors clustered at the village level in parenthesis. *** p<0.01, ** p<0.05, * p<0.1

Table B9: Household experience with food insecurity

VARIABLES	(1) Worried enough food	(2) Consumed limited variety	(3) Skipped meals	(4) Slept hungry	(5) Didn't eat for whole day
Panel A: All preselected					
dense	-0.0820	-0.0686	-0.0178	-0.0700	-0.00464
	(0.0558)	(0.0501)	(0.0470)	(0.0571)	(0.0508)
Adjusted significance level					
Observations	969	961	960	960	954
R-squared	0.197	0.191	0.164	0.187	0.166
Mean of outcome in sparse	0.704	0.700	0.622	0.316	0.186
Panel B: Preselected in savings groups only					
dense	-0.101	-0.0891	-0.0300	-0.110*	-0.0137
	(0.0609)	(0.0563)	(0.0558)	(0.0643)	(0.0550)
Adjusted significance level					
Observations	782	777	773	772	766
R-squared	0.215	0.215	0.179	0.205	0.181
Individual controls	YES	YES	YES	YES	YES
Mean of outcome in sparse	0.738	0.734	0.627	0.359	0.207

Weighted least squares regression with attrition weights on preselected only. Each regression includes month of interview dummy. Household controls are vulnerability variables. Dependent variables are indicators for whether members of the household experienced a food insecurity problem the preceding month. All regressions with IP fixed effects. "Adjusted significance level" is the significance level after adjusting for multiple comparisons using the Benjamini-Hochberg step-up method, with regressions from columns 1-5 in the same regression family. We report only 1%, 5%, 10%, 15% adjusted significance levels. Errors clustered at the village level in parenthesis.*** p<0.01, ** p<0.05, * p<0.1

C   Web Appendix (not for publication)

Social Connection Profile

At the time of the collection of the screening tool to community members, data collectors administered an additional baseline interview module. This module included the following questions on within-group social connections: the number of family members in the group; the number of neighbors (living within 5 minutes walking distance from the respondent's dwelling) in the group; the list of names (if any) of people whom they "seek advice from", "give advice to," and "visit at their home", and whether those mentioned were members of the group.

While all community participants responded to the social connections module at the time of the elicitation of their vulnerability profile, for budgetary reasons we could not collect the same information from all SCORE beneficiaries. We tracked and administered the additional module to seven SCORE beneficiaries from each group. Because there are more beneficiaries in dense than in sparse groups, we interviewed fewer participants in dense groups, and the sample is unbalanced (see Table II). We thus rebalance the sample by employing weighted least squares, as in DiNardo et al. (1996). This method is similar to inverse probability weights (see Imbens and Wooldridge, 2009) and is employed in other RCT studies to address attrition (e.g., Banerjee, Duflo, Glennerster et al., 2015).

Since the imbalance was driven by the lower likelihood of interviewing SCORE beneficiaries in dense groups, we generate predicted probabilities of not being interviewed using a program beneficiary indicator, the assignment to dense treatment indicator, and the interaction of the two (see table I). These are used as weights in a weighted least square (WLS) estimation model.[32] Table III reports results regarding within-groups social connection with and without reweighting.

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[32] Another approach would be to use weights created from a model that includes the vulnerability baseline variables; we tested the alternative approach and found that it was less successful in rebalancing the data.

Table I: Response to social network questions

Dep. Var: Group participant interviewed	Probit estimates
SCORE beneficiary	-0.005
	-0.107
Dense VSLA	0.264
	-0.182
SCORE beneficiary X Dense	-1.037***
	-0.163
Constant	0.696***
	-0.154
Observations	3216

Probit regressions on the sample of VSLA partici-pants. Dependent variable is equal to one if par-ticipant was interviewed after group formation, 0 otherwise. Errors clustered at the parish level in parenthesis. *** p<0.01, ** p<0.05, * p<0.1

