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WHY DON'T THE POOR SAVE MORE? EVIDENCE FROM HEALTH SAVINGS EXPERIMENTS

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ABSTRACT

Using data from a field experiment in Kenya, we document that providing individuals with simple informal savings technologies can substantially increase investment in preventative health, reduce vulnerability to health shocks, and help people meet their savings goals. The two main barriers that keep people from saving on their own appear to be transfers to others and "unplanned expenditures" on luxury items. Providing people with a designated safe place to keep money was sufficient to overcome these barriers for the majority of individuals, through a mental accounting effect. Adding an earmarking feature reduced savings for the average individual due to the associated liquidity cost and did not help present-biased people save more. For such individuals, stronger incentives to start and continue making deposits are necessary to overcome self-control problems.

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1 Introduction

In developing countries, the returns to many types of investments in human or physical capital appear to be high, yet investment levels remain quite low. For example, it has been estimated that 63 percent of under-five mortality could be averted if households invested in readily available preventative health products (Jones et al. 2003). Why don't people make these investments? While credit constraints are the most obvious culprit, and while recent evidence does suggest that relieving credit constraints can increase investments in bednets (Tarozzi et al. 2011) or clean water connections (Devoto et al. 2011), the upfront costs of many preventative products (such as bednets) are not massive. Households should be just as able to gradually save up for such investments as to take out loans and gradually pay them back. Indeed, simply relieving credit constraints alone does not necessarily solve the problem. For example, Ananth et al. (2007) observe that many fruit sellers in the Philippines remain permanently in debt, paying very high interest on daily loans extended by their wholesalers. Why aren't these fruit sellers able to save up enough to avoid these interest payments?

To understand why the poor are constrained in their ability to save, we designed a field experiment in rural Kenya in which we randomly varied access to four innovative saving devices which differed in the degree of commitment they offered. One saving technology offered only a very soft form of commitment through mental accounting. Two other products offered stronger commitment through earmarking. A final product, in addition to earmarking, offered credit as well as a social commitment to make regular contributions. By observing the impact of these various technologies on asset accumulation, and by estimating which types of people benefit most from them, we can identify the key barriers to saving in our study context. While several other recent studies have investigated reasons why people have difficulty saving, they study potential savings barriers one at a time. To our knowledge, ours is the first to simultaneously estimate the importance of several barriers relative to each other in a single population.

Though the saving technologies we study could be relevant for any number of purposes, we designed them around enabling savings for health investments. The reason for this is that poor health is very common in Kenya (as in much of Sub-Saharan Africa), so that there are likely substantial welfare effects of increasing savings for health. In addition to take-up, the primary outcomes we study are: (1) investment in preventative health products, and (2) whether households are able to deal with health emergencies when they arise. We benchmark these effects by comparing the four treatment groups to a control group which received the same encouragement to save for health but was not offered a savings technology. Our primary data are follow-up surveys conducted after 6 and 12 months with 771 individuals.

We supplement this with a longer-run follow-up conducted about three years later with a random subsample.

We find extremely high take-up and usage of all four saving technologies, suggesting that their primary appeal is in their common feature: providing a safe and designated place to save money for a specific goal. The main mechanism through which the products increased savings appears to be mental accounting. Respondents reported that the savings devices provided them with the strength to resist "unplanned expenditures," including transfers to friends and relatives as well as certain types of luxury spending.

While all our technologies were widely adopted, the magnitude of their impact on health savings differed. The most basic technology (which provided nothing more than a designated place to save) had a large impact on health savings for the average individual. Adding an earmarking feature reduced impacts on preventative health investment to close to zero on average, however. This is because the cost of making savings completely illiquid (and thus unavailable in times of emergency) outweighs its benefit for the average individual. By contrast, earmarking for health emergencies was highly valued and was effective in reducing vulnerability to health shocks (one of the most common types of risk for people in Kenya).

We provide further evidence on the savings barriers that these devices helped overcome by examining how impacts varied with background characteristics. First, we find that the effects of all the saving devices were positive and large for individuals who, at baseline, were the most "taxed" by their social networks (people who were giving assistance to others but who received no assistance in return.) We also find that such individuals are the only subgroup which continued to save when savings were earmarked for preventative health. For them, the demands on their income are strong enough that limiting liquidity is not enough to discourage savings. These findings are consistent with a number of recent studies in Sub-Saharan Africa, which suggest that people might be willing to pay to avoid demands from others (Baland et al. 2007; Jakiela and Ozier 2011).[1]

Second, we find that time-inconsistency is another important constraint. As might be expected, those with time-inconsistent preferences (who make up about 16% of our sample) did not save in the device which did not restrict withdrawals. They also did not benefit

