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Saving for a (not so) Rainy Day: A Randomized Evaluation of Savings Groups in Mali

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Abstract

High transaction and contracting costs are often thought to create credit and savings market failures in developing countries. The microfinance movement grew largely out of business process innovations and subsidies that reduced these costs. We examine an alternative approach, one that infuses no external capital and introduces no change to formal contracts: an improved "technology" for managing informal, collaborative village-based savings groups. Such groups allow, in theory, for more efficient and lower-cost loans and informal savings, and in practice have been scaled up by international non-profit organizations to millions of members. Individuals save together and then lend the accumulated funds back out to themselves. In a randomized evaluation in Mali, we find improvements in food security, consumption smoothing, and buffer stock savings. Although we do find suggestive evidence of higher agricultural output, we do not find overall higher income or expenditure. We also do not find downstream impacts on health, education, social capital, and female decision-making power. Could this have happened before, without any external intervention? Yes. That is what makes the result striking, that indeed there were no resources provided nor legal institutional changes, yet the NGO-guided, improved informal processes led to important changes for households.

JEL Codes: O12, D12, D91
Keywords: Micro-savings, Savings groups impact

1 Introduction

Most of the world's poor do not have ready and affordable access to banking services. For centuries, informal, often collective mechanisms called rotating savings and credit associations (ROSCAs), have evolved to simulate savings services.[2] Yet even when such practices are present, they are effusive, often not reaching the poorest. And often, perhaps relatedly, the structure is not flexible, not satisfying the financial service needs of the poor.

This gap thrust microcredit to the forefront of development policy. Despite receiving massive attention and funding, microcredit institutions, whether banks or nongovernmental organization, often find between 10% and 30% of households want to participate (Angelucci, Karlan, and Zinman 2014; Attanasio et al. 2014; Augsburg et al. 2014; Banerjee et al. 2014; Crepon et al. 2014; Tarozzi, Desai, and Johnson 2014; and for a summary, see Banerjee, Karlan, and Zinman 2014). Moreover, their ability to reach remote villages is often extremely limited: in our sample in Mali at baseline, fewer than 30% of villages had a formal credit institution within 15 kilometers.

In response to low participation rates and often high interest rates of microcredit, several large international NGOs began promoting "savings groups", in short improved versions of often already present informal arrangements (ROSCAs, and accumulating savings and credit associations, or ASCAs). The response has been clear: take-up has been in the millions, reaching communities where microcredit institutions have no presence, and at relatively low cost. Oxfam America ("OA"), Freedom from Hunger ("FFH"), and the Strømme Foundation ("SF") has introduced savings groups in Mali, Senegal, Niger, Burkina Faso, Benin, Cambodia, El Salvador, Honduras, Mexico, Colombia, Uruguay, Brazil, Peru, and Guatemala. CARE, Save the Children, PLAN and Catholic Relief Services all have major programs promoting similar savings groups. The worldwide number of people participating in savings groups was estimated to be almost 7.5 million as of 2013, up from 2.3 million in July 2010 (Allen 2013), with 400,000 in Mali, the site of this study.

Naturally this prompts the obvious question: what exactly is new? How can a finance intervention have take-up in the millions when it relies entirely on resources and institutions already present? There is no infusion of outside capital, no introduction of new formal institutions, no new physical technology, and no new regulatory body making savings safer.

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[2] In the typical ROSCA, participants save a fixed amount every week, and each week one member takes home the entire pot. The cycle continues, with each member saving every week, until all members have received the pot once.

Instead, the intervention merely modifies existing informal mechanisms with two key distinctions: flexibility combined with commitment, and the involvement of NGOs.

The primary innovation, compared to ROSCAs, is flexibility. Members are allowed to take out loans from the accumulating fund, instead of having to designate an individual to take home the entire pot each week as in traditional ROSCAs. The groups also set their own rules about weekly contributions, the interest rates on loans, and penalties for late contributions. SfC is, however, less flexible than a ROSCA in one dimension: the entire group has to agree upon a common time in which to receive the lump sum payout at the end of the yearly savings cycle. That may be an attractive feature, however, if the needs for funds of group members tend to fall at the same time of the year, e.g. in the lean season when food stocks are low and the need for capital for agricultural inputs high. In doing so, SfC can help members better smooth consumption in the face of aggregate shocks, not just idiosyncratic shocks like most informal risk sharing arrangements, by moving consumption from one period to another. Since literacy in Mali is very low, particularly among women[3], SfC staff train women on an oral accounting system in order to keep track of outstanding loans and total savings balances of each woman. This oral accounting "technology" is new, and helps to make the flexibility work (the flexibility requires some form of recordkeeping). The oral accounting system also facilitates some commitment through peer pressure, since it engages members in details of each other's finances. Second, the NGOs' role may also be important for generating participation by either providing a quality signal on the financial product or a persuasion effect from a belief that NGO advice should be followed (although we will argue that this could explain initial adoption, but not sustained usage).

Using a randomized evaluation in 500 villages with a household panel survey covering over 6,000 households in central Mali, we study the impacts of the SfC program on women's access to finance, economic activities such as small business operations and farming, food security, assets, and social capital and intra-household bargaining power. Supplemental high frequency panel survey data on approximately 650 households enable us to measure consumption smoothing across seasons. Of the 500 study villages, 209 villages were offered SfC while the remaining 241 villages served as control communities. About 37% of women in the baseline sample had joined SfC by endline, three years after the baseline.

In an intent-to-treat (ITT) analysis, we find that access to savings groups leads to an increase in total savings of 30% and a three percentage point increase in the likelihood of receiving a loan in the last year. We find some suggestive evidence of increased agricultural output, but we find

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[3] 92% of female respondents in our survey were illiterate at baseline.

little evidence of increased investment in small businesses. Households significantly increase their livestock holdings – the most important form of buffer stock savings for Malian households. Households in the intervention villages report higher food security and consumption data collected every three to four months reveal that treatment households are able to better smooth food consumption over the year, though the level of consumption at endline (collected soon after harvest) is no different across treatment and control. We do not find any evidence of increased investments in education; health or health expenditures; women's bargaining power, involvement in the community or social capital.

So why does this "new" arrangement change behavior, in turn affecting economic outcomes such as livestock holdings, food security and consumption smoothing? In other words, what is the mechanism through which the savings groups shifted actual behavior? We do not think there is a single mechanism. The changes in behavior, and economic outcomes, are important, and the scale of this worldwide "movement" promoting savings groups has been huge. We think of potential mechanisms in two main categories: changes due to mitigation of market failures, including information asymmetries and information costs for starting flexible savings groups, and changes in preferences or the management of cognitive biases.

We have no dispositive evidence on mechanisms, but rather suggestive and exploratory evidence on a number of potential mechanisms. For example, we find some evidence that women become more future oriented in treatment villages compared to control. This could either be a result of increased buffer stock[4] or a direct effect from the savings group model. We do not find that individuals identified in the baseline as more time inconsistent are more likely to join SfC groups but this may reflect data limitations. We are not able to provide any direct evidence on whether risk sharing improved, though the fact that buffer stock savings (livestock) increased points towards improved intertemporal smoothing and not risk sharing – as households who could better share risks would not need to hold large buffer stock savings.[5]

We also find that a sustained role of the NGO is necessary for the program's benefits to expand. SfC is designed to be self-replicating, so that an NGO worker only need to train the first group of women in a given village. A "replicating agent" (RA) was selected from the women in the first group and then trained on how to start new groups within the village or in neighboring areas. We observe some evidence of these intended spillovers: approximately 6% of women in control groups at endline report being members of savings groups with similar characteristics as SfC. In

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[4] Dean and Sautmann (2014) show that time preference as captured by price list experiments, as we used, is affected by the respondents' current financial situation and credit constraints.

[5] Livestock is, however, both buffer stock savings and an asset providing a risky but positive return.

order to assess what factors may limit the spread of SfC – and perhaps give insights into why groups like SfC did not organically occur in the absence of an NGO – we varied within the treatment group how replicating agents were trained. In randomly selected treatment villages, RAs were provided with more structured and formal training while in the remaining villages RAs received less intense, less formal training. The impact is stronger for the more formal and intense training, suggesting that despite the simplicity of the program, a sustained involvement of the NGO in the program's expansion is beneficial.