Table II: Group composition–sample of respondents of social network questions

VARIABLES	Disability in household	Drug abuse at home	Child labor	Orphaned child in hhld	Food insecure	Informal employment	Casual work	Household unemployed	Safe source of water	Access to latrines	Assessor scale	Income per capita	Number of hhld members	Vulnerability index
Panel A: Unweighted regressions														
Preselected	0.113**	0.043**	0.141***	0.237***	0.201**	-0.078	0.111**	-0.010	0.039	-0.122***	0.500***	-3,562***	0.116	0.681***
	(0.054)	(0.018)	(0.047)	(0.076)	(0.087)	(0.047)	(0.043)	(0.017)	(0.081)	(0.038)	(0.082)	(1,175)	(0.463)	(0.169)
Dense	0.022	0.014	0.068*	0.059	0.014	-0.029	0.022	0.013	0.107*	0.024	0.055	-74	-0.117	0.114
	(0.038)	(0.026)	(0.035)	(0.042)	(0.061)	(0.033)	(0.024)	(0.027)	(0.061)	(0.018)	(0.079)	(994)	(0.251)	(0.125)
Preselected X Dense	-0.011	0.084*	-0.015	-0.151*	-0.012	-0.122*	0.036	0.081	0.048	-0.005	0.003	660	-0.245	0.292
	(0.064)	(0.047)	(0.061)	(0.079)	(0.103)	(0.071)	(0.059)	(0.053)	(0.098)	(0.058)	(0.122)	(1,921)	(0.495)	(0.240)
Observations	2,233	1,968	1,967	1,972	2,184	2,240	2,240	2,240	2,017	2,259	1,972	2,220	2,249	1,941
R-squared	0.140	0.106	0.149	0.109	0.206	0.173	0.192	0.138	0.353	0.113	0.182	0.148	0.043	0.222
Panel B: Weighted regressions														
Preselected	0.111**	0.041**	0.139***	0.233***	0.204**	-0.088*	0.115**	-0.005	0.046	-0.120***	0.507***	-3,611***	0.115	0.694***
	(0.054)	(0.018)	(0.047)	(0.076)	(0.087)	(0.048)	(0.044)	(0.018)	(0.081)	(0.037)	(0.082)	(1,170)	(0.456)	(0.170)
Dense	0.030	0.045	0.099**	0.146***	0.074	-0.064	0.067*	0.007	0.088	-0.010	0.155*	-243	-0.197	0.320**
	(0.049)	(0.041)	(0.042)	(0.049)	(0.059)	(0.043)	(0.038)	(0.034)	(0.071)	(0.025)	(0.092)	(1,285)	(0.313)	(0.158)
Preselected X Dense	-0.031	0.073	-0.032	-0.236***	-0.049	-0.066	0.003	0.055	0.019	0.001	-0.138	1,510	-0.312	0.041
	(0.064)	(0.045)	(0.060)	(0.083)	(0.099)	(0.068)	(0.060)	(0.046)	(0.099)	(0.057)	(0.116)	(1,775)	(0.488)	(0.238)
Observations	2,233	1,968	1,967	1,972	2,184	2,240	2,240	2,240	2,017	2,259	1,972	2,220	2,249	1,941
R-squared	0.146	0.150	0.167	0.123	0.208	0.186	0.187	0.140	0.372	0.135	0.159	0.121	0.052	0.227

Regressions on a restricted sample of VSLA participant households (preselected plus self-selected) who received in-depth interviews. This sample include all participants who were not direct beneficiaries, and a random sample of beneficiaries. Panel A: replicates Table 4 on restricted sample without weights. Panel B: sample weighted by likelihood of being interviewed. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table III: Social connections within the groups shortly after group formation

Dep var: number of connections in group	(1) Relatives	(2) Neighbors	(3) Visits someone's home	(4) Seeks advice	(5) Gives advice	(6) At least one connection from columns 3-5	(7) At least one connection from columns 1-5
Panel A: Differences across group type and selection							
Preselected	-0.240*	-0.697***	-0.060	0.027	-0.053	-0.055	-0.133***
	(0.136)	(0.142)	(0.125)	(0.079)	(0.094)	(0.044)	(0.036)
Dense	-0.281	-0.564*	-0.170	-0.005	-0.093	-0.044	-0.028
	(0.175)	(0.312)	(0.146)	(0.088)	(0.105)	(0.059)	(0.040)
Preselected X Dense	0.149	0.371	0.305	0.061	0.114	0.089	0.010
	(0.204)	(0.222)	(0.183)	(0.115)	(0.129)	(0.065)	(0.050)
Observations	2,270	2,269	2,298	2,298	2,298	2,298	2,299
R-squared	0.135	0.100	0.163	0.146	0.105	0.201	0.174
Panel B: Difference by group type							
Dense VSLA	-0.290*	-0.627*	-0.008	0.043	-0.045	-0.012	-0.077*
	(0.152)	(0.314)	(0.134)	(0.073)	(0.083)	(0.054)	(0.041)
Observations	2,270	2,269	2,298	2,298	2,298	2,298	2,299
R-squared	0.133	0.091	0.158	0.144	0.104	0.200	0.152
Mean outcome in sparse	1.336	2.345	1.047	0.563	0.482	0.628	0.886

Regressions on sample of VSLA participants who were interviewed after group formation and inclusive of IP fixed effects. Observations weighted by the likelihood of being interviewed (see main text). Weighted means reported in last column. Errors clustered at the village level in parentheses. *** p<0.01, ** p<0.05, * p<0.1

VSLA outcomes: Robustness checks

This section provides additional tables and robustness tests to the main regression tables in the text.

- Table IV reports alternative specifications of Table 7, with all outcome variables aggregated at the group level.

- Table V reproduces Table 8 using alternative samples.

- Table VI reproduces Table 8 using additional control variables.

- Table VII reproduces Table 8 but pools the second and third wave of data into a panel.

- Tables VIII and IX study heterogeneity outcomes for vulnerability variables not discussed in table 11 of main text.