[1]Baland et al. (2007) present evidence from Cameroon consistent with a model in which middle-class individuals take on (costly) loans they don't need as a way to signal poverty and avoid requests for financial help from friends and relatives. Similarly, a recent experimental study in Western Kenya finds that women are willing to pay a substantial cost (in the form of either a fee or foregone returns) in order to hide income from their relatives (Jakiela and Ozier 2011). This is consistent with Platteau (2000), who shows that there exist strong social norms in West Africa which necessitate that an individual provides support to friends and relatives if she is asked for money and has cash on hand. Our results however contrast somewhat with that of a recent field experiment in Ghana, which finds no evidence that external pressure to share is responsible for the inability of many small entrepreneurs to invest cash grants in their business (Fafchamps et al. 2011).

from earmarking, but did save when they were induced to begin savings through credit and encouraged to continue saving through social pressure to continue making deposits. These differences suggest that people with such preferences need products which not only earmark savings for a specific purpose but which also commit them to make regular deposits. That some form of commitment is needed for people with time-inconsistent preferences resonates well with evidence from multiple settings - from retirement savings in the US (Thaler and Benartzi 2004; Choi et al. 2011) to bank savings in the Philippines (Ashraf et al. 2006a) to agricultural investments in Kenya (Duflo et al. 2010) and Malawi (Brune et al. 2011). Our contribution is to show that, in the absence of a direct deposit or deposit collection feature, earmarking alone is not sufficient to meaningfully increase savings among time-inconsistent individuals. This is consistent with Ashraf et al. (2006a), who find that many time-inconsistent individuals in the Philippines are "sophisticated" enough to sign up for a commitment device, but not enough to use it once they have it.

Third, we also find some evidence of intra-household barriers to individual saving. We find somewhat larger effects (though not statistically significant) for married individuals. This is consistent with evidence of savings misallocation due to intra-household heterogeneity in time preferences found in Kenya by Schaner (2011). It is also related to experimental evidence from the Philippines presented in Ashraf (2009), which showed that hiding money from one's spouse is desirable under certain intra-household decision-making structures.

All in all, our results suggest that devices which simply help individuals harness the power of mental accounting are beneficial to about 66% of our sample: the subgroup of the population composed of individuals who are not hyperbolic, and who are either married or heavily taxed by friends and relatives. Given that we find that much of the value of a savings product is through mental accounting, a product which does not severely limit liquidity is preferred to one that does - especially for people living in an environment in which income shocks are common, such as rural Kenya.

Our results contribute to a fast-growing literature on savings in developing countries. It has by now been well established empirically that the reason for low observed savings rates is not just that the poor are simply "too poor to save."[2] Several studies have investigated reasons for such undersaving, but as with developed countries, much of the existing literature on undersaving in poor countries puts the emphasis on self-control problems. Bernheim, Ray

[2]For example, Shipton (1990) describes how people in the Gambia make their own wooden lockboxes, which they smash open once they have reached their savings goal. Collins et al. (2009) examine a wealth of other informal saving tools used by poor families in Bangladesh, India, and South Africa. Rutherford (2000) documents how poor households often report wanting to save more. Dupas and Robinson (2009) find that simple bank accounts can increase savings and investments among market vendors in rural Kenya. Banerjee and Duflo (2007), looking at detailed household survey data form 13 countries, find that even extremely poor households do not use all of their income to afford basic necessities.

and Yeltekin (1999, 2011) propose a model in which self-control problems can lead to a low-asset trap. In their model, self-discipline through personal rules is harder when one is poor and credit constrained than when one is rich and has access to credit, because the cost of deviating from personal rules is limited when one has very little to lose. Banerjee and Mullainathan (2010) argue that there are "temptation goods" (goods whose consumption yields utility in the present, but whose future consumption yields no utility), so that the consumption of these goods by future selves serves as a "temptation tax" on savings. If there is satiation in temptation goods such that their consumption share declines with income, then a poverty trap can emerge since poor people face a higher effective tax and therefore have a lower incentive to save than richer people. Both theories are consistent with studies which find demand for some form of commitment among people in developing countries (Ashraf et al. 2006a; Duflo et al. 2010; Brune et al. 2011). A more recent strand of literature puts emphasis on limited attention. Karlan et al. (2011) and Kast et al. (2010) provide experimental evidence from a multiplicity of countries that simple reminders to save can increase saving rates by about as much as access to commitment savings products.