Other work on similar savings groups – implemented by DanChurchAid, CARE, the International Rescue Committee and Catholic Relief Services – in East Africa have found mixed evidence on impacts. Ksoll et al. (2013) find some evidence of improvements in consumption in Malawi using a cluster design with 46 villages but limited evidence of increased small business activities. In Burundi, Bundervoet (2012) finds the largest impacts using 77 savings groups: three months after the end of one cycle, VSLA members had higher consumption and assets.[6] Ongoing work by Karlan, Savonitto, Thuysbaert and Udry (2012) evaluating the CARE model in Uganda, Malawi and Ghana find some evidence of women investing more in small enterprises and improvements in food security but no change in assets after two years of the program. Greaney, Kaboski, and Van Leemput (2013) find that an alternative implementation model where savings group trainers are paid for their services, instead of being paid NGO staff, increased the quality of the savings groups – as captured by small business investments of members - by improving selection into the savings groups. Privatized groups attract better off (at baseline) members than the standard model. There is no control group who did not gain access to savings groups. Their finding raises an interesting question of the tradeoff between cost effectiveness and the type of valuable consumption smoothing we observe in Mali. This may be particularly important given the interest in the organizations implementing savings groups to target the ultra-poor and households who are not likely to benefit from more formal microfinance institutions.

This paper proceeds as follows: Section 2 describes the intervention and section 3 gives an overview of the experimental design and the available data. Section 4 discusses adoption, how women use SfC and its impacts on savings and use of credit. We then present the main impact estimates in section 5. In section 6 we discuss why an NGO was necessary to introduce this product, and section 7 discusses the potential underlying mechanisms. Section 8 concludes.

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[6] The experimental design asked interested women to form into groups, and then randomized the timing of when those groups were trained in the savings group methodology in a public lottery.

2   Intervention

Saving for Change (SfC), is a community-based savings group program developed by OA/FFH. The SfC program builds on the ASCA model, enabling women to organize themselves into simple savings and credit groups. The objective is to improve savings and credit opportunities, especially for those who are not reached by institutional lenders and ROSCAs. After an introductory village meeting in which the NGO agent explains the working of SfC, twenty or so women voluntarily form a group that democratically elects officers, sets by-laws, meets weekly, and collects savings from each member. Each woman is also asked to describe a savings goal at the beginning of a cycle. At meetings, each woman contributes a savings amount (previously established by the members) to a communal pool, which grows in value each time the group meets. When a woman needs a loan, she proposes the desired amount to the group. Once all demand has been voiced, the group collectively discusses whether there are enough funds and how to divide funds, and prioritizes requests if there is more demand than funds. Loans must be repaid with interest, at a rate set *ex ante* by the members. Each group manages its own funds which are entirely internally generated (with no matching or external loans provided), and all transactions occur in front of the group for full transparency.

In Mali, literacy rates – particularly among women – are very low.[7] ASCAs which enable women to take out loans from an accumulating pot are quite rare, perhaps because keeping track of each women's credit and debits is challenging without written records. SfC in Mali uses an oral accounting system to keep track of savings amounts and outstanding loans.[8] This likely facilitates more flexibility in terms of savings and loans than could otherwise be accomplished in traditional ASCAs.

At a predetermined date, the cycle ends and the group divides the entire fund among members, which is referred to as a share-out. The timing can coincide with times of high cash flow requirements such as festivals, the planting season, or the "hungry" season. The interest from the loans gives each member a positive interest rate. The group then decides whether to start a new cycle, and under what conditions. At this time, groups sometimes opt to increase their weekly contributions, accept new members, or change leadership positions.

The SfC-promoting NGOs offer significant technical support to SfC groups, particularly during the first year after which the program is introduced in a village. However, the NGOs do not

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[7] In our baseline survey, 14% of women reported being able to read or write.

[8] The system is based on each woman always sitting in the same location in a circle, and remembering her own savings, and loan and fines balances as well as those by the woman sitting to her right. The women are all also supposed to remember the total amount in the cash box after each meeting.

introduce any outside capital into the groups. The SfC groups are formed and supported by two types of agents: "hired agents" (paid employees of a local NGO and trained formally), and "replicating agents" (local women from a village in which a hired agent formed a group, and trained by the hired agents). The program aims to generate many replicating agents, thus giving the program independence from the activities (and thus subsidies) of the NGO. In practice, however, hired agents often assist replicating agents with creating and training new groups.

3   Experimental design and data

The experiment was implemented as SfC expanded into new geographic territory. The study sample was comprised of 500 villages in the Segou region.[9] Study villages were divided into 209 treatment villages and 291 control villages.[10] We stratified the randomization by commune and used a re-randomization procedure to ensure balance on a number of village characteristics.[11]

Treatment villages were divided into catchment areas of about 15 villages each by OA/FFH and local partner NGOs. As described above, hired agents work intensively in a given village for one year before transitioning to a role where they support the replicating agent. This enables the hired agents to continuously expand the number of villages with SfC over time. In the study area, each hired agent was assigned a catchment area and was instructed to target 10 villages in the first year of implementation (May 2009-April 2010). In the following year (May 2010-April 2011), hired agents continued to support villages targeted the first year and also introduced SfC in the remaining villages in their zone. During the third year (May 2011-April 2012), the number of hired agents decreased and the territories expanded somewhat. Hired agents continued to

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[9] The 500 villages were spread across four administrative "cercles": Segou, Bla, San and Tominian. There are 7 cercles in the Segou region and 49 in all of Mali. The four in the study are east of the regional capital and form a contiguous geographic area. The villages were selected from government lists of villages in almost all communes (a unit larger than the village and smaller than the cercle) in those four cercles. 11 of 84 (6 of which are in San) were removed from the sample frame because other NGOs had already been promoting savings groups there.

[10] More control than treatment villages were selected in order to improve statistical power for measuring spillovers to control villages (using variation in proximity to treatment). However, we found little correlation between distance to treatment village and the existence of SfC-like savings groups in control villages.

[11] The village-level variables for which balance was checked were: number of households in the village, distance to paved road, distance to market, availability of electricity and the presence of formal credit, schools, a health center and ROSCAs. We re-randomized until for none of these variables a test for the equality of means between treatment and control villages yielded a p-value smaller than 0.35. See Bruhn and McKenzie (2009) for an analysis of this approach, and suggested improvement, to instead draw a fixed number of random assignments and then choose the "best" one based on a pre-determined objective criteria (such as largest smallest p-value across all pairwise tests, or largest p-value for an aggregate test).

support existing replicating agents, added extra groups in neighborhoods of big villages/towns, and implemented follow-up to strengthen older groups.

In order to investigate the way in which the training method of the replicating agent affects program impacts, treatment villages within each catchment were randomly assigned to one of two replication types. Replicating agents in *structured replication* villages participated in a formal, three-day training. As part of the training, replicators received a pictorial guide and a certificate stating they are certified to form SfC groups. In *organic replication* villages, replicating agents were not provided with the formal training and material resources. Hired agents provided support (answering questions and giving advice) to replicating agents, whether in the structured or organic villages. Hired agents were instructed to target an equal number of villages from each replication type within the first year.

3.1 Data

We collected panel data with a comprehensive household survey at baseline and endline on almost 6,000 households (representative at the village level). For 606 households of the 6,000 households, we also conducted surveys at higher frequency, either every two to three weeks or every three to four months over a 20 month period, in order to examine consumption smoothing outcomes.

3.1.1 Full-sample surveys

We conducted a comprehensive household panel survey on almost 6,000 households (baseline survey in February-May 2009, and endline survey three years later, February-May 2012). To generate the sample frame, we first conducted a census survey of all adult women in the 500 villages in the study. In each village, 12 women from the census list were randomly selected for inclusion in the baseline survey, totaling a sample of 5,993 women in 5,954 households.[12]

The endline survey targeted the same households and women. Of the 5,954 households in the baseline sample, 5,601 (94.1%) were resurveyed in the endline survey. As a number of sections in the survey were administered to only one woman in the household (the primary female respondent), we tried to interview these same women in the endline. If the baseline female primary respondent could not be re-interviewed after repeated visits, she was replaced by another randomly selected female from the same household. For 5,094 of the 5,602 households surveyed in the endline, we managed to re-survey the same baseline female primary respondent; in 386 households, the baseline primary respondent was replaced by

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[12] As we sampled women randomly from the census list and households often have multiple adult women, there are about 40 households from which more than 1 woman was drawn.

another woman in the same household; and in the remaining 122 households no adult woman could be interviewed. The percentage of baseline primary respondents who were re-surveyed in the endline survey was thus 85.9% (5,094 out of 5,954) and the total endline sample of primary respondents 5,462 (see Table 1A for an overview).

The baseline and endline surveys included an adult, household and village questionnaire. The adult questionnaire was administered individually to the primary female respondents and the primary female respondent's husband, and included sections on savings, credit, risk aversion, time preferences and cognitive ability (digit span and raven's test). For primary female respondents, there were additional sections on malaria knowledge, social integration, intra-household decision making, social capital and food security. We define a household in this context as the primary female respondent, the person she defers to (i.e., her authority figure, most often her husband), and this person's immediate dependents. This would include other wives if the respondent's husband (i.e. her authority figure) is polygamous, for example. In about 75% of cases, the household is embedded in a larger household structure, but we focus in this paper on outcomes at the household and female respondent-level.[13] The average size of the small household in our data is 7.4. The household module included sections on migration, education, health, livestock, agriculture, other economic activities, housing, assets, transfers, food consumption and non-food expenditures.