Table IV: Impact of group composition on total group savings and lending amounts

	Ips dense and sparse		All 3 waves		Exclude 20% interest groups		Seasonality		Untrimmed	
Panel A: Wave I										
Cumulative savings	-753 (116,417)	-8,878 (120,179)	69,753 (96,733)	89,547 (99,497)	21,455 (117,498)	20,360 (120,247)	-11,965 (117,301)	-566 (122,055)	-123,631 (122,035)	-52,001 (118,198)
Cumulative loans	-86,571 (206,627)	-122,743 (205,672)	4,429 (181,030)	9,350 (173,426)	-45,473 (207,768)	-64,776 (207,315)	-172,296 (199,915)	-134,698 (209,513)	-217,731 (230,688)	-45,173 (255,776)
Number of groups	78	78	99	99	113	113	115	115	115	115
Panel B: Wave II										
Cumulative savings	-440,142* (235,309)	-399,442 (254,984)	-518,325** (244,177)	-491,610* (246,562)	-401,773 (242,908)	-411,560* (240,113)	-433,936* (238,648)	-413,237 (249,035)	-573,461** (266,662)	-375,419 (254,927)
Cumulative loans	-921,219* (525,009)	-905,090 (593,916)	-1,053,242** (522,821)	-1,022,045* (547,523)	-820,324 (537,867)	-863,769 (566,941)	-918,180* (538,387)	-937,845 (604,063)	-922,634 (668,154)	-708,141 (726,304)
Number of groups	74	74	98	98	101	101	102	102	102	102
Panel C: End of cycle										
Cumulative savings	-140,543 (203,898)	-88,012 (203,596)	-110,320 (213,570)	-61,542 (201,382)	-122,338 (204,266)	-139,006 (200,365)	-158,962 (204,677)	-118,354 (198,508)	-182,609 (262,455)	-45,811 (231,542)
Cumulative loans	-342,375 (497,645)	-159,539 (493,037)	-77,777 (512,477)	20,642 (510,183)	-45,732 (471,838)	-84,421 (493,448)	-306,547 (499,655)	-32,201 (483,653)	-525,061 (768,914)	-143,930 (729,555)
Return on savings	-1.144 (1.130)	-0.968 (1.069)	-0.480 (1.129)	-0.494 (1.145)	-1.018 (1.066)	-0.389 (1.061)	-1.034 (1.127)	-0.435 (1.045)	-2.441 (1.709)	-2.044 (1.699)
Defaults	0.006 (0.009)	0.006 (0.011)	0.009 (0.009)	0.013 (0.011)	0.006 (0.009)	0.005 (0.011)	0.052 (0.036)	0.069 (0.046)		
Number of groups	74	74	99	99	108	108	110	110	110	110
Date controls	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
IP f.e.	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Rules f.e.	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES

This table replicates the last two columns of Table 7 using various specifications. Columns 1 and 2 ("IPs dense and sparse"): exclude groups formed by IPs which only formed dense groups or sparse groups. Columns 3 and 4 ("All 3 waves"): includes only those groups with all three audits completed. Columns 5 and 6 ("Exclude 20% groups"): drops two groups that had a high interest rate on internal loans (20%). Columns 7 and 8 ("Seasonality"): includes a dummy variable for the audit month to correct for seasonality. Column 9 and 10 ("Untrimmed"): does not trim the top 1% of reported savings, loans and loans to savings ratios. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table V: Impact of composition on preselected–alternative sample specifications

	Sample of all SCORE		IPs dense and sparse		All 3 waves		Exclude 20% interest groups		Untrimmed	
Panel A: Wave I										
Cumulative	-1,125	-626	-2,608	-3,501	435	917	-1,689	-1,328	-4,864	-3,693
savings	(3,943)	(3,825)	(4,331)	(4,176)	(3,459)	(3,158)	(4,170)	(3,937)	(4,466)	(4,232)
Observations	1,136	1,136	572	572	803	803	905	905	944	944
Cumulative	-8,934	-7,877	-13,913*	-15,734**	-12,637*	-10,631*	-13,384*	-12,130	-19,143***	-13,393*
loans	(8,852)	(8,028)	(7,806)	(7,451)	(6,487)	(5,937)	(7,724)	(7,522)	(6,853)	(7,802)
Observations	1,138	1,138	574	574	804	804	906	906	946	946
Panel B: Wave II										
Cumulative	-16,406**	-13,893	-21,620***	-18,538**	-23,014***	-19,133**	-18,865**	-17,617**	-26,289***	-19,973**
savings	(7,952)	(8,479)	(7,343)	(8,264)	(7,356)	(8,110)	(7,647)	(7,956)	(8,038)	(8,267)
Observations	995	995	533	533	786	786	791	791	825	825
Cumulative	-42,529**	-34,112	-64,249***	-57,717***	-64,708***	-56,219***	-59,741***	-54,236***	-78,738***	-65,642***
loans	(21,132)	(21,597)	(13,988)	(15,028)	(13,966)	(14,927)	(13,884)	(14,933)	(18,715)	(21,336)
Observations	995	995	533	533	786	786	791	791	825	825
Panel C: End of cycle										
Cumulative	-9,199	-5,124	-15,438**	-10,087	-13,786**	-7,784	-12,238	-10,431	-15,188*	-7,548
savings	(5,898)	(6,984)	(7,268)	(8,776)	(6,649)	(7,775)	(8,903)	(7,943)	(8,821)	(10,117)
Observations	1,080	1,080	540	540	791	791	869	869	918	918
Cumulative	-31,237*	-13,533	-42,923***	-26,098	-30,471**	-13,559	-24,610	-18,380	-55,457***	-31,454
loans	(16,206)	(22,019)	(12,718)	(23,751)	(15,083)	(23,104)	(21,811)	(23,138)	(17,583)	(23,268)
Observations	1,080	1,080	540	540	791	791	869	869	918	918
N. Meetings	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
IP f.e.	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Rules f.e.	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES

Table replicates last two columns of Table 8 using alternative samples. Columns 1 and 2 ("Sample of all SCORE"): include preselected and self-selected that were enrolled subsequently to replace dropout preselected. Columns 3 and 4 ("IPs dense and sparse"): exclude groups formed by IPs which only formed dense groups or sparse groups. Columns 5 and 6 ("All 3 waves"): includes only those groups with all three audits completed. Columns 7 and 8 ("Exclude 20% groups"): drops two groups that had a high interest rate on internal loans (20%). Columns 9 and 10("Untrimmed"): does not trim the top 1% of reported savings, loans and loans to savings ratios. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table VI: Impact of composition on preselected–alternative controls

	Seasonality		Vulnerability baseline controls		WLS	
Panel A: Wave I						
Cumulative	-2,578	-2,216	-2,909	-2,632	-1,710	-779
savings	(4,221)	(4,020)	(4,087)	(4,036)	(4,072)	(3,814)
Observations	930	930	919	919	918	918
Cumulative	-16,369**	-14,078*	-13,710*	-13,037*	-18,044**	-13,800*
loans	(7,012)	(7,296)	(7,116)	(7,050)	(7,145)	(7,505)
Observations	932	932	921	921	920	920
Panel B: Wave II						
Cumulative	-21,186***	-15,171*	-20,489***	-16,343**	-22,323***	-19,336**
savings	(7,341)	(8,082)	(6,932)	(7,828)	(7,945)	(8,845)
Observations	805	805	796	796	795	795
Cumulative	-66,791***	53,321***	-61,849***	-52,216***	-57,840***	-45,172**
loans	(14,771)	(14,634)	(13,791)	(15,352)	(17,661)	(18,219)
Observations	805	805	796	796	795	795
Panel C: End of cycle						
Cumulative	-13,736*	-8,521	-15,211*	-8,559	-14,089*	-10,721
savings	(7,421)	(8,412)	(7,632)	(8,562)	(7,356)	(8,078)
Observations	897	897	885	885	884	884
Cumulative	-39,565***	-18,006	-39,157**	-17,442	-27,646*	-11,672
loans	(12,747)	(22,145)	(15,904)	(22,817)	(13,846)	(20,661)
Observations	897	897	885	885	884	884
N. meetings	YES	YES	YES	YES	YES	YES
IP f.e.	YES	YES	YES	YES	YES	YES
Rules f.e.	NO	YES	NO	YES	NO	YES

Table replicates last two columns of Table 8 with alternative sets of control variables. Columns 1 and 2 ("Seasonality"): Adds month of audit fixed effects. Columns 3 and 4 ("Vulnerability baseline controls"): adds the vulnerability measures for each participant as controls; Columns 5 and 6 ("WLS"): Weighted least squares, with inverse probability weights derived from a regression of vulnerability baseline controls on the likelihood that the preselected joined the savings group. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table VII: Panel estimates (wave 2 and 3) of the impact of composition on savings and borrowing

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Savings (preselected)			Loan Amounts (preselected)			Group savings			Group lending		
Dense	4,856	-17,492***	-13,311*	-37,714*	-66,356***	-53,198***	129,653	-324,777	-293,854	-470,479	-925,895**	-825,171*
	(8,477)	(6,492)	(7,258)	(20,010)	(14,093)	(15,691)	(191,011)	(198,347)	(192,850)	(400,333)	(437,434)	(451,380)
End of cycle	17,291***	5,222	6,854	23,064***	-4,294	-6,235	446,172**	63,339	85,243	796,492*	-24,988	-55,114
	(4,245)	(6,404)	(5,762)	(7,143)	(11,203)	(11,784)	(199,967)	(201,350)	(208,649)	(404,137)	(438,955)	(444,222)
Dense X End	-6,965	322	335	10,799	21,437	24,904*	-128,138	95,301	101,125	127,915	522,942	611,626
of Cycle	(7,033)	(6,484)	(6,120)	(12,212)	(13,353)	(14,312)	(273,537)	(237,083)	(230,063)	(603,000)	(530,229)	(513,160)
Observations	1,741	1,707	1,707	1,750	1,707	1,707	217	213	213	217	213	213
Date controls	NO	YES	YES	NO	YES	YES	NO	YES	YES	NO	YES	YES
IP f.e.	NO	YES	YES	NO	YES	YES	NO	YES	YES	NO	YES	YES
Rules f.e.	NO	NO	YES	NO	NO	YES	NO	NO	YES	NO	NO	YES

Panel of preselected in cycle 2 and 3. See notes on Table V. Errors clustered at village level in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table VIII: Heterogeneous treatment effects (Savings): additional interaction terms