Our evidence is consistent with the presence of both self-control and inattention problems, but suggests that, for most people, these barriers can be alleviated without resorting to services such as formal commitment savings accounts or reminders. In our study, a simple safe place to save is enough to increase preventative health investment by at least 68 percent, and increase the likelihood that people reach their savings goal by 13 percentage points within a year. This is substantially larger than the 6 percent increase in savings and 3 percentage points increase in goal-reaching observed by Karlan et al. (2011) through monthly reminders over a 6 or 12 month period. It also compares favorably with the impacts of the commitment product studied by Ashraf et al. (2006a) in the Philippines. They find an 81% increase in bank savings after 12 months, but the effect fades to (a statistically insignificant) 33% increase after 2.5 years (Ashraf et al. 2006b). Also, in that study, only 10% of those offered the commitment product actively used it. In contrast, the take-up rate of our most basic product was 75 percent in the first year, and still close to 40 percent after three years.[3]

The remainder of the paper proceeds as follows. Section 2 describes the experimental technologies we introduced and the underlying theoretical framework. Section 3 describes the sample, the timeline of the experiment and the data. We discuss the results in terms of medium-run take-up (Section 4) and impacts (Section 5) before we describe longer-run evidence in Section 6. We then bring on evidence from exit surveys to discuss mechanisms in Section 7, before we conclude.

[3]Note that this long-term figure was measured two years after the last contact with the research team, that is, two years after the last potential "reminder" to save in the box.

2 Experimental Design

2.1 Experimental Saving Technologies

As we will describe below, two of our four savings technologies involved a social component. For this reason, we had to work with existing social structures in order to implement the study. We chose to work with one of the most common social structures throughout the developing world: local saving circles called ROSCAs (Rotating Savings and Credit Associations). A ROSCA is a group of individuals who come together and make regular cyclical contributions to a fund (called the "pot"), which is then given as a lump sum to one member in each cycle. While people who participate in ROSCAs are clearly a self-selected group of people, they are still representative of a relatively large share of the population, since over 40% of adults in our study area participate in ROSCAs.[4]

We worked with 113 ROSCAs in one district of Kenya, and randomly assigned these ROSCAs to one of five treatment groups (one control and four different experimental treatment arms). Individuals in all study arms were encouraged to save for health and asked to set a health goal for themselves, but only individuals in the treatment arms were offered a saving device to help them reach that goal.

In the first experimental treatment (*Safe Box*), respondents were given a simple locked box made out of metal.[5] The box had a deposit slit at the top, similar to a piggy bank. The box was locked with a padlock, and the key to the padlock was provided to the participants. Each participant was also given a passbook in which they could record the deposits made in the box, so that they could keep track of the total amount in the box without having to open it. They were asked to record what health product they were saving for, and its cost, on the front page.

In the second experimental treatment (*Lockbox*), respondents were given a passbook and a locked box identical to those in the *Safe Box* treatment, except that they were not given the key to the padlock. Instead, the key was kept by the program officer, so that respondents could not open the box on their own. The cell phone number of the program officer was written on the passbook, and participants were instructed to call the program officer once they had reached their saving goal. The program officer would then meet the participant and open the *Lockbox* at the shop where the product could be purchased.[6]

[4]In the Appendix, we use data from a census of rural households in a nearby part of Kenya to examine determinants of ROSCA participation.

[5]Providing boxes was inspired by the lockbox offered as part of the SEED program designed by Ashraf, Karlan, and Yin (2006a). In that study, participants would have to bring their lockbox to the bank to get it opened and the money in the box would be immediately deposited onto the bank account by the bank teller.

[6]While the program officers told individuals that they could only use the money for their health savings

In the third experimental treatment, we encouraged participants to use their existing ROSCA structure to create a "*Health Pot*." Specifically, participants were told that, if a subset of the ROSCA members could agree on a health product that they would all want to acquire, they could agree on an additional health contribution, to be made at each meeting on top of the regular contribution. The size of the health contribution would depend on the health product chosen and the number of people participating in the *Health Pot* scheme. For instance, if 10 out of 15 ROSCA participants decided to create a side pot in order to acquire a bednet worth 250 Ksh, each participant would have to contribute 25 Ksh to the side pot at each meeting so that one participant could receive the bednet. To ensure that the health pot would be used to acquire the chosen product, ROSCAs were encouraged to purchase the health product on the behalf of the pot recipient or to accompany the pot recipient to the shop where the product was to be purchased, instead of letting the recipient walk away from the meeting with the pot in cash.[7]