3.1.2 High-frequency surveys

Between the baseline and endline surveys, we conducted high frequency surveys on a subset of 684 randomly selected households (from both the treatment and control groups). The sub-sample for the high-frequency surveys was drawn in different steps. First, we selected four centrally located larger villages spread out over the study region to serve as the base villages for our enumerators and determined the study villages reachable in under two hours by motorbike from these base villages. From this set of 333 villages, we randomly sampled 60 treatment and 60 control villages. From each group, 24 villages were randomly selected to receive survey visits every two weeks, with the remaining villages receiving survey visits every three months. Finally, we randomly sampled seven households from the baseline sample in

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[13] We collected some information on extended family, including joint agricultural production and food consumption. The extended families are quite large: on average there are 19.2 members; the 90th percentile is 41 members.

each of the two-week villages and five in each of the three-month villages. The original sample frame thus consisted of 120 villages.[14]

The high-frequency questionnaires included fixed modules on financial transactions, transfers, health, non-agricultural income, expenditures and asset transactions and a variable component that, on a rotating basis, asked about agricultural production, crop stocks, food consumption, food security, and education. The high-frequency surveys were conducted over a 20-month period (June 2010-January 2012). In total, 5,815 interviews of 309 households and 989 interviews of 297 households were completed in the two-week and three-month villages, respectively.

3.2   Balance check and attrition

We conduct different tests, for both the full sample and the high-frequency sample, to verify that there are no important observable differences between the treatment and control groups. Appendix Table A2 compares the treatment and control groups along 24 covariates and summary indices constructed using these covariates. For the full sample, (a) a simple mean comparison along the 24 covariates and the 6 indices, reported in Appendix Table A2, fails to reject equality in 29 out of 30 tests, (b) an aggregate test at the household level, in which we regress assignment to treatment on the set of indices and the food consumption measure, fails to reject orthogonality (p-value of 0.61 reported at the bottom of Appendix Table A2). The same tests for the high-frequency sample indicate that imbalance is not a concern.[15]

Appendix Table A3 reports tests for differential attrition between the treatment and control group. The left panel shows that mean attrition is slightly higher in the treatment group (1.3 percentage points, se = 0.7 pp). However, in a regression of attrition on the six indices and food consumption, treatment status and the interaction of treatment status and the seven covariates, a test of the joint significance of treatment status and the interaction terms fails to reject that the composition of attrition is the same in treatment and control (p-value of 0.27 reported at the bottom of Appendix Table A3). In the high frequency sample, there is no evidence of differential attrition between treatment and control: we fail to reject the equality

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[14] Soon after the start of the high-frequency surveying, 8 of the originally sampled villages turned out to be too far away from the base villages or unreachable during several months of the year. These villages were replaced by other randomly selected villages.

[15] The sample in these tests is the sample obtained after the early replacement of the 8 villages (as described above). Since our main outcome of interest is consumption smoothing, our final sample consists of the households for which we have at least one consumption observation. Attrition is defined accordingly.

of mean attrition (a difference of 1 pp, se = 2.4 pp) and of the composition of attrition (p-value of 0.59).

3.3 Baseline sample characteristics

As shown in Appendix Table A2, a study village has on average about 1,000 inhabitants, is 23 kilometers from the nearest paved road, and reachable by truck during nine months per year. About 70% of villages have a primary school in the village, and 20% have a health center. Prior to the intervention, approximately 22% of women were members of a ROSCA. Approximately 35% of primary respondents had received a loan in the last 12 months while 29% had given a loan. Of all female adults in the household aged 20 to 65, 22% received at least one transfer (either cash or in-kind) from another household in the last 12 months while 17% had given a transfer. Approximately fifty percent of primary respondents operated a business and a small portion (5%) engaged in paid labor. Over the past year, households invested $19.65 in agriculture and $15.71 in education. Livestock holdings averaged $690.60. About half of the primary school aged children were enrolled in school.

3.4 Econometric specification

Given that treatment assignment was random, the main identification strategy is straightforward. Our principal estimating equation for impacts on outcome measures in the full-sample survey is the following:

$$Y_{i1} = \alpha + \beta \, SfC_i + X_{ijt}\pi + \theta_j + \varepsilon_{ijt}$$

where Y_{i1} is the outcome variable of interest at endline for household i, and SfC_i indicates assignment to treatment status at the village level. X_{ijt} is a vector of variables, including Y_{i0} the lagged (baseline) value of the dependent variable, and the variables used in the re-randomization procedure. θ_j are commune dummies, i.e., the stratification variables. Throughout, standard errors are clustered at the unit of randomization, the village.

4 Adoption, savings and use of credit

4.1 Adoption rates and usage of SfC

With informal groups trained by replicating agents, participation in a SfC group is not simple to define. We define SfC groups are savings groups that women report as being "applause

groups"[16] that hold regular meetings and have received training from someone outside the group. Table 2 shows take-up is 29.7% in treatment villages and 6.3% in control.

Appendix Table A1 presents several descriptive statistics on SfC usage. Average weekly savings contributions were $0.48. Given that women joined SfC at different points in time, not all women had completed a savings cycle by the time of the endline survey: 83% of SfC members report having received at least one share-out (i.e., end-of-cycle withdrawal of savings by all participants). The average number of share-outs was 1.68 and the amount of the most recent share-out averaged $30.64. Most share-outs (53.5%) occurred in April-June, i.e. the months preceding the lean season (July-October). The most frequently reported uses of the share-out proceeds were food (47%) and small businesses (27%). A little under half of the SfC members reported having received a loan from the group in the last 12 months before the survey, for an average loan amount of $20.39. The most frequently reported uses of the SfC loans are food (38%) and small businesses (42%).

4.2   Characteristics of SfC adopters

Table 3 compares baseline characteristics of adopters and non-adopters in treatment villages. Adopters tend to come from somewhat larger and somewhat wealthier households, as measured by food consumption per capita (a difference of 0.24, mean for non-members of 2.68). No differences in participation rates were observed based on the gender of the household head or household ethnicity. SfC adopters were more likely than non-adopters to have resorted to a costly strategy to cope with a shock within the last year (a difference of 4 pp, mean for non-members of 16%). This could mean that these households, on average, faced more serious shocks (and thus the value of a shock-coping mechanism was higher for them), or that these households had fewer pre-existing coping mechanisms to deal with shocks. There were no noticeable differences in levels of food-insecurity between adopters and non-adopters.

SfC adopters were more somewhat older and more likely to be a leader in the village (a difference of 7 pp, mean for non-members of 15%). More adopters were involved in ROSCAs (a difference of 9 pp) compared to non-adopters (20%). Additionally, more SfC adopters had taken a loan in the past year at the time of the baseline survey (a difference of 8 pp, compared to 31% of non-adopters). SfC adopters were not only financially more active but also economically: they are more likely to operate a business and to own livestock. Women who adopted SfC scored considerably higher on the social integration index, the community action index, and the

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[16] Because of a characteristic clap performed at the end of each meeting by most groups, SfC groups are known as "tegereniton" or "applause groups" in Mali.

intra-household decision making power index.[17] Given the communal nature of SfC groups, it is not surprising that women who opted to participate in the program had stronger or more frequent social ties prior to joining the group. Measures of financial patience and time inconsistency were similar between adopters and non-adopters.

4.3 Did SfC increase financial savings and use of credit?

We first look at whether the introduction of SfC into a village led to increases in financial savings and use of credit. As can be seen in table 4A, female respondents from the treatment villages are 4.9 percentage points (se = 1.6) more likely to be members of any type of savings group.[18] Overall, savings held by the primary respondents increased in treatment villages, on average, by $3.65 (se = 1.32, mean in the control group of $11.96) over the course of the study period. This is driven by the increase in savings in ASCAs, including SfC groups ($3.21, se = 0.84). There is a small, but statistically significant decrease, in the amount of savings held in formal institutions (-$1.10, se = 0.56), but very few women have formal savings accounts (1% of the control group).

A woman involved in savings groups prior to SfC may opt to participate in SfC rather than continue with her existing savings group. We find that participation in ASCAs and ROSCAs other than SfC does significantly decrease by 19.7 percentage points (se = 1.9 pp) while SfC participation increased by 24.6 percentage points (se = 1.7 pp). This suggests that the SfC program does crowd out other types of savings groups, and thus some of the changes in economic outcomes are coming not from the introduction of a completely new concept, but rather an improvement in the organization and terms and conditions of the savings groups (i.e., the "technology" improvement).

