Banking the group: Impact of credit and linkages among Ugandan savings groups*

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Abstract

Traditional banks and microfinance institutions lend directly to clients using individual or joint liability contracts, and generally have strict rules on selection and repayments. In most rural areas of sub-Saharan Africa, these formal institutions are uncommon. Financial services are more often provided by savings groups; however, these are often unable to fully meet local financial needs. In this paper, we study an alternative lending model with the potential to bridge the gap between formal and informal finance. In this delegated lending model, better known as linkage, a formal financial institution lends to savings groups and lets the group decide the allocation of borrowed funds. In our RCT, a random sample of existing savings groups gained access to linkage loans from a commercial bank in Uganda. We show that the bank loan stimulated an immediate and sizable increase in internal lending, which is sustained over time. Despite this benefit, we also find that linkages are a double-edged sword: On the one hand, members of treated groups had temporarily lower rates of food insecurity after two years, and point estimates suggest sizable increases in income and microenterprise size (which are not statistically significant). On the other hand, groups assigned to loans experienced significantly more turnover, suggesting that the possibility of external financing generates powerful selection effects.

JEL classification: O12, O16

Keywords: Savings groups, VSLA, Linkage, Financial inclusion, Microfinance, Microlending, Selection.

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1 Introduction

Credit is an important yet often missing element in the production process in low income countries. Farmers need credit to make investments, confront a cyclical earnings cycle, and smooth out unexpected income or consumption shocks. Microentrepreneurs also confront cyclical demand and the need to make relatively large investments in stock or machinery. Despite such needs, many rural communities are often underserved by financial institutions, including microfinance. Traditional lending models, including microfinance, rely on individual or joint liability contracts which generally have strict rules on selection and repayments, and are not very common in rural parts of sub-Saharan Africa.

In this study, we seek to better understand the impact of delegated credit, delivered by a commercial bank to a savings group rather than an individual. Savings groups already provide financial intermediation to millions of households in rural areas of sub-Saharan Africa (Allen and Panetta, 2010, Karlan, Savonitto, Thuysbaert, and Udry, 2017), but remain largely disconnected from formal credit markets. With delegated credit, which is better known as "linkage credit", the bank offers a loan with specific terms (interest rates and repayment plans), and savings groups on-lend the external credit to members, using the (generally more flexible) terms of credit that are prevalent in that group. Repayments to the bank are generated through savings accumulation and repayment of internal loans, and are not tied directly to those who (indirectly) borrowed from the bank.

To understand the impact of this novel type of finance, we randomly introduced a delegated credit product to existing savings groups in five districts in Uganda. Together with a complementary savings account, loans are provided to the group as a whole, and not to any single individual. In this paper, we show how credit linkage generates new internal lending, and then report on the extent to which savings groups participants benefit from delegated bank credit. The potential expansion of credit operates through a very specific *credit rationing* channel: the bank provides additional funds to the group, and the group

uses those funds to provide credit to members. Note that groups already provided loans to members; moreover, while the interest rate charged by the bank generally differs from the interest rate charged internally by the group to its members, this internal rate is unaffected by the additional funds. In other words, the product increases the *quantity* of credit, but not its price.

In addition to the expansion of credit, the adoption of formal financial products is likely to impact the groups through a number of other channels. First, the associated savings account allows groups to store excess funds in a safe place, and thus reduce the need to over-lend at the end of each cycle and the ability to lend money saved in the bank (if this is not easily accessible to members). Second, the intervention provided a great deal of personal contact with bank agents, thus improving the information available to members about the banking system. We expect that this might generate spillovers from group accounts to individual accounts. Finally, we expect that the program changes the incentives to join and remain in a treated group. For instance, these groups may become more attractive to households seeking larger loans, or less attractive to savers who face reductions in returns to their savings.

Our study, started in 2015, provided training and facilitated access to these formal financial products through 2016. Our data collection effort took place in February-March 2018, less than two years after the intervention. By the end of the implementation period, two thirds of the targeted groups had submitted a loan request, and one third had received a loan from the bank. We find high rates of pass-through of the loan: internal loans to members are four times higher in the week of the bank loan receipt relative to the expected amount; the increase is around 1 million shillings, or 40% of the average first-time bank loan (2.3 million shillings). We find that the internal loans generated are not larger in size; thus, the increase in lending comes from an increase in the number of loans generated. Despite evidence that internal lending amounts increased in a sustained way, a majority of groups stopped borrowing from the bank after the initial loan allocation, suggesting that the benefits from the

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program were not sufficient to overcome the costs of continued engagement.

In terms of welfare impacts, in the short run, the intervention raised financial resources available to members, lowered rates of food insecurity; however, the relatively sizable increase in household income does not raise to the level of statistical significance. Moreover, all benefits wore off by the end of the study. On household production, we find fewer households investing in agriculture, and statistically insignificant increases in enterprise sizes (as measured by revenues and costs) as well as profits. As for the other outcomes, point estimates are larger at midline.

These moderate effects are modulated by the finding that groups exposed to the treatment suffered from higher rates of member dropout. This is the result of increased churn within groups, and not of increased group mortality. After three years, the gap in dropout rates between treated and control groups is somewhat smaller and becomes statistically insignificant, indicating some catching up by control groups.

The findings are consistent with the idea that linkage helps relax liquidity constraints in the group, but the average benefit from linkage do not appear to be sufficiently high to cover the significant recurrent costs. The muted impacts on investments are also consistent with a broader literature that finds small average impacts from microfinance interventions (Banerjee et al., 2015), which is puzzling given that investment returns appear to be high in rural areas among credit borrowers (Beaman et al., 2014). The fact that external credit generated changes in group membership is consistent with other experiments of delegated credit (Maitra et al., 2017).

The rest of the paper is organized as follows. Section 2 provides information on financial linkages, in Uganda and elsewhere; details on the accounts offered in our study; an explanation of the structure of the intervention; a discussion of study timeline and instruments. Section 3 discussed the estimation strategy adopted. Section 4 reports the results. Section 5 concludes.

2 Background information

2.1 Savings Groups

Savings groups are community-based financial institutions, whose members save on a weekly basis, are able to accumulate those savings through a storage technology (typically, a savings box), and use those accumulated savings to generate interest bearing loans to members. Thus, savings groups provide a degree of financial intermediation in the community. Consistent with groups matching savers and borrowers, Cassidy and Fafchamps (2015) show that there is negative assortative matching along time consistency. A number of impact evaluation studies found that the introduction of savings groups improves food security, overall consumption smoothing, livestock holding, household business outcomes and women's empowerment(Ksoll, Lilleør, Lønborg, and Rasmussen, 2015, Beaman, Karlan, and Thuysbaert, 2014, Gash and Odell, 2013, Karlan, Savonitto, Thuysbaert, and Udry, 2017); however, these welfare impacts are quite muted, raising the question of why the increase in financial intermediation created by savings groups does not improve outcomes.