The fourth experimental treatment (*Health Savings Account*, or *HSA*) also took advantage of the ROSCA structure, but this treatment did not require agreement across members. Each participant was encouraged to make regular deposits into an individual *HSA* managed by the ROSCA treasurer. The treasurer was given a ledger book in which to record deposits, withdrawals and balances for each member's account. The funds deposited into the *HSA*s were earmarked for health - ROSCA treasurers were encouraged to not allow withdrawals unless the participant needed money for health expenditures (such as clinic fees or medications). The money saved in *HSAs* by ROSCA members was usually kept by the treasurer of the ROSCA, or deposited in a bank account if the ROSCA owned one.[8]

As we will discuss below, as these technologies differ in the type and amount of commitment features they provide, comparing savings under the different technologies will allow us to estimate which features are most important and to back out the relative importance of various savings barriers. However, the technologies also differ in one other important way: two of them were geared towards mobilizing savings for preventative health products (the *Lockbox* and the *Health Pot*), one was geared towards building savings to rely on in case health shocks occur (the *HSA*), and one was geared towards both these aims (the *Safe Box*).

goal, this could not actually be enforced in the field. If, for example, a respondent called the program officer to open the box but demanded to use the cash for something else, the program officer could not force her to follow through on her goal. However, the vast majority (74%) of those who called the program officer to open the box purchased the product in front of the program officer. The remainder said that they would do so later. In a follow-up survey, we asked people if they thought that they were allowed to get the box opened to purchase something other than their goal, and only 6% said they thought they could (see Appendix Table A6). Thus it seems that, as intended, people thought of the lockbox as featuring strong commitment.

[7]As discussed later, the majority did this (see Table 2).

[8]Many ROSCAs hold money with the treasurer, either because they have a welfare insurance fund or offer individual credit to members (in addition to the main pot). See Appendix Table A1.

Thus, in our empirical analysis, we separately examine the two types of savings in estimating effects.

2.2 Features of the Experimental Technologies

As shown in Figure 1, the four experimental saving technologies offered various combinations of a set of three features: secure and designated storage, earmarking, and social commitment and credit.

Figure 1. Features of Experimental Saving Technologies

		Storage (S)	Earmarking (E)	Social Commitment and Credit (C)
Panel A. Technologies Enabling Savings Towards Preventative Health Investments				
P_1	Safe Box	Yes		
P_2	Lockbox	Yes	Yes	
P_3	Health Pot	Yes	Yes	Yes
Panel B. Technologies Enabling Savings Towards Emergency Health Treatments				
T_1	Safe Box	Yes		
T_4	HSA	Yes	Yes	

The most basic intervention was the *Safe Box*, which provided only a designated, secure place to store money. The *Lockbox* and *HSA* interventions differed from the *Safe Box* only in the earmarking they provided - the money stored in these two schemes could not be spent on anything other than preventative health and medical expenditures, respectively. Finally, the *Health Pot* featured social commitment and credit on top of the earmarking and storage. The social commitment feature comes from the fact that ROSCAs by definition exert group pressure to make deposits. This is a much stronger form of commitment than the individual savings technologies since the social commitment was for people to actually make deposits. While any money put into the *Lockbox*, *HSA*, and *Health Pot* could only be used for health, only the *Health Pot* provided any pressure to actually make deposits. The credit feature comes from the fact that all but the last member of the group would receive the health product earlier than they would if they instead saved alone.

If we call P_1, P_2, and P_3 the effects on preventative health investments of, respectively, the *Safe Box*, the *Lockbox*, and the *Health Pot*, we can estimate the role of having a safe and designated storage technology for savings as P_1; we can estimate the role of earmarking as $(P_2 - P_1)$; and we can estimate the combined roles of social commitment and credit as $(P_3 - P_2)$. Likewise, if we call T_1 and T_4 the effects on availability of funds for health

emergencies of, respectively, the *Safe Box* and the *HSA*, then T_1 will reflect the role of having a storage technology; and $(T_4 - T_1)$ will reflect the role of earmarking.

2.3 When Should These Features Matter?

We expect the three features to have differential effects on health savings, depending on the types of savings barriers that individuals face.

Storage There are two important ways through which access to a safe storage technology designated for savings can affect saving behavior.

First, even though outright theft of money is not commonly reported by respondents, people may be hesitant to simply leave cash unsecured at home. For this reason, a secure storage technology can enable individuals to avoid carrying loose cash on their person and thus allow people to keep some physical distance between themselves and their money. This may make it easier to resist "temptations", to borrow the terminology in Banerjee and Mullainathan (2010), or "unplanned expenditures", as many of our respondents call them. While these unplanned expenditures include luxury items such as treats, another important category among such unplanned expenditures are transfers to others.

Second, a storage technology can increase the "mental costs" associated with unplanned expenditures, thereby reducing such expenditures. Indeed, if people use the storage technology to save towards a specific goal, such as a health goal in our study, people may consider the money saved as unavailable for purposes other than the specific goal - this is what Thaler (1990) coined "mental accounting". By enabling such mental accounting, a designated storage place may give people the strength to resist frivolous expenditures as well as pressure to share with others, including their spouse.