Table 4b shows that significantly more women reported receiving a loan in the last 12 months in the treatment group (3.3 pp, se = 1.6, mean in the control group of 56%). Of women who

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[17] The intrahousehold decision-making index includes questions on how much influence she has on decisions in the following domains: food for the household, children's schooling expenses, and economic activities such as small business activities. The community action index includes questions on: how frequently she speaks with different village leaders, participation in village meetings and activities, and voting in last elections. The social capital index includes questions about seven other randomly selected community members from our sample and whether the respondent knows the person, would engage in informal risk sharing and transfers with the person, or go to the market together. The components that make up these indices are enumerated in Table 7. The index is constructed – as in Kling, Liebman, and Katz (2007) – by first normalizing (subtracting the mean and dividing by the standard deviation of the control group) each individual variable, and then adding all the normalized variables together. This summed variable is then normalized with respect to the control group.

[18] This includes all ROSCAs and ASCAs – as defined above.

received loans, the total amount received as loans in the last 12 months did not differ between the treatment and control villages ($1.33, se = 1.23). However, respondents from treatment villages did borrow significantly larger amounts from savings groups, on average, compared to control respondents. Women in treatment villages were 12.4 percentage points (se = 1.4) more likely to receive a loan from a savings group and 4.4 percentage (se = 1.6) less likely to receive a loan from family and friends. In Malian culture, it is often considered shameful or embarrassing to ask friends or family members for a loan. Therefore, the impacts point to a benefit of the SfC program that is difficult to quantify but likely quite important: SfC groups provide a less stigmatized source of credit while simultaneously normalizing lending within the community.

5   Impacts

Savings groups may impact a wide set of outcomes, and at the start of the experiment there was no simple and linear mechanism of change. Our partners anticipated increases in economic activities and income, increased investments in health and education, increased consumption and improvements in women's bargaining position and women's social capital. We will present a wide range of outcomes in the following order: economic activities (agriculture, livestock and microenterprises); food consumption and non-food expenditures; food security and consumption smoothing; health and education; and, social capital and household decision-making power.

5.1   Economic activities

Columns (1)-(4) of Table 5 present estimates of impacts on economic activities (agriculture, livestock and small businesses). These show the main impacts, and appendix tables A4A, A4B and A4C provide details on agriculture, livestock, and small businesses, respectively.

5.1.1   Agriculture

In Mali, as other places in West Africa, women farm their own agricultural plots. Columns (1) and (3) show the impact on the value of agricultural output and the household and primary female respondent level, respectively. We find no change in the value of output at the household level, but women in SfC villages had $5.93 more in agricultural value (se = 2.37, mean of control = 25.88), a 23% increase. Appendix table A4A shows that we see no significant changes in agricultural input expenses as a result of the intervention, at either the household or female respondent level. A similar fraction of women in both treatment and control groups reported cultivating land (39% compared to 41%, a difference of 2.1 pp, se = 1.5). Total expenses on inputs were also similar in treatment and control villages (a difference of -$0.10, se = 0.43). Respondents in treatment villages did report a significant increase in the values of both output ($5.93, se = 2.37, mean in the control group of $25.88) and sales ($1.97, se = 0.97, mean

in the control group of $6.95). Given that agricultural inputs (which are typically considered better measured than outputs) did not change, this is a somewhat puzzling finding. In-kind inputs, may have increased: the amount of land women report cultivating increases (0.044 hectares, se=0.027; mean in the control group of 0.3 ha) and men may be providing more labor on women's plots (0.82 of a day, se=0.50; mean in the control group 4.3). Neither of these results is significant at conventional levels, however, and therefore we cannot confidently claim any particular input change that led to the increase in agricultural output.

Columns (7)-(12) show that we also find no changes in the agricultural inputs at the household level. Seventy-one percent of households in the control group cultivated land, which is similar to the treatment group (a difference of 0.2 pp, se = 1.4). Expenses on agricultural inputs too were similar between the two groups (a difference of $4.49, se = 3.79). The value of output and sales did not change at the household level, as they did at the women's level.

5.1.2 Livestock

In West Africa, livestock is both a productive activity and an important form of buffer stock savings (Kazianga and Udry 2006). In order to construct the value of the livestock, we use information households report on the number of different types of animals and then use median prices as reported by community leaders to construct the value of livestock holdings. Table 2 Column (2) shows a large increase in the value of livestock held by households in treatment areas ($119.94, se = 41.33, mean in control group of $895.78). This is a large, 13 percent increase. Appendix Table A4B shows that the magnitude is driven mainly by increased holdings of male cows ($49.73, se = 20.64). The value of goats ($11.47, se = 4.57) and sheep ($12.28, se = 4.70) also increase. The increase in cows is a particularly large effect since in the average share-out, a member would get about $30 and share-outs happen about once a year. The average member in our sample had been in SfC for almost two years. A typical share-out would enable households to purchase a goat or a sheep. This suggests then some crowding-in of investments into cows: cows are large, lumpy investments. SfC may have enabled households to push pass the threshold of being able to invest in one. However, this may also reflect measurement difficulties in capturing the value of livestock when transactions are rare and when quality is not easily observed. If the cows in treatment villages are on average younger and therefore smaller or thinner than in control villages, for example, we may overstate the increase in value of livestock.

Consistent with the increase in holdings, column (8) shows that yearly expenditures related to livestock increased as well ($6.22, se = 3.38) in treatment villages.

5.1.3 Small businesses

Table 5 Column (4) demonstrates no statistically significant increase in small enterprise profits. On average, women in control villages reported business profits of $41 per year, which was similar to those of women in the treatment area (a difference of $5.13, se = 3.82). Appendix Table A4C shows most outcomes related to business development or expansion also show no differences between treatment and control. A similar fraction of women in control and treatment groups had a business (a difference of 1.8 pp, se = 1.3, mean in the control group of 43%). In addition to asking women directly about their business profits, as reported in Table 5, we also asked detailed questions about sales and expenses and constructed an alternative profits measure as the difference between sales and expenses. Using this profits measure, in column (2) of Appendix Table A4C, there are no differences between control and treatment villages either (a difference of -$0.33, se = 2.35, mean in the control group of 36.71).[19] While we see no change in profits, we do find suggestive evidence of increases in both expenses and sales for businesses in treatment villages compared to businesses in control villages: on average, treatment businesses spent $35.66 more (se = 20.77, mean in the control group of $131 per year) and sold $38.56 more (se = 22.75). These differences are significant at the 10% level. Taken together, there is only weak and limited evidence of improvements in business outcomes.

5.2 Consumption and expenditures

As can be seen in Table 5 Column (5), overall monthly household expenditures per equivalent adult on non-food items did not differ in treatment and control villages (a difference of -$0.04, se = 0.11). We do find suggestive evidence of a small increase in total food consumption per adult in treatment villages. Food consumption per equivalent adult in the past week increased by about $0.13 (se = 0.07, mean in the control group of $3.89), a 3% increase. This is a modest effect, significant only at the 10% level. The endline, when food consumption was collected, was after the harvest when most households are not struggling with food security. SfC may, however, have effects on consumption and food security during the lean period as it helps households save throughout the year, resulting in a lump sum of cash prior to the lean season.

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[19] de Mel, McKenzie, and Woodruff (2009) examine different methods of measuring micro-enterprise profits and conclude that simply asking profits provides a more accurate measure of firm profits than detailed questions on revenues and expenses. In our data, the correlation between self-reported and calculated profits is high (.78).

5.3 Impacts on food security and consumption smoothing

5.3.1 Food security

As SfC increases access to loans and improves savings by helping women to save regularly, a portion of these funds may be used to purchase food, resulting in greater food security. We find indeed that food insecurity in treatment villages was lower compared to control villages (Column (7) of Table 5). A food insecurity index developed by FFH that measures chronic food insecurity showed a decline of 3.9 percentage points (se = 1.6, mean in the control group of 43%).[20]

5.3.2 Consumption smoothing

While very detailed and complete, the FFH food insecurity measure may reflect respondents' perceptions of how food secure they are, which is important but may differ from actual food shortages. To cross-check this finding, we verified whether households in fact are better able to cope with seasonal fluctuations and maintain their food consumption at approximately the same level throughout the year, without having to resort to skipping meals or eating less. The high frequency surveys allow us to observe respondents' food consumption in multiple seasons throughout the year. We examine whether households are better able to smooth consumption over the year using the following estimating equation:

$$Y_{ijt} = \alpha + \beta_1 \, SfC_j + \beta_2 Lean_{jt} + \beta_3 \, SfC_j * Lean_{jt} + \gamma Type_i + \tau_t + \delta_i + \varepsilon_{it}$$

where $Lean_{jt}$ indicates whether the outcomes was measured in the lean season (June-September), τ_t is a vector of year dummies, $Type_i$ indicates whether the household is in the two-week or three-month sample and δ_i is a household-level random effect. Because the full-sample and high-frequency survey instruments are quite different, constructing variables in exactly the same way is often impossible – so we do not include baseline and endline data as rounds when analyzing the high-frequency data. Standard errors are clustered at the village level.