Savings groups are quickly becoming common in both rural and urban areas of Uganda and elsewhere. According to the latest Finscope figures, almost half of households in Uganda belong to one (FinScope, 2018).

2.2 Financial Linkage

Formal banking products that are targeted specifically to the savings group are called linkage products. Banks may offer a group savings account, which can be used by the group to store excess funds. Group savings account protect savings from theft or misuse; however, they also raise the cost of accessing the group's liquidity, as accessing the funds may involve time and travel to a bank branch of mobile money operator. A second product, and the focus of this paper, is a bank loan, offered to the group. The bank loan raises the liquidity of the group,

and allows more internal loans to be generated and issued. According to the State of linkage report, as of 2016 25 banking institutions in 27 sub-Saharan countries offered some type of linkage product to groups. In Uganda, where savings groups are particularly prevalent, at the time of the intervention there were six different financial institutions offering these products.

It is important to explain how these two products integrate with the daily operations of the savings group. Savings account provide an alternative location to members' funds. They are safer than a lock-box, and thus should alleviate the fear of losing funds to theft. On the other hand, because funds in savings accounts are less liquid, accounts may discourage internal lending. The loan product increases the funds available to the group for internal lending; note that the interest rate charged by the bank is lower than the rate charged internally by the group (that rate varies from a minimum of 3% per month to 10% per month), and that internal loans generated by the bank loan are priced at the internal rate.

2.3   The Opportunity Bank product

We study a linkage product offered by Opportunity Bank Uganda LTD. (OBUL) and marketed around the country concurrently with the study. Bank loans range between one and 20 million UGX and carry a monthly interest of 2.75%. Repayment periods vary from three to nine months. The initial loan was always limited to no more than five million UGX, with a three month repayment period. Issued loans are given to the group and not to any one individual, and are used to generate internal loans to members who borrow using the internal rates. Groups repay the bank on a monthly basis, either via cash payments to a bank representative, or through the mobile network or bank branch. Crucially, and unlike more standard microfinance interventions, repayments to the bank are generated through the cashflow of the group, i.e., from savings and internal loan repayments. These cash flows need not coincide with the repayments issued by those members who borrowed from the

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bank's funds.

The process of linking the group to Opportunity Bank is not straightforward. First, groups must be formally registered with local authorities (at the parish level). Usually, registration requires completing a registration form and obtaining signatures from community representatives. Second, groups need to have a (free) group savings account, held at an OB branch. The bank uses the account to manage loan deposit and payments, but groups can also use it to store excess savings. Third, financial regulations require borrowing groups to have financial identification cards, issued by the Government of Uganda. To meet these regulations, three representatives of the group complete a financial card request under their name; deposit a biometric reading of the fingers; and pay a one-time fee of UGX 15,000 (USD 5) each. These actions require a visit to the branch[1]. Fourth, groups complete a loan application form, which include an extensive set of documents (see figure 3). Finally, branch managers take two weeks or longer to decide whether to approve the loan request. Approved loans are then deposited into the group's group saving account, after a number of banking fees and duties totaling UGX 120,000 (USD 35) have been subtracted from the loan.

As the above makes clear, while there are significant one-time learning and financial costs involved in linkage, groups also face large recurring costs in maintaining these linkages. Secondly, linked groups gain access to a savings product, in addition to the bank loan. Part of the way groups respond to linkage may thus be mediated through the acquisition of this savings account. To account for this, our intervention will attempt to separate the effect of savings from those of credit.

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[1]The creation of financial cards turned out to be very time consuming; biometric readers often failed to recognize all ten fingers, took hours to complete, and often were unsuccessful.

3 The intervention

Our intervention is registered under AEACTR-0003613 and took place in five districts of Central Uganda: Buikwe, Luweero, Nakaseke, Nakasongola, and Wakiso. In each district, we partnered with one of two local NGOs, READ Uganda and Project SCORE, to enroll savings groups in the study and provide support to the research team. These NGOs were chosen due to their focus on savings group formation, their active and ongoing support to groups they formed, and their ability to intermediate between groups, research teams, and representatives of the commercial bank.

Groups enrolled in the study were assigned to one of three treatment arms: a control group, a "savings only" intervention, and a "savings + loan" intervention. Groups assigned to one or both financial products received an intervention package that consisted in a number of activities aimed at lowering the implicit and explicit costs of linking to the bank. Groups received numerous visits from NGO and bank representatives, during which the group was able to learn about the linkage process, the terms of the products, and the requirements needed to successfully obtain a financial product. The study also facilitated the formal registration of the savings group within local authorities, and helped filling out the applications for the savings accounts and loans. To further reduce transaction costs, the research team paid the one-time fees associated with the financial cards. The overall intervention, spread over a period of months, was very intensive, went beyond the standard engagement of commercial banks, and was not cost effective.

One noteworthy difficulty in organizing this linkage product is that the bank branch managing the intervention was located 60 to 100 km from study communities. To reduce the substantial transaction costs associated with managing the savings and loan accounts, group had the ability to administer some transactions remotely, through mobile money. In addition, on occasion an OB mobile branch (located inside an armored truck) visited the study communities to carry out banking transactions.

3.1 Study timeline

In late 2014 and early 2015, a research team representative visited approximately 300 VSLAs in five Central Region districts served by READ Uganda and SCORE program in order to screen groups based on their overall capacity and performance. The screening tool employed was developed by CARE to help commercial banks identify groups that could benefit from a formal bank linkages, and was considered state of the art at the time of the study. Groups were enrolled in the study if they scored sufficiently high in the questionnaire, and were thus considered to be highly likely to be acceptable for the commercial bank. In total, 156 groups were selected for the study, and randomized into the three treatment arms. To avoid cross-treatment spillovers, treatment assignment was done at the level of the village.[2]

In February-April 2015, baseline interviews were carried out in all study groups. For each group, 15 respondents were selected for the baseline. The intervention phase was slated to begin immediately after randomization. However, a series of delays caused by the speed of governmental approvals and commercialization of the product pushed the start date well past the baseline and into early 2016. At that time, the commercial bank hired a field agent solely devoted to marketing the product to savings groups in the study and helping the groups navigate the linkage process.

The active intervention period lasted one year and ended in December 2016. After that date, the bank field agent was relocated to a different branch and support activities to study groups ended. To measure impacts, the research team collected midline surveys in February-April of 2018, and the endline survey one year later, between February and April of 2019.

It is important to highlight that the product became available in all OBUL branches at

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[2]Because not all groups in a village participated in the study, villages assigned to the loan treatment will generally have groups where linkage did not take place. Groups in study villages might not have been part of the study for a variety of reasons, including: failure to score sufficiently high in the screening tools; not being supported by the SCORE or READ; refusal to participate in the study; refusal to being screened; were not in session at the time of the screening.

the start of our intervention in 2015, potentially leading to program spillovers. However, the company introduced it in the areas under study in a controlled way, and was not allowed to market other individual products to savings groups members during the intervention period. Indeed, OB followed the protocol closely and there is no evidence of program spillovers in our study areas.