In Section 7, we will discuss results from in-depth exit interviews we conducted with a random subset of respondents. Those interviews yield evidence which shows that both these effects (physical distance and mental accounting) were at play and explain the large observed impacts of the *Safe Box.*

Earmarking Earmarking (E) has an obvious liquidity cost. Thus, if earmarking enables savings for some people, it must be that for them the value of the earmarking outweighs the liquidity cost. There are two types of people for whom that might be the case. First, earmarking might help people for whom the pressure to share is so strong that they need a way to tie up money. Second, earmarking might be valuable for people that are trying to overcome intra-personal barriers (those with time-inconsistent preferences). Among

this group, only "sophisticated" individuals should value earmarking to impose self-control, however, since "naive" individuals, by definition, lack the awareness to see the value of it.

It is worth noting that the value attached to earmarking for preventative health investments ($P_2 - P_1$) might differ from the value attached to earmarking for health emergencies ($T_4 - T_1$). Indeed, likely the most important form of risk facing rural households in Western Kenya is the risk of illness, and while the *HSA* was specifically designed to help households build liquid savings in order to access prompt care and treatment in times of sickness, the money saved in the *Lockbox* was not accessible in emergencies. If, as seems likely, saving for emergencies is given higher priority than saving for other health investments, then households might value the earmarking provided by the *HSA* more than that of the *Lockbox*.

Social Commitment and Credit (C) This feature, given the credit aspect, should appeal to everyone in our sample (especially since they are already engaged in the ROSCA). Its effect should be largest for those naive present-biased individuals, however, for whom neither a designated storage place nor earmarking alone would be enough, as discussed above.

3 Sample and Data

3.1 Sampling Frame and Randomization

Between May and July 2008, we compiled a "census" of all the ROSCAs that could be identified around a given set of market places in one administrative division of Western Kenya. For each ROSCA in the census, we administered a baseline survey to identify the size of the ROSCA, the contribution frequency, the services the ROSCA provided, and the list of members. ROSCAs that did not have a regular meeting schedule or that met daily were not eligible for the study (because these types of ROSCAs were usually for very short-term savings among market vendors). A total of 143 eligible ROSCAs were identified in this manner.

These 143 ROSCAs were randomized into 5 groups - one control and four treatment groups corresponding to the four experimental treatments described above. The randomization was done after stratifying on three ROSCA characteristics (gender composition, meeting frequency, and whether the ROSCA provided loans to its members).

3.2 Baseline ROSCA Information

Not all 143 ROSCAs sampled for the study could be enrolled. By the time we attempted to meet with ROSCAs to conduct the baseline (between August and October 2008), 11 ROSCAs (7.7%) had been discontinued, and 19 (13.3%) others were not interested in the program. This left us with 113 ROSCAs in the final sample. Appendix Table A1 provides characteristics on these 113 ROSCAs. We present means by treatment groups, as well as p-values for tests that the mean in each treatment group equals that in the control group and for the test that all five means are equal. Despite the fact that we lost 21% of the ROSCAs after the random assignment, the groups appear relatively balanced, suggesting that ROSCA attrition was orthogonal to the experimental treatment assignment (which is not surprising since ROSCAs did not know anything about the treatment at the time they attrited).

Though the characteristics of the ROSCAs themselves are not the focus of our paper, several are of some interest. First, most members are women: 74% of ROSCA participants are women, and 32% of ROSCAs are female only. The average ROSCA has 17 members, meets two to three times a month, and the average monthly contribution is 393 Ksh (US $5.24). Also of note is that many ROSCAs provide other services, besides the savings pot: 64% provide loans to members, and 54% have an insurance fund (principally for funerals or, in some cases, illnesses which require hospitalization). Finally, 98% of ROSCAs use a fixed, rather than a random order or a bidding process to allocate the pot.

3.3 Offer of Experimental Treatments

In each ROSCA that could be enrolled in the study, the assigned experimental treatment (if any) was offered to participants during a regular ROSCA meeting. During the meeting, participants in all ROSCAs (including the control group) were given information about preventative health products (examples included bednets, water chlorination products, and ceramic water filters) and were encouraged to save towards investing in these products. Since the control group was also encouraged in this way, this group can be considered as an "Encouragement Group." In other words, health investments were endorsed, and health was made salient, in exactly the same way in the control group as in the treatment groups. This means that the differences in health investments we observe across groups can and should be interpreted as the impacts of the saving technologies introduced, rather than as differences in encouragement. In the four treatment groups, the savings devices were introduced and explained right after the encouragement was provided. All ROSCA members were offered

the treatment (a total of about 1,900 people in total across the four treatment groups).[9]

3.4 Baseline Data

A random subset of ROSCA members were sampled (using a random number table) for data collection during the same meeting that the encouragement (and treatment offers, for those in the treatment groups) was provided. In total, we enrolled 771 respondents into the surveys across all 113 participating ROSCAs. After obtaining consent, those respondents selected for the surveys were given a baseline survey.