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[20] The full FFH food security module is comprised of 18 questions, 9 of which are core yes/no questions that ask whether a person has experienced a certain food insecurity phenomenon (e.g., "In the last 12 months, did you worry that your food would run out before you had money to buy more food?"). Nine additional questions ask how often this phenomenon occurred: 'rarely,' 'sometimes,' or 'often.' Whereas the basic FFH food security index is based on the number of positive answers to the yes/no questions, the chronic food insecurity takes into account only phenomena that occurred sometimes or often. As a more simple measure, w also find that respondents in SfC villages were 2.8 percentage points less likely to report they did not have enough to eat (se = 1.6, mean in control group of 37%).

Results are reported in Table 6. We find that weekly food consumption per equivalent adult falls in the lean season for all households (-$0.36, se = 0.11). However, we find evidence that households in treatment villages experience a smaller decline in food consumption in the lean period. The coefficient on the interaction term $SfC_j * Lean_{jt}$ is positive ($0.36, se = 0.16). In fact, since the magnitudes are the same, SfC allows households to smooth consumption throughout the year. This is consistent with the finding from the FFH food security measure.

The fact that no important differences were seen in levels of food consumption may seem contradictory to the finding that food security increased in treatment villages. Note that the time periods for these two outcomes are not the same: food consumption is measured for the past seven days, whereas food security is measured for the past 12 months. Endline data collection occurred shortly after the harvest, during a season of relative plenty, when we would expect to find smaller effects of SfC on food consumption. As we have seen above, the high frequency data provide evidence that SfC did have positive effects on food consumption levels in the lean season. Thus this is consistent with SfC contributing to important reallocation of resources, to consumption smoothing, but not to higher levels of aggregate income over the year.

5.4 Health and education

5.4.1 Health

The most frequent type of shocks households face is illness. We present an index of health outcomes in column (1) of Table 7 and find no difference in health outcomes between SfC and control villages.[21] The magnitude of estimate is also quite small (0.0008, se=.03). Columns (1)-(6) of Appendix Table A5 provide a closer look into some individual outcomes. We do not find that the SfC intervention affected the likelihood of illness or changed the way in which households dealt with health shocks. Treatment and control households are also equally likely to consult a health facility, reported similar amounts of health expenditures from the last month (a difference of $0.21, se = 0.38) and financed health expenditures in the same ways: they were equally likely to sell households assets or take a loan from a savings group or other source in order to pay for health expenses.

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[21] The index includes whether households had experienced serious illness in the last month; whether a household member consulted a health center; total household expenditures; and means of financing health expenditures. The notes to Table 6 provide more detail, and Appendix Table A6 shows the estimates for many of the individual outcomes in the index.

5.4.2 Education

Our implementation partners anticipated that households would be better able to pay for school supplies and fees, leading to eventual improved education. In Table 7 Column (2) we again use an index over education variables, including enrollment for children of different genders and age ranges and educational expenses.[22] However, we do not find evidence of changes in educational outcomes. The point estimate on the index is 0.02 of a standard deviation (se=0.02). Columns (7)-(11) of Appendix Table A5 show detailed educational outcomes. The rate of both primary and secondary enrollment for boys and girls was the same, on average, for treatment and control villages. There is a slight increase in educational expenses per capita in the treatment group; the treatment group spends, on average, 8% more than the control group ($0.50, se = 0.28, mean in the control group of $6.06), which is significant at the 10% level.

5.4.3 Housing

Table 7 Column (3) examines whether housing quality was impacted by the offer of a savings group. The housing index includes measures of the quality of the household's roof, walls, and floor; whether the household has access to water in the house; the availability of electricity; the presence of a latrine; and the use of coal or gas for cooking. We find that the housing index increased by 0.06 of a standard deviation (se=0.03) in treatment villages. There is evidence that households were also able to improve the quality of their housing stock as a result of SfC's presence in the village.

5.5 Social capital and intra-household decision-making power

5.5.1 Social capital

We see no significant differences between treatment and control respondents along various measures of social capital (Table 7). Our measures of social capital include a battery of questions on engagement in the community, such as speaking to the village chief or councilor, participating in village meetings, or voting, as well as questions on social networks, such as asking others for help, being willing to help others, going to the market with other women, etc. Column (4) shows an index of the community-based questions and column (5) presents an index of the social network-based questions. The point estimates are small in magnitude and

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[22] Included in the index is: enrollment of male children between 6 and 12 years old; enrollment of female children between 6 and 12 years old; enrollment of male children between 13 and 18 years old; enrollment of female children between 13 and 18 years old; and educational expenses last 12 months.

precisely estimated, suggesting that there were no changes in social capital along the dimensions we measured.

This is in stark contrast to results by Feigenberg, Field, and Pande (2013), which found that increased frequency of meetings for group-based microcredit can increase social capital, alleviating constraints stemming from asymmetric information. SfC groups were entirely self-formed, so the formation of the groups may have relied on existing social capital without necessarily expanding it. In Feigenberg, Field and Pande, many group members had pre-existing weak ties but a bank officer assigned women into groups.

5.5.2   Female decision-making power

We also find no impact on women's decision-making power as shown by an index in column (6) of Table 7. Included in the index are a number of questions, including e.g., whether the woman is free to decide on her own about food expenses, about education expenses, or about business decisions. In no individual measure, nor in the index of all questions (a difference of 0.02, se = 0.03), do we see a statistically significant change.[23]

6   Why was an NGO necessary?

Given that SfC is not fundamentally different than informal savings institutions observed in other parts of the world, why was it necessary to have an NGO intervene to provide this product and improve food security? As mention in section 3, the experimental design included two different treatments: "structured" and "organic" replication. In structured replication villages, replicating agents were formally trained by the program, given a pictoral guide and given a certificate of training. By contrast, organic replicating agents were only provided with on-the-job training by the technical agent. This allows us to see how easy it is to implement SfC once people know the general concept, thereby getting at whether there are high information costs and/or a role for endorsement effects of organizing such an ASCA – perhaps due to low literacy (though we do not have a treatment with and without oral accounting since it is an integral part of the program). We do not, however, believe the NGO endorsement can explain the sustained usage we observe among SfC members: the average SfC member had been a member for almost 24 months and less than 10% joined and subsequently quit a group, unlike in Karlan, Knight, and Udry (2013).

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[23] Note that the balance check indicated that the average household in the treatment villages scored somewhat higher on the index of intra-household decision making power. If this were to bias the impact assessments in any way, we would most likely expect to find an erroneously large effect of the SfC program on decision making.

We examine whether impacts differ between villages with structured versus organic replication. If SfC is difficult to implement without a lot of support, we anticipate the benefits to be higher in structured than organic treatment villages. Table 8 shows that this is indeed the case. First, villages where replication was structured had significantly more SfC members, on average, than organic villages. Total savings is likely higher in structured villages than in organic villages ($5.21 compared to $2.08), though the difference between groups is only at the margin of significance (p value = 0.11). The main effect in Table 7 on housing quality was driven by structured villages (column 7). Furthermore, only households in villages with structured replication scored lower on the FFH food insecurity index (-0.06, se=0.02). Overall, these results suggest that even with some NGO support, these groups were not capable of improving food security.[24] It is therefore not surprising that these groups did not spontaneously develop without outside assistance. There are multiple reasons for this: it could be that organic replicators did not have sufficient information to train groups properly, or that organic replicators may perform worse because they do not have the advantage of a quality signal or persuasive power of the NGO (in the form of the certificate and prestige from travelling outside the village at the request of an NGO) to generate higher participation.

7   Mechanisms

SfC is a simple intervention that seems to have increased savings (in cash and in livestock), the use of credit, and improved households' ability to smooth consumption. As SfC does not rely on outside capital, and is merely an improved version of preexisting informal financial arrangement (ROSCAs) with which all are familiar, the question is: how and why does SfC change behavior? In this section we discuss a number of underlying constraints and potential mechanisms that generated the impacts we found on household finance and consumption smoothing. We do not put forward one particular of these mechanisms as "the" answer. Instead, we outline a number of potential mechanisms and provide the evidence that we have for or against each. Most likely a number of mechanisms are at work. This experiment focused on having sufficient power to detect impacts of the implementing partners' preferred method of implementing SfC. Future work on mechanisms would need to test alternative interventions, collect more nuanced and detailed process data, or expand the sample frame and identify mechanisms through testing for heterogeneous treatment effects.

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[24] Unfortunately we do not have sufficient sample size in the high frequency surveys to analyze the smoothing results by the two different treatment arms.