3.2   Data

Data for the study comes from a variety of sources. Our main results originate from three rounds of household surveys, carried out at baseline (in 2015), midline (in 2018) and endline (2019); since the intervention took place in 2016, these surveys allow us to measure the impacts of the intervention after two and three years. Surveys included primary outcomes of interest: self reported amount of savings and loans, participation status with savings groups, satisfaction with the group; household assets, earnings, and investments. The sample at midline and endline included all those who were interviewed at baseline. At endline, we also interviewed all other current members of the study groups. To create tracking sheets for this exercise, between December 2018 and January 2019 a small team visited all groups and took pictures of the current participant rosters. We then identified those that had not yet been interviewed by their name. New interviewees thus consisted of long-time members (that is, those who were members in 2015 but were not randomly selected for inclusion in the panel sample) and newcomers, who joined the group at some point between 2016 and 2019.

In addition to the interview sample, our analysis incorporates information from a variety of other sources. We received information on group loans offered in the study area from Opportunity Bank; these include issuance and repayment dates plus loan amounts of all loans to study groups for the year 2016 and 2017. In 2019 we also photographed and digitized loan ledger books belonging to most (but not all) of the study groups. The loan groups provide information on internal loans generated, including the issuance date and loan

amounts.

Summary statistics   Table 1 provide summary statistics and balance tests from the panel sample, comparing the loan group against the control. The top panel reports average respondent characteristics at baseline. Two thirds of group participants are women, and the average years of education is 2.8. As expected from the mostly rural location of the study, approximately 70% of households are engaged in agriculture. Members are financially active within VSLAs: 82% borrowed at least once in the previous cycle. However, as only 3% of households reported having a loan from a formal lender, the sample is not accustomed to working with the formal financial sector. Characteristics are well balanced between the two treatment arms.

The bottom panel of the table reports summary statistics of the variables that appear in the screening tool. Taken together, loan groups are similar control groups: key measures of group performance –savings volumes, writeoffs, value of investments–are similar across the two treatment arms. There is one variable that is unbalanced and that is portfolio at risk. To account for any possible imbalance, we will control for all baseline variables in this table in our regressions.

Table 2 reports the summary statistics of the sample of internal loans collected from the group ledgers. We have information on 110 of the 145 groups; on average, each group reported 140 loans over the period under consideration. Loan Amounts indicates the average value of a loan, which is UGX 350,000.

4   The provision of credit within the savings group

In this section, we describe the take-up of the bank loan by treated groups, and then show the extent to which the additional funds are on-lent to the membership.

Table 1:
Balanced arms

	Control	Loans	(1) vs. (2)
			p-value
Members characteristics (baseline)			
Age	38.485	39.103	0.569
Female	0.780	0.760	0.531
Schooling	2.865	2.900	0.755
Married	0.693	0.688	0.876
Size of household	5.130	4.861	0.169
Fraction farming	0.753	0.690	0.171
Fraction business	0.315	0.273	0.187
Food security index	0.642	0.696	0.381
Satisfaction with group index	0.008	-0.009	0.175
Formal loans	0.029	0.029	0.998
VSLA loans	0.822	0.798	0.425
Screening tool components			
Overall score	76.417	75.316	0.581
Group maturity	0.600	0.579	0.819
Savings volume	2.583	2.474	0.431
Attendance	1.467	1.632	0.242
Portfolio at risk	2.167	1.544	0.049**
Writeoffs	1.750	1.684	0.674
Lending frequency	3.517	5.281	0.539
Value of investments	18.717	23.035	0.539
Disciplined group	0.817	0.877	0.369
Good procedures	1.350	1.474	0.246
Group awareness	1.417	1.579	0.132
Good decisionmaking	0.817	0.895	0.235
High quality records	18.100	22.491	0.535
Number of groups	57	60	

Top panel: summary statistics of individual level data from members interviewed in 2015 as part of the baseline. P-values computed after clustering at the level of randomization (village level). Bottom panel: summary statistics of group level characteristics collected during screening visits to groups.

Table 2:
Summary statistics: individual loans

Variable	Mean	Std. Dev.
All groups (N=110)		
Total loans per VSLA	137.45	93.74
Loan Amounts (UGX)	UGX 348,827	UGX 542,338
In borrowing group	0.12	0.32
Number of loans per borrower	2.75	2.59

Value of loans issued by groups on a weekly basis. Information from loan ledgers.

4.1 Borrowing from the bank

The intervention led to a significant take-up of the savings product, and a more limited take-up of the loan product. By December 2017, our review of treated groups indicated that over 75% of groups assigned to linkage ended up opening a savings account with the bank. (Comparable figures are not available for control groups, although some take-up was expected). Take-up of the loan product was significantly lower. While over 65% of the groups formally requested a loan from OBUL, only 36% ended up with one (figure 1). In addition, there was a significant amount of abandonement of the linkage program between the first loan and subsequent loans. As shown in figure 1, all groups that borrowed repaid their initial loan, but 8.8% of treated groups (24% of the groups that took up a loan) ended up repaying late. None of those groups received a subsequent loan. 28% of groups assigned to the treatment borrowed and repaid the loan on time; 37% of these borrowed again from OB, and all of those groups repaid their second loan on time. By the end of our review period, in 2017, only 7% of treated groups had a third loan. Thus, lack of timely repayment appears to be one of several reasons for the lack of repeat borrowing.[3]

Overall, the intervention injected over 100 million UGX (approximately $30,000) in the study areas as loans between 2016 and 2017. All groups received between 1 and 5 million UGX during the first loan cycle. Among those receiving the second (third) loan, loan sizes

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[3]We have indication that a small subset of groups ended the linkage program and began to borrow from other financial institutions.