The survey included modules on basic household demographics, time and risk preferences, and health investments. Importantly, the survey also included questions on whether the respondent had a health savings goal, what this goal was, how much money they needed to save to reach the goal, and how long they thought it would take them to reach that goal. Likely because people had been primed to think about health from the encouragement, most respondents reported having some type of health savings goal. In fact, over half of respondents reported that their goal was one of the preventative health products that were showcased during the encouragement talk (the most popular products were bednets and water purification products). The average value of the goal was relatively large given average incomes (548 Ksh after trimming the top 1%,around $7.31 US), and respondents estimated they needed 2.5 months on average to reach that goal (as we will see below, this turns out to be an extremely overoptimistic estimate).

Note that in the treatment groups, this goal elicitation took place *after* the experimental saving technologies had been offered. This means that the treatment could have affected the goal chosen by the respondents. We present results on how the goals varied by treatment arms in Appendix Table A2. Overall, we see some differences between the groups, though they are relatively minor. Given that these differences are potentially endogenous, however, we consider the reaching of one's specific goal as supportive evidence, rather than the main outcome of interest. To estimate impacts, we instead focus on overall health investments and savings, measured through detailed follow-up surveys.

3.5 Follow-up Data

Two follow-up surveys, a midline and an endline, both including modules similar to those administered at baseline, were conducted approximately six and twelve months after the

[9]Note that this means that, even for the individual devices (the *Safe Box*, the *Lockbox*, or the *HSA*), the offer was made in the presence of others and each participant's decision to take-up the offer was public (just as the decision to participate in the *Health Pot* had to be public by nature).

experimental treatments were offered. For respondents in the treatment groups, treatment-specific modules were administered in addition to the general survey. In particular, respondents in the *Safe Box* and *Lockbox* groups were asked to produce their box. In the *Safe Box* group, respondents were asked to open the box so that the enumerator could record the amount that was in it. In the *Lockbox* group, enumerators brought the key with them for the survey; they opened the box, counted the money and then closed the box again. They then offered the respondent the option to keep the key. If the respondent refused the key, the enumerator brought the key back to the office. For respondents in the *HSA* group, the treasurer's records of all deposits and withdrawals were copied.

Close to 95% of the sample could be interviewed during the 6-month follow-up, and 92% could be interviewed during the 12-month follow-up. Attrition was not differential across experimental arms, either at 6 or 12 months (see Appendix Table A3).

3.6 Final Sample Characteristics

Table 1 presents baseline characteristics for the final sample available for the analysis. Column 1 presents the sample mean and standard deviation for a series of characteristics. To test for balance across groups, columns 2-5 present the coefficient estimates (and standard errors) of the difference, for each group, between the baseline mean in the treatment group and the mean in the control group. The standard errors are adjusted for clustering at the ROSCA level, since the randomization was done at that level. Column 6 presents the p-value for an F-test of the equality of means across all five groups.

A few characteristics of the sample are worth mentioning. The great majority of respondents are married (75% of women and 88% of men). Respondents are around 39 years old, and have close to 4 children on average. Education levels are relatively low (average years of education is just 6.3, much less than the 8 needed to complete primary school). The sample is also quite poor. Less than a quarter of people have a cement floor in the house (i.e, they have a dirt floor), and average weekly income reported by respondents is around 600 Ksh (US $8). We do not have data on spousal income, but given the large number of dependents, it is likely that income for the average household in our sample is below the $1 per person per day extreme poverty threshold. Health investments are relatively low, with the average respondent owning less than 2 bednets for a household size of 5 or more, and only about half of respondents reporting using chlorine to treat their water. Consequently, health is also very poor. Respondents reported that 33% of their children under 5 had malaria in the month preceding the baseline survey, and 20% of respondents reported having malaria in that month themselves.