7.1 Cognitive Biases and Preferences

Here we detail several cognitive biases and potential shifts in preferences that were generated by the introduction of SfC. We discuss time inconsistent preferences and patience below. Weekly meetings may also affect other cognitive biases, such as attention and task management. However, we have no proxy for attention issues in our survey instruments, to examine whether there were heterogeneous treatment effects on those with low attention to household finance task management. The SfC methodology also encourages members to set a savings goal, which could induce increased savings through a labeling effect (Dupas and Robinson 2013).

7.1.1 Time inconsistent preferences

SfC may have made an impact addressing the needs of those with time inconsistent preferences. SfC offers a commitment device to save weekly, which may help households to use savings to better smooth their consumption throughout the year. The saving cycles are often structured so that the lump-sum payouts are distributed in the period leading up to the lean season. Gugerty (2006) highlights that informal savings groups, particularly ROSCAs, offer participants a commitment device to save. Dupas and Robinson (2013) suggests that savings groups which combine commitment with the flexibility of loans, as does SfC, can increase saving and investment. Commitment savings products have been shown to increase savings and to be in demand particularly among those with time inconsistent preferences (Ashraf, Karlan, and Yin 2006) as recent theory also predicts (Basu 2011). Furthermore, more recent evidence suggests that commitment devices still need some flexibility to function best (Dupas and Robinson 2013; Karlan and Linden 2014).

However, in Table 3, we find no evidence that female respondents who demonstrate time inconsistent preferences, as measured by similar survey questions as in Ashraf et al (2006)[25], are more likely to participate in SfC. Our measure of time inconsistency is, however, problematic: the responses between the baseline and endline are uncorrelated in the control villages. We therefore do not see this as dispositive, and have little direct evidence on the role of commitment as a mechanism.[26]

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[25] At two different points in the baseline survey, we asked whether the respondent would prefer 2000 FCFA in 6 months or 2500 FCFA in 7 months (or neutral), and whether the respondent preferred 2000 FCFA today or 2500 FCFA in 1 month (or neutral).

[26] In the survey we collected information on regretted expenses, which may correlate with time inconsistent preferences, but less than 5% of the female respondents reported any expenses they regretted. We also find no evidence of heterogeneous treatment effects by the baseline time inconsistency measure.

7.1.2 Patience

SfC may have made an impact through the NGO quality signal or NGO persuasion effect on patience. If, for instance, the NGO was a trusted entity, individuals may have shifted their beliefs as to the optimal level of savings. Or, as discussed earlier, one could argue this is a shift in preferences via a persuasion effect (these are empirically indistinguishable in our setting). The disciplining device of a commitment savings product may also shift time preferences.[27] Indeed, in table 7, we find that female respondents in treatment villages are slightly more likely to be patient (2.2 percentage points, se=0.012, mean in the control group of 19%) than respondents in the control village at endline.

7.2 Market failure: screening, monitoring and enforcement

Households rarely achieve complete insurance due to asymmetric information failures such as limited screening, monitoring and enforcement (Townsend 1994; Kinnan 2012; Ligon, Thomas, and Worrall 2002) in both formal and informal institutions. As a result, there is a mismatch between households' cash flow needs and those offered by either formal or informal financial alternatives. That is, products offered do not provide the flexibility that people need. SfC, in theory, can be construed as an organizational "technology," one that helps mitigate asymmetric information constraints.

When the program is introduced, two aspects are emphasized as new members are trained: the well-defined process for each member maintaining, orally, the information on total savings and outstanding loans of exactly two other group members, in order to compensate for the lack of written records; and the group-level process of requiring public explanations of what each will do with the loans they request. This process thus improves the flow of monitoring information for peers, and allows members to screen each other better when approving each other's loans. We cannot, however, provide direct evidence of this mechanism using the field experiment as these aspects of the program which address asymmetric information are integral to the program and therefore were not experimentally varied.

If risk sharing was improved, however, then households would not need to rely as much on buffer stock savings in order to smooth consumption. We in fact find a large increase in livestock holdings. This is suggestive of households increasing their intertemporal savings abilities rather than improving their contemporaneous ability to share risk.

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[27] Carcalho, Prina, and Sydnor (2013) provide suggestive evidence that even traditional savings account access can make individuals more patient.

7.2.1 Intra-household bargaining

If households are not unitary (Browning and Chiappori 1998), relaxing the community-level constraints on monitoring, screening and enforcement which may have prevented savings groups from functioning well may also affect household outcomes by altering women's ability to implement their preferences on expenditure patterns. Anderson and Baland (2002) suggest that women participate in ROSCAs in order to impose female preferences over consumption and savings onto husbands, altering the resource allocation within the household. If households are inefficient as Anderson and Baland suggest, then SfC may then enable women to better implement their preferences vis-à-vis the men in their households. we would then expect to see women reporting more influence on decisions – for example, being more able to decide about food expenses. However, as discussed in section 5.5.2, we find no evidence of changes in women's decision-making power. Table 7 shows the treatment effects on an index capturing intrahousehold decision-making. Of particular interest given the empirical results, is the question on whether the female respondent was free to make decisions on food expenses. The point estimate on women's influence on food expenses in particular is very small and statistically insignificant (-0.01 pp, se = 0.02, mean in the control group of 0.41). We find no direct evidence on this channel with what we expected to be a directly related measure of women's ability to influence food security. We also find no evidence of women with baseline low bargaining power benefiting more from SfC, as shown by tests of treatment heterogeneity.[28]

8 Conclusion

By promoting a specific form of an accumulating savings and credit association which is more flexible than existing informal savings groups while maintaining the role of commitment, our partner NGOs facilitated an increased access to financial management tools. This led to increases in savings and access to loans in treatment villages. While we do not observe any increase in small enterprise activity, as anticipated by the NGOs, access to SfC in treatment villages did increase investments in livestock and improve food security and consumption smoothing. We also saw evidence of increased agricultural output, although no accompanying statistically significant increase in inputs. We found no evidence of changes in health or education investments or in women's standing in the village.

The group-based micro-savings movement is quickly expanding, with millions of participants worldwide. It is inexpensive compared to microcredit, does not require outside capital, and has low administrative costs. Using financial and administrative data from OA/FFH and our take-up

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[28] These estimates are available from the authors upon request.

data, we estimate implementation costs per household to be under $20. The structure of the savings groups promotes replication of other savings groups, though this experiment has shown the replication process does require some involvement by the NGOs. Future research could further disentangle the underlying mechanisms of how savings groups improve households' consumption smoothing. Furthermore, since the aspiration of such programs is to increase the level of consumption, further innovation could explore, e.g., combining this approach with infusions of outside capital, if in fact the lack of infusion of capital is a hindrance to growth.

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Table 1: Number of observations

	Nb. of villages	Nb. of households
A. Full Sample		
Observations		
Baseline	500	5,954
Resurveyed at endline	500	5,579
Endline	500	5,603
B. High Frequency Sample		
Observations		
Original sample	120	684
Sample of households with at least one consumption measurement	120	579

Table 2: Take-up

	Control villages	Treatment villages		
		All	Structured	Organic
Member of SfC [1]	6.27%	29.65%	33.56%	25.73%

[1] "Tekereni/Applause Group" that has regular meetings and received training.

Table 3: Comparison of baseline characteristics of SfC members vs. non-members
in treatment villages

	Non-Members	Members	Difference from regression with commune-fixed effects	Standard errors for difference
	(1)	(2)	(3)	(4)
A. Household characteristics				
Household size	6.79	7.55	***	(0.16)
Household head is a woman (0/1)	0.06	0.07		(0.01)
Bobo (0/1)	0.38	0.25		(0.02)
Food consumption per adult equivalent ($)	2.68	2.92	***	(0.08)
Resorted to costly strategy to cope with shock (0/1)	0.16	0.20	**	(0.02)
FFH food insecurity index (0/1)	0.27	0.31	*	(0.02)
B. Characteristics of primary female respondent				
Age	33.73	36.68	***	(0.60)
Can read and write (0/1)	0.13	0.14		(0.02)
Married (0/1)	0.95	0.95		(0.01)
Not first wife (0/1)	0.15	0.15		(0.02)
Leader in the village (0/1)	0.15	0.22	***	(0.02)
Involved in a ROSCA (0/1)	0.20	0.29	***	(0.02)
Held savings other than in tontine (0/1)	0.42	0.41		(0.02)
Took a loan in past year (0/1)	0.31	0.40	***	(0.02)
Had a business (0/1)	0.44	0.56	***	(0.02)
Owned livestock (0/1)	0.50	0.51	***	(0.02)
Index of intra-household decision making power	0.05	0.14	***	(0.04)
Index of community action	-0.08	0.22	***	(0.05)
Social integration index (0/1)	-0.05	0.20	***	(0.05)
Patient (0/1)	0.36	0.36		(0.02)
Time inconsistent (0/1)	0.08	0.11		(0.01)
Observations	1,384	839		

1 Means are presented in columns (1) and (2). Columns (3) and (4) show the statistical significance between columns (1) and (2) using a regression which also includes commune fixed effects and standard errors clustered at the village level.