Figure 1: Fraction of treatment groups borrowing and repaying on time, and transition into subsequent loans
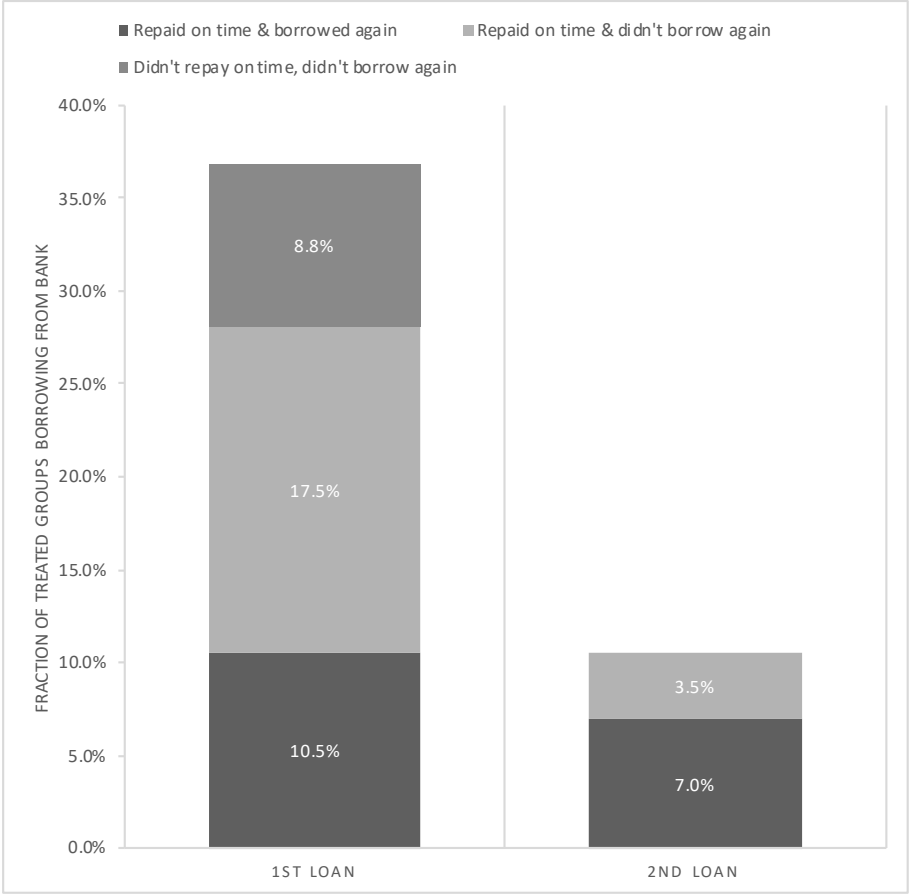
Borrowing and repayment patterns by treated groups, separately for first and second OB loans. The first loan is considered repaid on time if repaid within three months (92 days), or within 6 months (185 days) for the second loan. These data cover the period 2016-2017.

varied from 3 to 5 million (5 to 10 million) UGX.

## 4.2 Impact on internal lending

We next study the extent to which the external loan generated internal loans. To do so, we adopt a leads-lags model of the following form:

$$LoanAmt_{it} = \sum_{j=-20}^{20} \alpha^j GroupLoan_g \times Week_{gt}^j + \delta_t + \delta_g + \varepsilon_{it}, \tag{1}$$

where $LoanAmounts_{gt}$ is the total value of internal loans given out in group g during meeting week t; $GroupLoan_g$ identifies groups that received the loan from Opportunity Bank; $Week_{gt}^j$ is an indicator for week t for group g, which occurred j weeks before or after the provision of the bank loan. The parameters are α^j, which identify deviations of internal lending from the expected amount j weeks before/after the receipt of the bank loan. To control for seasonality and group characteristics, the regression includes VSLA fixed effects and week-year fixed effects; the estimation of parameters α^j arises from the variation in the timing of the receipt of the bank loan. Identification assumes that the timing of receipt is random, and independent of internal loan demand shocks. This is quite reasonable, as the actual delivery of the bank loan depended on when (busy) loan officers gave final approval, and were thus not timed to internal needs. Moreover, if groups did expect the bank loan to arrive, then we should see $\alpha^j \neq 0$ for $j < 0$.

Figure 2 plots the coefficient estimates α^j for the forty week period surrounding the issuance of the bank loan. We can see that the amounts lent increase substantially the week the group receives the funds from the bank. The point estimate is close to one million shillings, which is four times as high as the average amount lent (UGX 230,000) and is 40% of the UGX 2.3 million that linked groups received from the bank. The figure also shows that the amounts do not increase substantially in the periods following the bank

Figure 2: Pass through of the bank loan
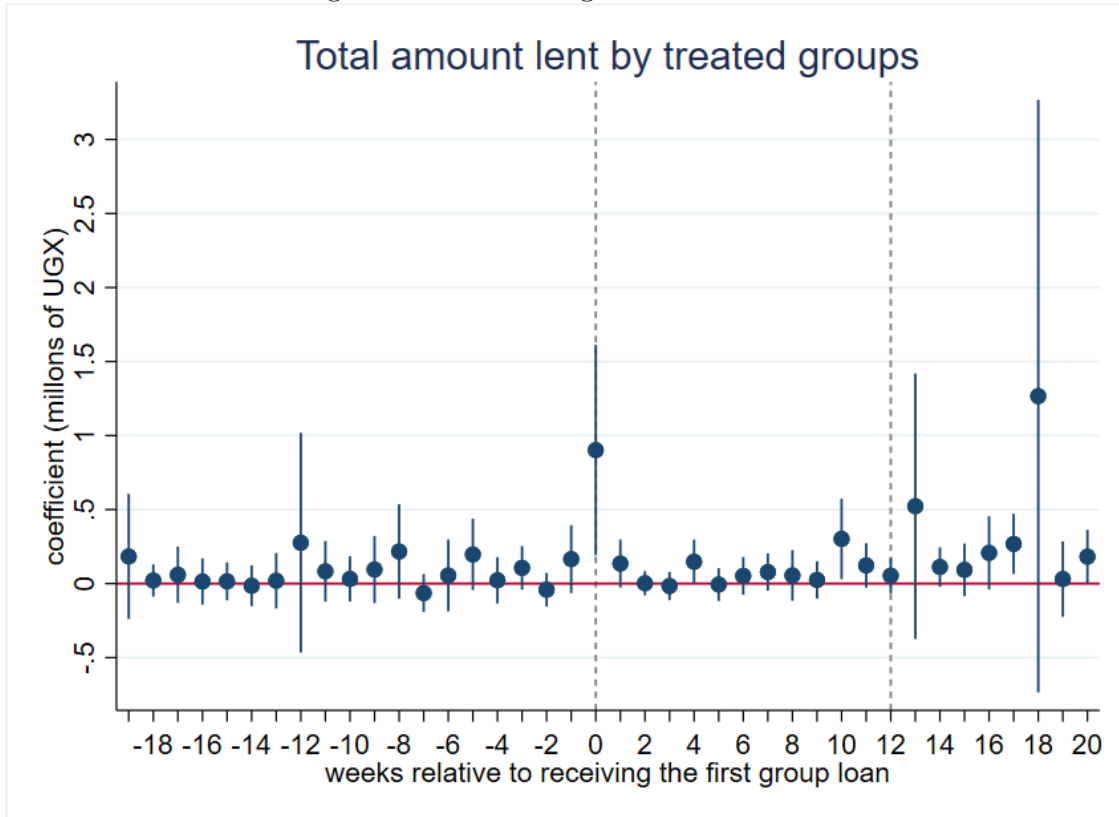
Coefficient estimates of the interaction between Week j and bank loan indicators from equation (1), where $j = 0$ corresponds to the week the group receives the bank loan. Results in UGX.

loan–the point estimates are all statistically insignificant and close to zero until past the 12th week, which corresponds to when the full bank loan is due for repayment. After the 12th week, point estimates become slightly larger and marginally significant (at the 10 or 15% levels), indicating possibly that the short-term cash infusion led to a slight increase in overall lending once the loan was repaid. Crucially, the periods preceding the bank loans are not characterized by low lending, indicating that, to the extent that there is crowd out between internal and external loans, crowding out is not huge.