In terms of time preferences, only about 18% of people are what we call "somewhat patient" (i.e. prefer 55 Ksh or less in 1 month to 40 Ksh now). About 16% of respondents are present-biased.[10] Surprisingly, about 18% appear to be more patient in the present than in the future. Though this seems counter-intuitive, previous studies have found similar results: about 10% of respondents from India in Bauer et al. (2010) and 15% of respondents from the Philippines in Ashraf et al. (2006a) had preferences of this type. We also found similar levels in a previous study in the same area of study (Dupas and Robinson 2009). A large fraction of respondents (45%) exhibits extreme impatience in both present and future. Again, this is comparable to previous levels observed in the area of study, though much higher than in Bauer et al. (2010) and Ashraf et al. (2006a).

Turning to the differences across groups in columns 2-5, the groups appear well-balanced overall, with no more significant differences than should be expected. There are 20 dependent variables, and therefore $20 \times 4 = 80$ coefficients estimated in Table 1. Only 5, 3 and 0 coefficients are significantly different from zero at the 10, 5 and 1 percent level, respectively.

Note that some respondents belonged to two (or more) ROSCAs enrolled in the study. Thus some respondents (9% of the sample) were exposed to more than one experimental treatment. While the likelihood of being exposed to more than one treatment is not exogenous (it depends on the number of ROSCAs one participates in), the combination of treatments one is exposed to, holding constant the number of ROSCAs, is exogenous. For this reason, we include a dummy for being exposed to more that one treatment as a control in the regression analysis below.

Before turning to the results, we want to note that our sample is not representative of the entire population, but instead represents the roughly 40% of people who participate in ROSCAs. In the Appendix, we present descriptive evidence of selection into ROSCAs. ROSCA participants are slightly richer and more educated than average, and are more likely to be women. More fundamentally, our sample includes only individuals who already self-selected into participating into a savings club, which means that we are looking at a group of people who potentially have a higher propensity or desire to save than average. The fact that we find significant barriers to savings among this group suggests that the rest of the population might be having even more difficulty saving, but we cannot test that in this study. We leave this for future work.

[10] For measures of time consistency, we assign people to one of four categories: (1) "present-biased" individuals who exhibit a higher discount rate in the present than in the future; (2) respondents who exhibit maximum possible discount rates in both the present and future (these individuals preferred 40 Ksh to 500 Ksh in 1 month, and 40 Ksh in 1 month to 500 Ksh in 2 months); (3) respondents who are more patient in the future than in the present; and (4) "time-consistent" individuals who have the same discount rate in the present and the future.

4 Results: Take-up

Table 2 presents summary statistics on take-up of each of the four experimental devices. As mentioned above, take-up was measured for the full sample at two points in time (6 and 12 months after the introduction of the experimental treatments).

Overall take-up was very high for all four devices. At the 6-month mark, 74% of those sampled for a *Safe Box* and 69% of those sampled for a *Lockbox* had a positive amount of cash in their box at the time of the (unannounced) survey. These figures had barely changed by the 12-month follow-up: 71% of the *Safe Box* group and 66% of the *Lockbox* group still had positive amounts in their box. For the ROSCA-level interventions, take-up was equally high. About 65% of respondents had elected to participate in a *Health Pot* with fellow ROSCA members at the 6-month follow-up, and this figure had increased to 71% after one year.[11] Take-up of the *HSA*s was even higher - 93% of respondents elected to create an *HSA* within 6 months and 97% created one within 12 months.

While take-up of the *Lockbox* was almost as high as that of the *Safe Box*, the intensity of usage was significantly higher for the *Safe Box*. Among those with a positive balance in their *Safe Box*, average balances were 630 Ksh (US$ 8.4) after 6 months and 310 Ksh (US$ 4.1) after 12 months. Since these are total balances, not deposits, they are lower bounds on amounts saved. Note that the lower balance after 12 months suggests that most respondents withdrew money from the box to make a purchase between the first and second follow-ups.[12] Amounts saved in the *Lockbox* were not insubstantial, but much lower than those observed in *Safe Box*. The average balance was about half that of the *Safe Box* after six months, and 570 Ksh at 12 months. For the majority of respondents, this represents not only the current balance but also the total ever deposited, since they never called the program officer to withdraw from the box. Indeed, as Panel B shows, only 18% of respondents had called the program officer and asked for their box to get opened within the first 6 months. This had increased to 31% by 12 months. The demand for the earmarking feature (the unavailability of the key) remained very high over time, however. After 6 months, participants were asked: "Do you want the key now, or do you want us to hold on to the key?" Of the 88% who had kept the box, the majority (75%) requested that the program officer hold the key. At 12 months, when the program ended and the program officer handed the key to the participants, about 12% asked if it was possible to extend the program and for the officer to keep the

[11] Note that the adoption at the ROSCA level is slightly higher, with 19 out of 23 ROSCAs in the *Health Pot* group starting a health pot, or 82%. Not all ROSCA members elected to participate in the scheme, however, so the take-up figure at the individual level is lower.