VARIABLES	(1) Drug abuse	(2) Child labor	(3) Orphan in hhld	(4) Informal employment	(5) Casual work	(6) Hhld unemployed	(7) Safe source of water	(8) Access to latrines	(9) Hhld size below median
Dense	-7,392	-4,407	-11,520	-14,264	-2,347	-10,844	-21,693	-9,030	-7,323
	(8,592)	(8,868)	(9,063)	(10,460)	(8,710)	(7,762)	(17,087)	(10,534)	(9,479)
Drug abuse	25,094								
	(23,313)								
Dense X drug abuse	-24,755								
	(25,063)								
Child labor		19,971**							
		(9,926)							
Dense X child labor		-20,856							
		(12,484)							
Orphan hhld			-6,963						
			(8,787)						
Dense X orphan hhld			8,016						
			(10,812)						
Informal employment				-902.8					
				(7,476)					
Dense X informal				9,398					
				(9,413)					
Casual work					3,574				
					(7,880)				
Dense X casual work					-21,456**				
					(9,952)				
Hhld unemployed						-4,196			
						(9,401)			
Dense X hhld unemployed						13,778			
						(11,978)			
Safe source of water							-11,489		
							(13,241)		
Dense X safe water							9,794		
							(18,634)		
Access to latrines								5,936	
								(4,990)	
Dense X access to latrines								-541.6	
								(7,532)	
Hhld size below median									-4,196
									(7,337)
Dense X hhld size below									-4,729
									(8,915)
Observations	894	895	895	893	893	893	639	895	897
R-squared	0.292	0.294	0.290	0.293	0.300	0.292	0.331	0.290	0.293
P-value of F-test: Indicated vulnerability =0 in dense groups									
	0.181	0.0355	0.754	0.589	0.0155	0.825	0.220	0.258	0.183

Table IX: Heterogeneous treatment effects (Loans): additional interaction terms

VARIABLES	(10) Drug abuse	(11) Child labor	(12) Orphan in hhld	(13) Informal employment	(14) Casual work	(15) Hhld unemployed	(16) Safe source of water	(17) Access to latrines	(18) Hhld size below median
Dense	-12,264	-17,131	-26,974	-5,767	-8,185	-28,284	-51,896*	-12,320	-26,847
	(22,413)	(23,458)	(22,953)	(31,171)	(24,155)	(18,359)	(30,809)	(22,186)	(26,798)
Drug abuse	65,041								
	(64,962)								
Dense X drug abuse	-95,340								
	(65,926)								
Child labor		12,895							
		(23,526)							
Dense X child labor		-8,791							
		(27,235)							
Orphan hhld			-34,995***						
			(13,085)						
Dense X orphan hhld			24,447						
			(16,423)						
Informal employment				33,748					
				(20,299)					
Dense X informal				-15,492					
				(29,269)					
Casual work					-14,410				
					(16,746)				
Dense X casual work					-29,591				
					(23,143)				
Hhld unemployed						-47,232*			
						(23,795)			
Dense X hhld unemployed						83,868**			
						(31,692)			
Safe source of water							-30,212		
							(21,883)		
Dense X safe water							16,682		
							(30,910)		
Access to latrines								18,284	
								(25,620)	
Dense X access to latrines								-9,838	
								(26,250)	
Hhld size below median									-44,346***
									(13,701)
Dense X hhld size below									22,684
									(20,186)
Observations	894	895	895	893	893	893	639	895	897
R-squared	0.223	0.219	0.222	0.225	0.229	0.227	0.252	0.219	0.226
P-value of F-test: Indicated vulnerability =0 in dense groups									
	0.0871	0.367	0.924	0.356	0.0951	0.151	0.0887	0.391	0.833

Endline tables

In the main text, we use the baseline characteristics to generate predicted probabilities of not being found in the endline, and use these as weights in a weighted least square (WLS) estimation model. Table X shows that the probability of being interviewed at endline is correlated with baseline characteristics. Here we report the OLS endline results using unweighted regressions (OLS). For each outcome, we also report specifications without individual baseline controls and without IP fixed effects.

Table X: Endline attrition; Preselected only

Dep var: Household completed endline questionnaire	(1)	(2)	(3)
Assigned to Dense VSLA	-0.0196		-0.0318
	(0.0461)		(0.0437)
Child labor		-0.00960	-0.00703
		(0.0357)	(0.0363)
Drug abuse at home		0.0296	0.0342
		(0.0732)	(0.0721)
Chronic disease		0.0950**	0.0969**
		(0.0415)	(0.0413)
Child with disability		0.0240	0.0253
		(0.0347)	(0.0346)
Food insecure		0.0713	0.0731
		(0.0460)	(0.0456)
Quality diet		0.0101	0.0107
		(0.0238)	(0.0238)
Number of daily meals		0.0229	0.0236
		(0.0228)	(0.0226)
Informal employment		-0.00564	-0.0102
		(0.0361)	(0.0368)
Household unemployed		0.0482	0.0469
		(0.0568)	(0.0570)
Orphaned child in hhld		0.106***	0.106***
		(0.0291)	(0.0289)
Disabled child guardian		0.0381	0.0396
		(0.0361)	(0.0360)
Access to latrines		0.116**	0.116**
		(0.0482)	(0.0478)
Enumerator assessment: good/fair situation		0.000905	0.00268
		(0.0375)	(0.0383)
Total vulnerability score		-0.00428	-0.00437
		(0.00290)	(0.00289)
Monthly income		-4.85e-07	-4.79e-07
		(3.53e-07)	(3.48e-07)
Constant	0.783***	0.767***	0.789***
	(0.0346)	(0.192)	(0.193)
Observations	1,277	1,268	1,268
R-squared	0.000	0.044	0.045