Table 3 shows the long-run effects of the bank loan on internal lending. The table regresses $LoanAmt_{gt}$ on three indicators that take the value of 1 for groups that were successfully linked to the bank, for three critical periods following the bank linkage: at the time of the bank loan; during the three-month initial repayment period; and all periods following the

repayment period. As before, we control for time factors common to all groups through week-year fixed effects, and account for differences in group characteristics through savings groups fixed effects. The table demonstrates more clearly the dynamics of internal lending. First, lending expands immediately thanks to the bank loan. During the repayment period, the group issues a "normal" amount of loans. Once the bank loan is repaid, on average the group maintains a higher level of lending, which extends beyond the cycle and into future cycles. Overall, linked groups issue between UGX 155,000 and UGX 177,000 more per week, which is between 57% and 71% more than the average.

Table 3: Weekly loan amounts after linkage

	(1)	(2)	(3)
	2016 only	2016 - 2017	2016 - 2018
Post ×:			
first week	441,601**	448,776**	447,103**
	(196,427)	(196,531)	(193,827)
repayment period	12,001	18,709	16,832
	(38,307)	(37,354)	(37,658)
post repayment period	155,444**	177,494***	165,562***
	(76,313)	(61,009)	(58,506)
Observations	4,559	9,343	13,425
R-squared	0.143	0.130	0.113
Mean (control)	270168	248665	255455

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Groups that experienced an increase in overall lending volumes could achieve this by increasing the number of loans given out or by increasing the size of loans. In table 4, we study how individual loan amounts are changed by linkage. We take advantage of the fact that loan records include the name of the borrower to create a person-loan panel. Each observation is an individual loan issued by a savings group, and the dependent variable is the average amount of the loan. The independent variable of interest is *Post*, an indicator variable that identifies loans that were issued after linkage.

Table 4:
Outcome: Loans issued per week

VARIABLES	(1) Loan Amount	(2) Loan Amount	(3) Loan Amount	(4) first loans	(5) later loans
Post	-40,392	-39,336	-31,553	-34,697	-38,683
	(46,333)	(47,250)	(43,747)	(89,537)	(53,331)
Observations	14,117	13,459	13,459	4,979	9,138
R-squared	0.112	0.119	0.488	0.107	0.124
VSLA f.e.	Yes	Yes	Yes	Yes	Yes
Year and Month f.e.	Yes	Yes	Yes	Yes	Yes
Loan num. f.e.	No	Yes	Yes	Yes	Yes
Borrower f.e.	No	No	Yes	No	No
Mean (pre)	331264	331264	331264	331264	331264

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Column 1 reports the result of a regression with VSLA, month and year fixed effects. The coefficient estimate is negative, albeit statistically insignificant, indicating that individual loan sizes did not increase with linkage on average. It is however possible that there are heterogeneous effects of the loan: for example, larger loan sizes for existing borrowers, and smaller loans among new borrowers. Because we know the identity of the borrower, we can study this type of heterogeneity. First, in column 2, we control for the members' borrowing history by adding loan number fixed effects. In column 3, we further control for borrower characteristics by including borrower fixed effects. Coefficient estimates do not change much, confirming that there are no borrower selection issues. Finally columns 4 and 5 split the sample between first loans and later loans. Coefficient estimates are very similar among both types of loans. Thus, the increase in credit is driven by more frequent lending, and not by changes in loan sizes or borrower characteristics.

5 Impact of linkage on members

In the previous section, we demonstrated that linkage changed the borrowing patterns within linked savings groups. We next use household level surveys carried out in 2018 and 2019 to study whether exposure to the linkage program impacted living standards of members. In our analysis, we take advantage of the panel feature of our data to use an intent-to-treat methodology that controls for baseline characteristics. For each primary outcome, we run the following regression at the individual i in village v:

$$y_{iv} = \alpha_0 + \alpha_1 Linked\_Loan_v + X_{iv}\beta + \epsilon_{iv}. \tag{2}$$

The independent variable of interest is $Loan_v$, which is an indicator for household who participated in groups located in villages v that were assigned to the loan intervention. All specifications include five district fixed effects and X_{ig}, a matrix of group and all household and randomization controls reported in table 1. We also include the full set of employment sector indicators (not reported in the table).

We run regression (2) on the midline and endline data separately, using the panel sample. The estimated α_1 will tell us the effect of assignment to a linkage program on those who were targeted by the program.

To account for the fact that outcomes can be correlated at the group and village level, we report standard errors that are clustered at the village level. In addition, we control for the false discovery rate using the methods developed by Benjamini and Hochberg (1995). Since the correction leads to more conservative confidence intervals, we report q-values only for coefficients that are statistically significant without correction. We also report ITT results for the midline (after two years) in panel A of each table, and for the endline (after three years) in panel B. Discussion of panel C is left to section 6.

Household savings and credit We begin with the effect of the intervention on savings, credit, and some measure of credit rationing. Table 6 reports results of regression (2), where the dependent variable is the amount saved in formal savings accounts and VSLAs (column 1), amount borrowed across available sources icluding VSLAs, banks, MFIs and moneylenders, (column 2), and whether the person reported having had a loan denied by a formal lender (column 3). Due to a coding error in our data collection tool at midline, the questionnaire did not include savings and borrowing from all VSLAs, and thus the total savings and credit amounts are available for the endline only. Point estimates for savings are positive but insignificant, while for loans estimates are also positive (133,000 UGX, or slightly less than $40) (p-value 0.151). Table 7 disaggregates saving by type (VSLA vs. formal); estimates on savings continue to be statistically insignificant. Table 8 disaggregates credit by lender type. We see that VSLA credit is larger in groups assigned to the loan linkage, by approximately 144,000 UGX (18% of the average borrowed amount in the control group). Estimates from the other sources are statistically insignificant. [4] We also find no evidence that the intervention increased the likelihood of having a savings or loan account (results not shown). Overall, these results clearly show that there are no effects of linkage on external financial utilization. Finally, shareout amounts were somewhat higher in the treated group (table 9). This is broadly consistent with higher internal fund utilization rate, derived from increased in credit without a change in savings observed in treated groups. However, the estimates fails to achieve statistical significance.