Table 4A: Impacts on financial management - savings (Female respondent)

	Member of any savings groups (0/1)		Total savings amount ($)		Savings amount in ASCAs ($)		Savings amount at home ($)		Savings amount in formal institutions ($)		Net savings ($)		Member of SfC (0/1)		Member of an ASCA/ROSCA not SfC (0/1)	
	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)	
Village Offered SfC	0.049	***	3.654	***	3.213	***	1.497		-1.104	**	3.372	**	0.246	***	-0.197	***
	(0.016)		(1.321)		(0.840)		(0.920)		(0.561)		(1.508)		(0.017)		(0.019)	
Mean control	0.76		11.96		2.31		7.23		1.23		4.06		0.06		0.70	
SD control	0.43		54.60		25.10		35.44		30.04		62.65		0.24		0.46	
Obs.	5437		5437		5262		5432		5435		5437		5437		5437	

Notes

1 The specification in all columns includes commune fixed effects, the lagged (baseline) dependent variable, and controls used in the re-randomization routine (number of households in the village, distance to paved road, distance to market, availability of electricity and the presence of formal credit, schools, a health center and ROSCAs). Standard errors are clustered at the level of the village.

2 The variable net savings in column 6 is calculated as total savings minus outstanding loans.

Table 4B: Impacts on financial management - loans (Female respondent)

	Received a loan (last 12 months, 0/1)		Total amount borrowed (last 12 months, $)	Took a loan from saving groups (0/1)		Took a loan from family/friends (0/1)		Took a loan from formal sources (0/1)	Amount borrowed from saving groups ($)	
	(1)		(2)	(3)		(4)		(5)	(6)	
Village Offered SfC	0.033	**	1.330	0.124	***	-0.044	***	-0.002	3.831	***
	(0.016)		(1.228)	(0.014)		(0.016)		(0.004)	(0.528)	
Mean control	0.56		13.42	0.10		0.42		0.02	2.29	
SD control	0.50		46.63	0.30		0.49		0.14	10.95	
Obs.	5435		5383	5435		5435		5435	5436	

Notes

1 The specification in all columns includes commune fixed effects, the lagged (baseline) dependent variable, and controls used in the re-randomization routine (number of households in the village, distance to paved road, distance to market, availability of electricity and the presence of formal credit, schools, a health center and ROSCAs). Standard errors are clustered at the level of the village.

Table 5: Impacts on economic activities and food security

	Household			Female respondent			Household		
	Value of agricultural output ($)	Value of livestock ($)		Value of agricultural output ($)		Profits from business ($)	Monthly non-food expenses: PAE ($)	Weekly food consumption: PAE ($)	FFH food insecurity index (0/1)
	(1)	(2)		(3)		(4)	(5)	(6)	(7)
Village Offered SfC	6.41	119.94	***	5.93	**	5.13	-0.04	0.13 *	-0.039 **
	(14.68)	(41.33)		(2.37)		(3.82)	(0.11)	(0.07)	(0.02)
Mean control	270.45	895.78		25.88		41.20	2.85	3.89	0.43
SD control	528.11	1,421.73		67.01		114.43	4.43	2.50	0.50
Obs.	5,572	5,572		8,379		8,458	5,555	5,535	5,428

Notes

1 Additional controls are as listed in Table 4a.

2 Column (4) is self-reported profits from small businsses from primary female respondents.

3 PAE stands for per adult equivalent.

4 Monthly non-food expenditure includes expenses on non-durable household assets, transport and communication, energy and tobacco.

5 FFH food insecurity index equals 1 if the household was considered chronically food insecure.

Table 6: Weekly food consumption per adult equivalency (high-frequency sample)

Treatment	-0.26	
	(0.23)	
Lean season	-0.36	***
	(0.11)	
Treatment*lean season	0.36	**
	(0.15)	
Year 2011	0.05	
	(0.07)	
Year 2012	-0.29	*
	(0.17)	
Constant	1.67	***
	(0.22)	
Obs.	1,936	

Notes

1 Lean season is defined as months June through September, between planting and harvest.

2 The estimates are from a household random effects specification which also includes an indicator for whether the household was interviewed every 3 months or every 2 weeks. Standard errors are clustered at the village level.

Table 7: Impacts on secondary outcomes

| | Health index | Education index | Housing index | Female Respondent | | | | |
				Community action index	Social integration index	IntraHH decision making power index	Time-inconsistent	Patient
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Village Offered SfC	0.0008	0.02	0.06 **	-0.03	0.02	0.02	-0.003	0.022 *
	(0.03)	(0.02)	(0.03)	(0.03)	(0.04)	(0.03)	(0.007)	(0.012)
Mean control	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.19
SD control	1.00	1.00	1.00	1.00	1.00	1.00	0.26	0.39
Obs.	5,579	17,814	5,566	5,425	5,421	5,425	5,375	5,375

Notes

1   Additional controls are as listed in Table 4a.

2   Health index includes: At least one member of the HH experienced serious illness last month and could not work during more than 7 days (0/1); At least one member of the HH consulted a health center last month (0/1); Total HH health expenditures last month ($); Financing health expenses by sale of assets (0/1); Financing health expenses by loan from savings group (0/1); Financing health expenses by loan from other source (0/1).

3   Education index includes: Male child between 6 and 12 years old is enrolled in school (0/1); Female child between 6 and 12 years old is enrolled in school (0/1); Male child between 13 and 18 years old is enrolled in school (0/1); Female child between 13 and 18 years old is enrolled in school (0/1); Educational expenses last 12 months ($).

4   Housing index includes: Hard roof (0/1); Hard walls (0/1); Hard floor (0/1); Access to water in the house (0/1); Electric lighting (0/1); Toilet/latrines (0/1); Use of coal or gas for cooking (0/1).

5   Community Action index includes: Talked to village chief in past year (0/1); Participated in a village meeting in past year (0/1); Spoke at a village meeting in past year (0/1); Voted in last elections (0/1).

6   Social integration index includes: Would ask other woman in sample for money (0/1); Would give money to other woman in sample (0/1); Go to market with other woman in sample (0/1).

7   IntraHH decision making includes: Free to decide about food expenses (0/1); Free to decide about educational expenses (0/1); Free to take decisions about business (0/1) .

8   Time-inconsistent is equal to 1 if the respondent was patient during first test but not patient during second test.

9   Time preference is equal to 1 if the respondent was patient.

Table 8: Treatment effects in organic vs structured replication villages

	Member of SfC (0/1)		Total Savings Amount ($)		Received a loan (last 12 months, 0/1)		Net saving ($)		Value of agriculture output ($)		Total value of livestock ($)		Housing index		Consumption per adult equivalent - total ($)		FFH food insecurity index (0/1)	
	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)		(9)	
Treatment effect in organic villages (1)	0.21	***	2.08		0.02		3.24		14.28		89.55	*	0.02		0.06		-0.01	
	(0.02)		(1.42)		(0.02)		(2.39)		(18.91)		(48.95)		(0.04)		(0.10)		(0.02)	
Treatment effect in structured villages (2)	0.28	***	5.21	***	0.04	**	4.43	*	-1.46		150.35	***	0.10	***	0.20	**	-0.06	***
	(0.02)		(1.83)		(0.02)		(2.67)		(18.54)		(57.09)		(0.04)		(0.10)		(0.02)	
p-value (1)=(2)	0.01	**	0.11		0.45		0.70		0.50		0.37		0.08	*	0.26		0.08	*

Notes

1 Additional controls are as listed in Table 4a.

Table A1: Characteristics and uses of SfC

	Mean	Obs.
Contributions		
Number of months since respondent joined SfC group	23.68	813
SfC weekly contributions ($)	0.48	839
Share-outs		
Ever received a share-out (0/1)	0.83	844
Number of share-outs	1.68	844
Most recent share amount ($)	30.64	685
Share-out uses (0/1)		
Food	0.47	696
Education	0.01	696
Livestock	0.12	696
Agriculture spending	0.06	696
Business	0.23	696
House repairs	0.06	696
Health	0.04	696
Loans		
Received at least one loan from SfC (0/1)*	0.83	844
Received at least one loan from SfC in last12 mths (0/1)	0.43	853
Number of loans (last 12 mths)	0.59	853
Loan amount ($)	20.39	368
Interest payment ($)	2.82	361
Loan uses (0/1)		
Food	0.38	356
Education	0.02	356
Livestock	0.05	356
Agriculture spending	0.02	356
Business	0.42	356
House repairs	0.05	356
Health	0.06	356

* Since first participation in SfC.

Sample includes only individuals who identified themselves as SfC members.