Table reports outcomes from a linear probability model. Data on preselected only. Errors clustered at the village level in parenthesis.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table XI: Endline unweighted regressions: Savings

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		Bank account			Mobile money account			Bank or mobile account			Other SBG	
Panel A: Full sample												
dense	-0.0404	-0.0422	-0.0693*	0.0159	-0.00384	-0.0311	-0.0201	-0.0318	-0.0733	0.0375	0.0555	0.0435
	(0.0345)	(0.0322)	(0.0350)	(0.0394)	(0.0339)	(0.0382)	(0.0476)	(0.0448)	(0.0484)	(0.0415)	(0.0444)	(0.0382)
Observations	969	840	840	965	837	837	983	851	851	955	827	827
R-squared	0.019	0.124	0.212	0.036	0.144	0.228	0.012	0.129	0.235	0.034	0.063	0.213
Mean of outcome in sparse	0.130	0.130	0.130	0.200	0.200	0.200	0.284	0.284	0.284	0.117	0.117	0.117
Panel B: Sample of SBG members												
dense	-0.0482	-0.0552	-0.101**	0.0132	0.00244	-0.0396	-0.0262	-0.0362	-0.106*	-0.000782	0.0236	0.0194
	(0.0402)	(0.0377)	(0.0424)	(0.0426)	(0.0366)	(0.0404)	(0.0541)	(0.0515)	(0.0568)	(0.0440)	(0.0457)	(0.0327)
Observations	781	654	654	780	654	654	795	665	665	770	644	644
R-squared	0.019	0.121	0.218	0.043	0.161	0.257	0.014	0.135	0.251	0.036	0.089	0.214
Individual controls	NO	YES	YES	NO	YES	YES	NO	YES	YES	NO	YES	YES
IP fixed effects	NO	NO	YES	NO	NO	YES	NO	NO	YES	NO	NO	YES
Mean of outcome in sparse	0.140	0.140	0.140	0.199	0.199	0.199	0.295	0.295	0.295	0.123	0.123	0.123

	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
		Other type of group			At home			Value of total savings (UGX)	
Panel A: Full sample									
dense	-0.0113	-0.00163	0.0341	0.0782	0.0979*	0.0325	-17,126	13,768	-267.7
	(0.0482)	(0.0474)	(0.0463)	(0.0579)	(0.0561)	(0.0439)	(23,992)	(10,864)	(10,038)
Observations	955	827	827	910	796	796	843	724	724
R-squared	0.093	0.148	0.282	0.023	0.090	0.282	0.012	0.083	0.125
Mean of outcome in sparse	0.202	0.202	0.202	0.298	0.298	0.298	44817	44817	44817
Panel B: Sample of SBG members									
dense	-4.84e-05	0.0162	0.0653	0.110*	0.141**	0.0815	-24,720	12,521	-4,560
	(0.0493)	(0.0533)	(0.0592)	(0.0566)	(0.0574)	(0.0501)	(29,424)	(12,253)	(11,844)
Observations	770	644	644	728	616	616	691	574	574
R-squared	0.119	0.190	0.339	0.026	0.086	0.271	0.014	0.088	0.136
Individual controls	NO	YES	YES	NO	YES	YES	NO	YES	YES
IP fixed effects	NO	NO	YES	NO	NO	YES	NO	NO	YES
Mean of outcome in sparse	0.175	0.175	0.175	0.250	0.250	0.250	50039	50039	50039

Unweighted regressions from Table B7. See that table for details.

Table XII: Endline unweighted regressions: Participation in social groups

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		Score FFS			non-Score FFS			Women group			Financial group	
VARIABLES												
Panel A: Full sample												
dense	0.00580	0.000861	0.0108	-0.0219	-0.0403	-0.0105	-0.00306	-0.00631	0.00620	0.00531	0.00688	0.0450
	(0.0363)	(0.0419)	(0.0429)	(0.0358)	(0.0410)	(0.0501)	(0.0346)	(0.0367)	(0.0416)	(0.0571)	(0.0653)	(0.0454)
Observations	983	851	851	983	851	851	983	851	851	983	851	851
R-squared	0.009	0.040	0.155	0.008	0.036	0.103	0.017	0.070	0.163	0.074	0.163	0.416
Mean of outcome in sparse	0.0974	0.0974	0.0974	0.0974	0.0974	0.0974	0.0974	0.0974	0.0974	0.0974	0.0974	0.0974
Panel B: Sample of SBG members												
dense	-0.0107	-0.0166	-0.0234	-0.0207	-0.0444	-0.00450	-0.0268	-0.0415	-0.0393	-0.0179	-0.0177	0.0302
	(0.0369)	(0.0447)	(0.0552)	(0.0358)	(0.0408)	(0.0553)	(0.0380)	(0.0422)	(0.0525)	(0.0617)	(0.0700)	(0.0478)
Observations	795	665	665	795	665	665	795	665	665	795	665	665
R-squared	0.011	0.048	0.161	0.012	0.052	0.129	0.026	0.098	0.213	0.108	0.214	0.496
Individual controls	NO	YES	YES	NO	YES	YES	NO	YES	YES	NO	YES	YES
IP fixed effects	NO	NO	YES	NO	NO	YES	NO	NO	YES	NO	NO	YES
Mean of outcome in sparse	0.0945	0.0945	0.0945	0.0945	0.0945	0.0945	0.0945	0.0945	0.0945	0.0945	0.0945	0.0945