Impacts on income, investments, and business outcomes We next analyze the impacts on income (table 10), use and amounts of agricultural inputs (table 11), and microenterprise outcomes (table 12). All results are noisy, and lack statistical significance; point estimates are indicative of an increase in income, and a shift away from agricultural in-

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[4]It should be noted that the proportion of participants obtaining a loan from external sources is very low–only 12% of the control sample did so, and only 2.6% obtained it from a bank. ITT coefficient estimates are likewise very small, and largely statistically insignificant.

vestments towards microenterprise. At midline, point estimates for income indicate that members assigned to the treatment had 15% higher income (p-value: 0.19), but these point estimates fall and become even noisier at endline. On agricultural production, (table 11), there is a significant reduction in the likelihood of use of agricultural inputs at endline (column 2), with the effect being driven by nonlabor inputs. However, this result does not survive the FDR correction, and the average amount spent on inputs remains unchanged across the treatment arms. Finally, table 12 measures treatment effects on enterprise development. It should first be noted that all outcomes in the table are measured with significant noise between one data collection round and the next, possibly indicating a high amount of reporting bias. It is thus perhaps unsurprising that none of the outcomes measured are statistically significant. The likelihood of having an enterprise is 1 p.p higher in the treated group. When looking at those firms with an enterprise, we see positive point estimates for profits (both computed and self reported), costs, and revenues at midline. However, all estimates are very noisy; moreover, the sample size is very small. At endline, point estimates for costs remain as large as the midline, while revenues remain much smaller. Computed profits are thus negative (albeit statistically insignificant). On the other hand, self-reported profits remain positive and are close to significance (p-val 0.13).

Impacts on food security Table 13 analyzes the effect of the intervention on food insecurity. Food insecurity is measured from five questions, in increasing order of severity. At midline, participants in treated groups report significantly fewer instances of food insecurity, for all issues bar the most severe type. In total, they report 0.25 fewer issues (column 6), i.e., 24% less than the control group. By endline, these differences had shrunk to zero. In particular, the incidence of less severe issues (issues 1 and 2) in the control group do not seem to change much between the two rounds of data collection, while the incidence for the treated group does increase after the first year. The gains from the intervention are

short-lived.

Participation and satisfaction with the group We finally analyze the effect of the intervention on members' experiences with the group. First, we analyze whether the interventions caused differential attrition from the group. A priori, the effect of the treatment is ambiguous. On the one hand, improved access to safe storage of funds and credit should reduce attrition (at least among borrowers). On the other hand, external credit may reduce savings returns, which is detrimental for savers. More generally, the decision to participate in a linkage program can be controversial, given the low levels of trust in financial institutions by Ugandans. If the program creates more discontent, we would expect to see an increase in attrition.

Table 14 reports the result of a regression whose dependent variable is whether the member reported not being a participant of the group. The loan treatment is strongly associated with an increase in the likelihood of dropping out at midline: the estimate in column 2 suggests a 8.4 percentage point increase over the control group (19.3%): this represents an increase of 44% over the control mean. The coefficient estimate for the savings only treatment is also positive and large in magnitude, but is not statistically significant. One year later, more group participants had left both treated and control groups; the proportion leaving was slightly higher in the control group, and the differences between the two are no longer statistically significant. Nonetheless, the 6.2 p.p. difference is 24% of the control mean, which is large. Thus, the intervention changed the composition of the group, but like much else these changes fade over time.[5]

To shed some light on this result, table 15 regresses a "group satisfaction index" variable on our ITT regressions for the midline. On average, study participants associated with the loan intervention report lower (by 0.1 standard deviations) levels of satisfaction relative to

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[5]It should be noted that this result is not driven by group mortality: *none* of the groups in the treatment dismantled (and only two did in the control group).

control. Importantly, this lower satisfaction comes entirely from the dropouts (column 3), while stayers's satisfaction is unaffected by treatment. While it is not possible to glean the causal chain here, the result is suggestive that the intervention did lead to reductions in overall satisfaction and exit from the group.

6   Impact of linkage on the characteristics of the group

The discussion above indicates that exposure to linkage programs has muted welfare impacts, but does cause an increase in turnover within savings groups. If the new members who replace the leavers have characteristics that are very different from those leavers, they could change the average characteristics of the group. On average, groups that have undergone linkage could thus appear to be different; it would however be incorrect to attribute the difference as a causal effect of linkage of members. The potential for misattribution of impacts on linkage is quite possible: anecdotes of groups improving after linkage abound among the savings group community.

To better understand the effect of linkage on the average characteristics of the group, we make use of the full endline sample. As mentioned in the data section, at endline we interviewed all members that were active in 2018, irrespective of whether they joined prior or after the intervention. We then used these data to reconstruct all the (study) groups that a household belonged to at endline, and created a dataset of household-by-group. For each household i belonging to group g, we run the following regressions:

$$y_{ig} = \alpha_0 + \alpha_1 Linked\_Loan_g + X_{ig}\beta + \epsilon_{ig}. \tag{3}$$

Note that equation (3) differs from (2) in a number of ways. First, the regression above allows for multiple observations for each household, if households belong to multiple groups. Second, the assignment to the treatment, *Linked_Loan*, is defined over the group that

household i belongs to, and not her village. For members that were present at baseline, we thus ignore their *initial* assignment, and drop baseline observations that are no longer in a study savings group in 2018. The estimated coefficient α_1 thus indicates the difference in outcome y between groups assigned to the linkage and control. The difference is a weighted sum of two factors: the impact of linkage on stayers, and of the difference in the characteristics of newcomers. Given that the first factor is estimated to be close to zero for most outcomes, the coefficient estimate thus indicates the effect of selection.

We revisit all outcomes reported in section 5. For simplicity, estimates for equation (3) are reported in panel C of each table presented in the previous section.

The results indicate that linkage does make groups appear better off–due to the selection effects. Members of linked groups have higher savings and total loan amounts (table 6), and gain from higher shareout amounts (table 9). On the other hand, it terms of measured outcomes, coefficient estimates do not appear to be significantly larger in treated groups relative to control. Income is higher (table 10) and standard errors are somewhat lower although results remain insignificant; the patterns for agricultural production is also similar to the endline panel sample. On enterprise, coefficients for self reported and imputed profits are both positive and relatively small. Rates of food insecurity are also indistinguishable between treated and control groups.

7 Conclusion

In this study, we seek to better understand the impact of credit delivered through savings groups. Our randomized control trial enhances financial intermediation by introducing two formal banking products–a savings account and a loan account– to existing savings groups in five districts in Uganda. he main question we are interested in addressing is whether savings groups participants benefit from an enhanced access to bank credit. The potential

expansion of credit operates through a very specific *credit rationing* channel: the bank provides additional funds to the group, and the group uses those funds to provide credit to members. After two years, we find that most (75%) treated groups opened the account with the banking institution. Take-up of loans was considerably lower: only one third of groups were able to successfully receive a loan from the bank. Despite this, we observe a large increase of lending to members coinciding with the bank loans, suggesting that the loan did generate new borrowing opportunities. Our (preliminary and noisy) estimates suggest an increase of 13% in self-reported income, and 17% increase in savings. We find some limited spillover effects on personal use of loans from SACCOs, but these are limited to the savings only intervention arm. Finally, we find no effects on agricultural investments (we have yet to analyze impacts on enterprise). We also find that groups exposed to the treatment suffered from higher rates of member dropout, which we aim to explain in greater detail in future versions of the paper.