Table A2: Balance check using baseline survey data

	Full sample				High Frequency Sample			
	Mean - Control	Diff: C-T	p-value	N	Mean - Control	Diff: C-T	p-value	N
A. Financial management								
Female primary respondent								
Index of financial management	0.00	0.01	0.89	5,963	-0.02	0.02	0.80	687
Member of a tontine (0/1)[1]	0.22	0.01	0.58	5,958	0.20	-0.02	0.52	687
Total Savings Amount ($)	7.77	-0.29	0.71	5,954	6.21	0.73	0.70	686
Received a loan (12 mths, 0/1)	0.35	-0.01	0.47	5,940	0.39	-0.01	0.73	683
Gave a loan (12 mths, 0/1)	0.29	0.01	0.49	5,942	0.27	0.05	0.18	683
B. Economic activities								
Index of economic activity	0.00	0.00	0.97	5,989	-0.04	0.08	0.37	689
Female primary respondent								
Has business (0/1)	0.48	0.02	0.42	5,987	0.49	-0.01	0.91	688
Engaged in paid labor (0/1)	0.05	0.00	0.88	5,989	0.05	0.03	0.11	689
Household								
Total input expenses for agriculture ($)	27.14	-3.21	0.20	5,989	24.19	3.37	0.65	689
Value of agriculture output ($)	246.13	-4.25	0.77	5,988	243.20	-13.02	0.75	689
Total value of livestock ($)	769.53	5.92	0.88	5,989	685.14	94.25	0.36	689
C. Consumption								
Weekly food consumption per adult equivalent - total ($)	2.72	0.06	0.35	5,954	3.00	-0.15	0.36	688
D. Shocks and food security								
Shock index	0.00	-0.04	0.30	5,989	0.02	0.10	0.27	689
Resorted to costly strategy to cope with shock (0/1)	0.18	-0.01	0.29	5,966	0.21	0.01	0.69	689
Household experienced shock with big impact (0/1)	0.42	-0.02	0.30	5,964	0.42	0.03	0.45	689
FFH food insecurity index (0/1)	0.40	0.00	0.76	5,956	0.39	0.05	0.20	683
E. Health and education								
Health and education index	0.00	-0.04	0.31	5,989	0.04	-0.04	0.67	689
Household								
Health expenditures - past 30 days ($)	5.39	-0.54	0.10	5,974	6.01	-0.17	0.88	686
Educational expenses - past year ($)	18.34	-0.80	0.56	5,985	17.59	-0.79	0.76	689
Primary school enrollment (0/1)	0.51	0.00	0.94	3,884	0.52	-0.02	0.65	456
F. Empowerment and social capital								
Social index	0.00	0.05	0.27	5,975	0.01	-0.02	0.81	688
Index of intra-household decision making power	0.00	0.06	0.09	5,972	0.04	-0.04	0.62	687
Index of community action	0.00	0.01	0.73	5,962	0.01	-0.03	0.69	686
Social integration index (0-1)	0.00	0.02	0.68	5,952	-0.03	0.03	0.80	686
G. Village Characteristics								
Index of village remoteness	0.00	-0.10	0.28	5,991	0.29	-0.24	0.20	689
Village population	1019	-6.83	0.94	5,788	1033	-87.54	0.58	662
Distance to closest tarmac road (km)	22.56	1.82	0.35	5,883	15.29	0.42	0.90	667
Number of months reachable by truck	8.73	-0.33	0.22	5,859	9.56	-0.64	0.22	677
Presence of a primary school (0/1)	0.71	0.00	0.97	5,919	0.65	0.00	0.96	685
Presence of a health center (0/1)	0.21	-0.03	0.48	5,967	0.32	-0.12	0.15	689
F-test for joint equality of means of indices	0.61				0.70			

Standard errors are clustered at the village level. Also included in all specifications are dummy variables for a independent variable which has a missing value (where the main variable then has a value of -9).

Table A3: Attrition tests

	Full sample			High-frequency sample		
	Coeff (s.e.)		Coeff (s.e.)		Coeff (s.e.)	Coeff (s.e.)
Treatment	0.013 * (0.007)		0.029 ** (0.013)		0.010 (0.024)	-0.024 (0.052)
Treatment*Index of financial management			0.015 * (0.009)			0.018 (0.034)
Treatment*Index of economic activity			0.002 (0.006)			-0.032 (0.030)
Treatment*Food cons. per adult eq. - total ($)			-0.006 (0.004)			0.010 (0.016)
Treatment*Shock index			0.005 (0.007)			0.025 (0.023)
Treatment*Health and education index			-0.001 (0.006)			-0.008 (0.033)
Treatment*Social index			-0.002 (0.007)			0.038 (0.029)
Treatment*Index of village remoteness			-0.004 (0.007)			0.030 (0.031)
F-test for joint significance of treatment and treatment interaction coefficients			0.27			0.59

Notes

1 Standard errors are clustered at the village level. Also included in all specifications are dummy variables for a independent variable which has a missing value (where the main variable then has a value of -9).

Table A4A: Impacts on Agricultural Activities

	Female respondent						Household					
	Cultivates (0/1)	Total input expenses ($)	Land size	Men's unpaid labor	Women's unpaid labor	Value of sales ($)	Cultivate (0/1)	Total input expenses ($)	Land size	Men's unpaid labor	Women's unpaid labor	Value of sales ($)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Village Offered	0.02	-0.10	0.044	0.82	0.56	1.97 **	0.002	4.49	0.09	2.26	1.90	0.83
SfC	(0.01)	(0.43)	(0.027)	(0.50)	(1.06)	0.00	(0.014)	(3.79)	(0.10)	(5.11)	(3.93)	(5.32)
Mean control	0.41	4.00	0.30	4.25	14.94	6.95	0.71	41.75	2.27	77.68	62.62	67.59
SD control	0.49	17.46	1.03	20.50	32.46	25.79	0.46	117.62	3.79	160.70	118.51	187.39
Obs.	8,604	8,598	8,602	8,586	8,547	8,429	5,574	5,574	5,569	5,574	5,574	5,574

Notes

1 Additional controls are as listed in Table 4a.

Table A4B: Impacts on Household Livestock (detailed)

	Holds livestock (0/1)	Total value of livestock ($, trimmed)		Value of male cows ($)		Value of female cows ($)	Value of goats ($)		Value of sheep ($)		Value of poultry ($)	Total expenditures on animal care ($)	
	(1)	(2)		(3)		(4)	(5)		(6)		(7)	(8)	
Village Offered SfC	0.01	87.71	***	49.73	**	22.76	11.47	**	12.282	***	1.23	6.22	*
	(0.01)	(32.815)		(20.64)		(15.18)	(4.57)		(4.698)		(1.08)	(3.38)	
Mean control	0.88	819.22		373.39		123.89	104.30		96.17		23.16	43.05	
SD control	0.32	1,147.62		738.70		541.95	154.87		167.12		33.80	111.54	
Obs.	5,572	5,517		5,572		5,572	5,572		5,572		5,572	5,572	

Notes

1 Additional controls are as listed in Table 4a.

Table A4C: Impacts on Women's Businesses (detailed)

	Has business (0/1)	Profits (calculated) ($)	Expenses ($)		Sales ($)	
	(1)	(2)	(3)		(4)	
Village Offered	0.018	-0.33	35.66	*	38.56	*
SfC	(0.013)	(2.35)	(20.77)		(22.75)	
Mean control	0.43	36.71	131.04		176.47	
SD control	0.49	83.79	500.80		593.70	
Obs.	8,595	8,306	8,501		8,464	

Notes

1 Additional controls are as listed in Table 4a.

Table A5: Impacts on Health and Education (detailed)

| | Household | | | | | | All household members | | | | |
| | | | | | | | Girls | | Boys | | |
	Experienced serious illness (0/1)	Consulted health center (if sickness, 0/1)	Health expenditures ($)	Financing health expenses - sale of assets (0/1)	Financing health expenses - loan from saving groups (0/1)	Financing health expenses - loan from other sources (0/1)	Primary school enrollment (0/1)	Secondary school enrollment (0/1)	Primary school enrollment (0/1)	Secondary school enrollment (0/1)	Educational expenses ($)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Village Offered SfC	-0.001	0.004	0.21	-0.01	0.0002	-0.002	-0.001	-0.01	0.02	0.01	0.50 *
	(0.009)	(0.02)	(0.38)	(0.01)	(0.0006)	(0.003)	(0.02)	(0.02)	(0.02)	(0.02)	(0.28)
Mean control	0.15	0.45	6.35	0.30	0.00	0.01	0.40	0.36	0.48	0.43	6.06
SD control	0.35	0.50	12.70	0.46	0.02	0.10	0.49	0.48	0.50	0.50	13.64
Obs.	5,547	4,824	5,570	5,570	5,570	5,570	5,559	3,144	5,448	3,663	17,639

Notes

1 Additional controls are as listed in Table 4a.

2 Outcome(s): The dependent variables in columns (1) to (6) refer to last 30 days.