	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
		VSLA nonscore			Other group			Any group	
VARIABLES									
Panel A: Full sample									
dense	0.0579	0.0546	0.0781*	6.37e-05	0.0115	0.0294	-0.0142	-0.0341	0.0600
	(0.0386)	(0.0401)	(0.0429)	(0.0173)	(0.0155)	(0.0182)	(0.0576)	(0.0620)	(0.0619)
Observations	983	851	851	983	851	851	983	851	851
R-squared	0.032	0.063	0.202	0.031	0.075	0.117	0.059	0.104	0.215
Mean of outcome in sparse	0.0974	0.0974	0.0974	0.0974	0.0974	0.0974	0.0974	0.0974	0.0974
Panel B: Sample of SBG members									
dense	0.0355	0.0427	0.0751**	-0.0130	0.00526	0.0230	-0.0744	-0.0977	-0.00330
	(0.0412)	(0.0436)	(0.0368)	(0.0179)	(0.0154)	(0.0177)	(0.0555)	(0.0601)	(0.0625)
Observations	795	665	665	795	665	665	795	665	665
R-squared	0.033	0.079	0.214	0.036	0.065	0.111	0.077	0.145	0.239
Individual controls	NO	YES	YES	NO	YES	YES	NO	YES	YES
IP fixed effects	NO	NO	YES	NO	NO	YES	NO	NO	YES
Mean of outcome in sparse	0.0945	0.0945	0.0945	0.0945	0.0945	0.0945	0.0945	0.0945	0.0945

Unweighted regressions from Table B8. See that table for details.

Table XIII: Endline unweighted regressions: Land cultivation

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Land cultivation last season			Land cultivation this season			Land cultivation change		
Panel A: Full sample									
dense	-0.0662	0.0146	0.0189	-0.217	-0.181	-0.0594	-0.152**	-0.188**	-0.0563
	(0.186)	(0.172)	(0.131)	(0.194)	(0.188)	(0.162)	(0.0722)	(0.0903)	(0.0934)
Observations	978	846	846	980	848	848	976	844	844
R-squared	0.036	0.113	0.322	0.025	0.092	0.356	0.030	0.066	0.159
Mean of outcome in sparse	1.153	1.153	1.153	1.163	1.163	1.163	0.00948	0.00948	0.00948
Panel B: Sample of SBG members									
dense	-0.0632	-0.0177	0.0224	-0.248	-0.275	-0.161	-0.189**	-0.252***	-0.160*
	(0.219)	(0.206)	(0.142)	(0.220)	(0.214)	(0.140)	(0.0734)	(0.0944)	(0.0831)
Observations	792	662	662	793	663	663	790	660	660
R-squared	0.050	0.121	0.352	0.037	0.117	0.392	0.043	0.091	0.171
Individual controls	NO	YES	YES	NO	YES	YES	NO	YES	YES
IP fixed effects	NO	NO	YES	NO	NO	YES	NO	NO	YES
Mean of outcome in sparse	1.172	1.172	1.172	1.202	1.202	1.202	0.0299	0.0299	0.0299

Unweighted regressions from Table B5 (last three columns). See that table for details.

Table XIV: Endline unweighted regressions: Labor supply

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Respondent				Spouse			Household		Started new enterprise		
Panel A: Full sample												
dense	-0.0988	0.0560	0.0669	-0.383**	-0.0366	-0.0247	-0.155	0.0380	0.0405	-0.00827	-0.000819	-0.0261
	(0.121)	(0.0778)	(0.0542)	(0.149)	(0.0768)	(0.0768)	(0.132)	(0.0887)	(0.0752)	(0.0311)	(0.0289)	(0.0287)
Observations	714	326	326	426	326	326	776	326	326	814	810	810
R-squared	0.004	0.718	0.783	0.079	0.718	0.773	0.009	0.685	0.753	0.007	0.033	0.109
Mean of outcome in sparse	35.52	35.52	35.52	38.49	38.49	38.49	58.47	58.47	58.47	0.134	0.134	0.134
Panel B: Sample of SBG members												
dense	-0.165	0.0770	0.0923	-0.428**	-0.00760	0.0194	-0.248	0.0808	0.0721	-0.00681	0.00409	-0.0381
	(0.148)	(0.0924)	(0.0712)	(0.185)	(0.0933)	(0.109)	(0.158)	(0.102)	(0.102)	(0.0359)	(0.0334)	(0.0332)
Observations	560	256	256	341	256	256	613	256	256	644	640	640
R-squared	0.008	0.731	0.793	0.089	0.736	0.782	0.015	0.705	0.765	0.011	0.035	0.119
Individual controls	NO	YES	YES	NO	YES	YES	NO	YES	YES	NO	YES	YES
IP fixed effects	NO	NO	YES	NO	NO	YES	NO	NO	YES	NO	NO	YES
Mean of outcome in sparse	36.26	36.26	36.26	38.69	38.69	38.69	60.26	60.26	60.26	0.140	0.140	0.140

Unweighted regressions from Table B6. See that table for details.