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8 Figures and Tables

Figure 3: OB loan application checklist

VSLA PRE-DISBURSMENT CHECKLIST

1	Fully filled and signed VSLA application form.	
2	Committee approval.	
3	VSLA rating for linkage/Assessment form.	
4	VSLA decision making matrix	
5	VSLA rating report	
6	CRB search for the VSLA and the signatories.	
7	Mandatory saving(20%) of loan approved	
8	VSLA resolution to borrow	
9	Identification and passports for the VSLA signatories.	
10	Fully filled ID form for all the signatories.	
11	L.C letter of recommendation to borrow for the VLSA.	
12	Copy of certified VSLA registration certificate.	
13	Copy of certified VSAL constitution.	
14	Sketch map to the VSLA sitting venue.	
15	Group photo	
16	Have all the committee recommendations been full filled?	

RO NAMES: _____   Branch Manager: Branch Operations Manager

Signature: _____   _____   _____

Date:_____   _____   _____

Table 5:
Groups with OB loan vs. not

	No loan	Loan	Diff. p-value
Age	39.553	38.089	0.333
Female	0.778	0.690	0.045**
Schooling	2.951	2.907	0.769
Married	0.687	0.652	0.429
Size of household	5.061	4.602	0.094
Fraction farming	0.673	0.716	0.499
Fraction business	0.254	0.315	0.148
Food security index	0.635	0.836	0.039**
Group satisfaction index	-0.013	-0.008	0.801
Formal loans	0.037	0.013	0.057*
VSLA loans	0.814	0.811	0.940
Screening tool components			
Overall score	75.237	75.474	0.946
Group maturity	0.553	0.632	0.577
Savings volume	2.474	2.474	1.000
Attendance	1.526	1.842	0.095*
Portfolio at risk	1.553	1.526	0.956
Writeoffs	1.684	1.684	1.000
Lending frequency	1.889	1.842	0.846
Value of investments	2.690	2.938	0.125
Disciplined group	0.842	0.947	0.262
Good procedures	1.579	1.263	0.035**
Group awareness	1.632	1.474	0.296
Good decisionmaking	0.947	0.789	0.069*
High quality records	2.310	1.688	0.256

Table 6:
Financial inclusion

VARIABLES	(1) Total savings	(2) Total loans	(3) Credit Rationing
Panel B: Endline (panel sample)			
ITT: OB loans	21,715	132,981	0.018
	(63,393)	(91,862)	(0.015)
Observations	1,013	1,114	1,114
R-squared	0.123	0.085	0.036
Mean (control)	587439	919579	0.0310
Panel C: Endline (all group members)			
ITT: OB loans	75,384*	129,318*	0.001
	(45,330)	(69,790)	(0.008)
Observations	2,720	3,016	3,016
R-squared	0.036	0.023	0.007
Controls	Yes	Yes	Yes
District f.e.	Yes	Yes	Yes
Mean (control)	618391	1.005e+06	0.0358

Standard errors clustered at the village level in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Total savings, total loans are in UGX (exchange rate: approximately 3,000 UGX per USD). Panel A is not presented because Midline does not include targeted VSLA information so the results are not comparable.

Table 7:
Savings amounts by source

VARIABLES	(1) VSLA savings	(2) Formal savings
Panel A: midline (panel sample)		
ITT: OB loans		4,855
		(19,495)
Observations		1,260
R-squared		0.092
Mean (control)		103756
Panel B: endline (panel sample)		
ITT: OB loans	-8,807	-4,956
	(32,494)	(32,810)
Observations	1,114	1,055
R-squared	0.081	0.109
Mean (control)	294181	158286
Panel C: endline (all group members)		
ITT: OB loans	32,953	14,353
	(23,927)	(22,250)
Observations	3,016	2,823
R-squared	0.053	0.026
Controls	Yes	Yes
District f.e.	Yes	Yes
Mean (control)	324594	158633

Standard errors clustered at the village level in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 8:
Borrowing amounts by source

VARIABLES	(1) VSLA	(2) Bank	(3) MFI	(4) SACCO	(5) Moneylender
Panel A: midline (panel sample)					
ITT: OB loans		80,241	9,723	-0.034	-0.026
		(71,034)	(23,523)	(0.131)	(0.060)
Observations		1,619	1,620	1,620	1,621
R-squared		0.029	0.009	0.025	0.030
Mean (control)		112485	49145	0.465	0.0687
Panel B: endline (panel sample)					
ITT: OB loans	144,005**	24,736	72,257	0.001	-0.044
	(71,596)	(43,077)	(106,394)	(0.108)	(0.047)
Observations	1,114	1,101	1,096	1,106	1,113
R-squared	0.107	0.039	0.012	0.028	0.023
Mean (control)	768924	41985	72244	0.316	0.102
Panel C: endline (all group members)					
ITT: OB loans	115,690**	-685	28,719	0.167**	-0.051*
	(55,785)	(24,394)	(37,964)	(0.077)	(0.026)
Observations	3,016	2,977	2,968	2,990	3,013
R-squared	0.035	0.009	0.003	0.009	0.008
Controls	Yes	Yes	Yes	Yes	Yes
District f.e.	Yes	Yes	Yes	Yes	Yes
Mean (control)	814632	68758	78819	0.225	0.0660

Standard errors clustered at the village level in parentheses

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

There are few reports of SACCO and Moneylender loans, thus they have been transformed using the inverse hyperbolic sine function. Midline results for column 1 is missing as the midline does not include targeted VSLA information.

Table 9:
Shareout amounts

VARIABLES	(1) Total	(2) Average
Panel B: endline (panel sample)		
ITT: OB loans	68,971	56,654
	(87,574)	(41,214)
Observations	1,114	1,114
R-squared	0.103	0.150
Mean (control)	1.028e+06	500687
Panel C: endline (all group members)		
ITT: OB loans	104,586	51,658*
	(64,088)	(30,246)
Observations	3,016	3,016
R-squared	0.052	0.048
Controls	Yes	Yes
District f.e.	Yes	Yes
Mean (control)	1.108e+06	500263

The outcome variable in column 1 is the sum of all shareout amounts received by the household at the end of the cycle of each group. The outcome variable in column 2 is the average shareout, i.e., the total shareout divided by the number of groups the household belongs to. Shareout amounts are computed in Ugandan shilllings. Panel A is not presented because Midline does not include targeted VSLA information. Standard errors clustered at the village level in parentheses.

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

Table 10:
Household income

VARIABLES	(1) Monthly	(2) Annual
Panel A: midline (panel sample)		
ITT: OB loans	93,517	1,122,204
	(70,490)	(845,875)
Observations	1,621	1,621
R-squared	0.056	0.056
Mean (control)	409083	4.909e+06
Panel B: endline (panel sample)		
ITT: OB loans	58,704	704,449
	(117,895)	(1,414,742)
Observations	1,114	1,114
R-squared	0.117	0.117
Mean (control)	769972	9.240e+06
Panel C: endline (all group members)		
ITT: OB loans	92,429	1,109,143
	(83,654)	(1,003,849)
Observations	3,016	3,016
R-squared	0.028	0.028
Controls	Yes	Yes
District f.e.	Yes	Yes
Mean (control)	828489	9.942e+06

Self reported income from all income sources reported from all members of the household. Standard errors clustered at the village level in parentheses.

*** p<0.01, ** p<0.05, * p<0.

Table 11:
Agriculture

VARIABLES	(1) Land cultivated	(2) Any inputs used	(3) Amount inputs used
Panel A: midline (panel sample)			
ITT: OB loans	0.097	-0.028	7,635
	(0.227)	(0.031)	(27,246)
Observations	1,333	1,333	1,333
R-squared	0.001	0.001	0.000
Mean (control)	2.500	0.786	235706
Panel B: endline (panel sample)			
ITT: OB loans	-0.027	-0.064**[a]	-10,527
	(0.229)	(0.030)	(25,874)
Observations	998	1,114	1,079
R-squared	0.029	0.119	0.080
Mean (control)	2.579	0.788	226071
Panel C: endline (all group members)			
ITT: OB loans	-0.067	-0.068**[b]	-7,892
	(0.134)	(0.027)	(14,605)
Observations	2,719	3,016	2,895
R-squared	0.053	0.030	0.015
Controls	Yes	Yes	Yes
District f.e.	Yes	Yes	Yes
Mean (control)	2.381	0.781	202986

Standard errors clustered at the village level in parentheses
*** p<0.01, ** p<0.05, * p<0.1
[a]FDR q−val of 0.111. [b]FDR q−val of 0.039.
Land cultivated and amount inputs used do not include outliers at the top and bottom 1%
of the distribution.

Table 12:
Enterprise Values

VARIABLES	(1) Has enterp.	(2) Num enterp.	(3) Profits	(4) Self reported profits	(5) Costs	(6) Revenues
Panel A: midline (panel sample)						
ITT: OB loans	0.010	0.036	86,237	14,560	2,064,821	2,274,254
	(0.028)	(0.037)	(1,483,479)	(631,126)	(1,919,119)	(2,147,916)
Observations	1,333	1,333	283	283	283	283
R-squared	0.051	0.058	0.074	0.216	0.187	0.204
Mean (control)	0.197	0.249	689760	2.225e+06	7.010e+06	7.904e+06
Panel B: endline (panel sample)						
ITT: OB loans	0.012	0.039	-412,086	1,152,635	2,547,035	1,105,871
	(0.031)	(0.051)	(1,434,876)	(756,837)	(3,162,765)	(2,928,614)
Observations	1,114	1,114	467	467	467	467
R-squared	0.059	0.066	0.080	0.125	0.135	0.128
Mean (control)	0.426	0.542	1.503e+06	2.595e+06	1.060e+07	1.330e+07
Panel C: endline (all group members)						
ITT: OB loans	0.017	0.018	347,990	277,812	1,506,334	1,316,704
	(0.018)	(0.029)	(765,431)	(415,460)	(2,416,706)	(2,188,762)
Observations	3,016	3,016	1,269	1,269	1,269	1,269
R-squared	0.006	0.009	0.022	0.044	0.035	0.031
Controls	Yes	Yes	Yes	Yes	Yes	Yes
District f.e.	Yes	Yes	Yes	Yes	Yes	Yes
Mean (control)	0.415	0.521	1.261e+06	3.050e+06	1.110e+07	1.340e+07

Regressions on revenues, costs and profits only on respondents with enterprises. Profits are computed as revenues minus costs. Revenues, costs, and profits are winsorized at the top and bottom 1%. Standard errors clustered at the village level in parentheses.

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

Table 13:
Food Issues of Participants

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Issue 1	Issue 2	Issue 3	Issue 4	Issue 5	Total food isssues
Panel A: Midline (panel sample)						
ITT: OB loans	-0.079***	-0.063**	-0.057**	-0.036***	-0.010	-0.245***
	(0.021)	(0.029)	(0.026)	(0.011)	(0.008)	(0.069)
FDR q-val	0.001	0.042	0.042	0.003	0.241	
Observations	1,621	1,621	1,621	1,621	1,621	1,621
R-squared	0.077	0.084	0.057	0.038	0.026	0.087
Mean (control)	0.228	0.458	0.246	0.0656	0.0269	1.025
Panel B: Endline (panel sample)						
ITT: OB loans	0.036	0.031	-0.028	-0.029*	-0.011	-0.001
	(0.027)	(0.042)	(0.031)	(0.016)	(0.012)	(0.097)
FDR q-val	0.459	0.463	0.459	0.405	0.459	
Observations	1,114	1,114	1,114	1,114	1,114	1,114
R-squared	0.061	0.065	0.046	0.054	0.029	0.063
Mean (control)	0.238	0.470	0.326	0.0832	0.0522	1.170
Panel C: Endline (all group members)						
ITT: OB loans	0.024	0.001	-0.010	-0.018	-0.001	-0.003
	(0.020)	(0.027)	(0.024)	(0.011)	(0.006)	(0.072)
Observations	3,016	3,016	3,016	3,016	3,016	3,016
R-squared	0.008	0.017	0.008	0.022	0.011	0.009
Controls	Yes	Yes	Yes	Yes	Yes	Yes
District f.e.	Yes	Yes	Yes	Yes	Yes	Yes
Mean (control)	0.249	0.476	0.319	0.0733	0.0370	1.155

Standard errors clustered at the village level in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 14:
Participant droppped study VSLA

VARIABLES	(1) Dropped from baseline SG Midline	(2) Dropped from baseline SG Endline
ITT: OB loans	0.084***	0.062
	(0.030)	(0.040)
Observations	1,621	2,040
R-squared	0.037	0.034
Controls	Yes	Yes
District f.e.	Yes	Yes
Mean (control)	0.193	0.268

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 15:
Index of satisfaction with group at midline

VARIABLES	(1) All	(2) All	(3) Dropouts	(4) Stayers
ITT: OB loans	-0.087*	-0.081	-0.161**	-0.010
	(0.050)	(0.054)	(0.079)	(0.051)
Observations	1,358	1,358	369	989
R-squared	0.007	0.069	0.116	0.049
Controls	No	Yes	Yes	Yes
District f.e.	No	Yes	Yes	Yes
Mean (control)	0.0290	0.0290	-0.201	0.101

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1