Table XV: Endline unweighted regressions: Investments

VARIABLES	(1)	(2) investments in housing (UGX)	(3)	(4)	(5) investments in farming (UGX)	(6)	(7)	(8) Purchased land	(9)	(10)	(11) Sold land	(12)
Panel A: Full sample												
dense	-3,908	-8,085	-6,397	2,265	2,610*	2,751	0.00562	0.0102	-0.0130	0.0350***	0.0323***	0.0307***
	(13,759)	(11,520)	(10,970)	(1,428)	(1,495)	(1,763)	(0.0185)	(0.0188)	(0.0182)	(0.0116)	(0.0121)	(0.0116)
Observations	972	965	965	983	976	976	980	973	973	980	973	973
R-squared	0.001	0.036	0.064	0.010	0.045	0.070	0.002	0.022	0.057	0.014	0.026	0.076
Mean of outcome in sparse	22706	22706	22706	1912	1912	1912	0.0462	0.0462	0.0462	0.0145	0.0145	0.0145
Panel B: Sample of SBG members												
dense	-20,321	-22,809*	-28,147**	2,180	1,849	2,580	0.0160	0.0239	-0.00910	0.0415***	0.0409***	0.0409***
	(12,995)	(12,164)	(12,776)	(1,619)	(1,605)	(2,079)	(0.0187)	(0.0193)	(0.0171)	(0.0134)	(0.0140)	(0.0138)
Observations	787	780	780	795	788	788	793	786	786	794	787	787
R-squared	0.010	0.035	0.074	0.014	0.053	0.080	0.003	0.025	0.061	0.023	0.041	0.107
Individual controls	NO	YES	YES	NO	YES	YES	NO	YES	YES	NO	YES	YES
IP fixed effects	NO	NO	YES	NO	NO	YES	NO	NO	YES	NO	NO	YES
Mean of outcome in sparse	28009	28009	28009	1906	1906	1906	0.0366	0.0366	0.0366	0.0146	0.0146	0.0146

Unweighted regressions from Table B5 (first five columns). See that table for details.

Table XVI: Endline unweighted regressions: Food security

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		Worried enough food			Consumed limited variety			Skipped meals	
Panel A: Full sample									
dense	-0.0288	-0.0551	-0.0908	0.0128	-0.0156	-0.0476	-0.0143	-0.0400	-0.00692
	(0.0519)	(0.0547)	(0.0635)	(0.0521)	(0.0569)	(0.0586)	(0.0562)	(0.0595)	(0.0497)
Observations	976	846	846	968	840	840	967	841	841
R-squared	0.019	0.102	0.238	0.009	0.076	0.237	0.010	0.066	0.234
Mean of outcome in sparse	0.713	0.713	0.713	0.687	0.687	0.687	0.633	0.633	0.633
Panel B: Sample of SBG members									
dense	-0.0583	-0.0863	-0.123*	-0.0152	-0.0476	-0.0822	-0.0278	-0.0597	-0.0294
	(0.0509)	(0.0585)	(0.0737)	(0.0537)	(0.0603)	(0.0690)	(0.0612)	(0.0665)	(0.0602)
Observations	789	661	661	784	658	658	780	656	656
R-squared	0.033	0.107	0.254	0.019	0.076	0.241	0.018	0.079	0.263
Individual controls	NO	YES	YES	NO	YES	YES	NO	YES	YES
IP fixed effects	NO	NO	YES	NO	NO	YES	NO	NO	YES
Mean of outcome in sparse	0.753	0.753	0.753	0.723	0.723	0.723	0.645	0.645	0.645

VARIABLES	(10)	(11)	(12)	(13)	(14)	(15)
		Slept hungry			Didn't eat for whole day	
Panel A: Full sample						
dense	-0.00821	0.0112	-0.0359	-0.0151	0.00593	0.0141
	(0.0583)	(0.0577)	(0.0578)	(0.0465)	(0.0487)	(0.0509)
Observations	967	842	842	961	835	835
R-squared	0.027	0.103	0.212	0.039	0.121	0.195
Mean of outcome in sparse	0.303	0.303	0.303	0.185	0.185	0.185
Panel B: Sample of SBG members						
dense	-0.0259	-0.0111	-0.0807	-0.0126	0.0204	0.0128
	(0.0608)	(0.0625)	(0.0637)	(0.0487)	(0.0543)	(0.0588)
Observations	779	656	656	773	649	649
R-squared	0.035	0.116	0.229	0.054	0.124	0.205
Individual controls	NO	YES	YES	NO	YES	YES
IP fixed effects	NO	NO	YES	NO	NO	YES
Mean of outcome in sparse	0.333	0.333	0.333	0.202	0.202	0.202

Unweighted regressions from Table B9. See that table for details.