[12] Note that since those using the Safe Box intensively likely withdrew money before the followup, it is not very informative to examine how balances vary with background characteristics.

key (unfortunately this was not possible for budgetary reasons). Thus, even though the *Safe Box* had the larger impact on health investments (as we will show below), some individuals clearly valued the earmarking that the *Lockbox* afforded. For both box groups, secrecy (at least from the spouse) was not a major reason for usage, however. After 6 months, 78% of *Safe Box* spouses and 79% of *Lockbox* spouses knew about the box. This increased to over 90% after 1 year.

Panel C shows that the ROSCAs that formed a *Health Pot* for the most part enforced the earmarking feature: the majority of health pot recipients were either given the pot in-kind (the agreed upon health product), or accompanied to the shop to buy the product. Panel D, based on records kept by ROSCA treasurers in the *HSA* group, shows that participants made a substantial number of small deposits into their *HSA*. The median and mean balance among those who opened an *HSA* reached 90 and 189 Ksh (US$ 2.5) after 12 months, respectively.[13]

It is possible that the money put into these various devices displaced other types of savings. Some of the evidence we show in section 6.3 suggests it might have - in particular, the boxes appear to have somewhat crowded-out ROSCA savings in the long run. On the other hand, the amount households reported spending on durables or on animals were, if anything, higher in the treatment groups than the control group over the study period (results available on request). In any case, even if there were crowding out, the take-up results suggest that the savings devices we consider here are preferred to the alternative people had been using.

5 Results: Impacts on Health Investments

5.1 Average Impacts

We study the average impact of each of the four experimental treatments by running the following regression:

$$Y_i = a + T_i^{'}b + X_i^{'}c + R_i^{'}d + e_i \quad (1)$$

where Y_i is a measure of health savings/investments for individual i, T_i is a vector of treatment dummies, X_i is a vector of individual characteristics (age, gender, marital status, time preferences, and a dummy for being exposed to more than one experimental treatment). R_i is a vector of randomization strata dummies. For both outcomes, we estimate equation (1) both with and without the individual controls.

[13]For both boxes and the *HSA*, the balances observed are relatively substantial compared to average monthly ROSCA contributions, which are around 393 Ksh per month (see Appendix Table A1). The median balance is systematically significantly lower than the mean, suggesting some people used these technologies very intensively.

We consider three measures of health savings/investments: (1) how much the individual spent on preventative health products in the year between the endline and baseline; (2) whether the individual had to forgo medical treatment over the past three months for herself or a family member due to lack of cash; and (3) whether the respondent reached her baseline saving goal.[14]

Estimates of equation (1) are presented in Table 3. We focus on the results at the 12-month follow-up because it took that long to generate substantial impacts.[15] Columns 1 and 2 present the results for preventative investments, Columns 3 and 4 present the results for ability to deal with health emergencies, and Columns 5 and 6 present the goal-reaching results. Regressions without individual controls are shown in the odd numbered columns while those with the controls are in the even numbered columns. The mean and standard deviation of the dependent variables among the control group are presented in each column under the R-squared of the regression.

Columns 1 and 2 show that both the *Safe Box* and the *Health Pot* had positive effects on levels of preventative health investments in the 12 months following their introduction. Compared to the control mean, the effects are very large: the *Safe Box* increased investment by about 68% while the *Health Pot* increased investment by about 129%.[16] By contrast, the *HSA* treatment had no effect on investment, which is not surprising in that it was to be used for saving for emergencies only.

What is striking is the fact that the *Lockbox* had no effect on investment over the year following the project start. This confirms that, on average across the sample over one year, the liquidity cost of holding money in the *Lockbox* outweighed the benefit of the earmarking - that is, although people used both the *Safe Box* and the *Lockbox*, they saved more slowly in the *Lockbox*. It is likely that more people in the *Lockbox* group would have increased preventative health investment if given more time, so there may have been a positive effect

[14] As can be seen in Appendix Table A2, most respondents reported a preventative health product as a goal, but about 16% listed "savings for emergencies" as a goal. In the case of the preventative products, we define a respondent as having reached her goal if she purchased that item. For emergency savings, we do not have a very good estimate of whether people could reach their goal. While we can observe the amount of emergency savings in the HSA and compare that to the listed goal for those in the HSA group, we do not have a comparable measure for those in the control group. Instead, for all groups, we define a respondent as reaching her health emergency savings goal if she reports having no difficulty paying for medical treatment in the past three months. For these 16% of the sample, the likelihood of reaching one's goal is more than double that of those with a preventative investment goal.

[15] After 6 months, the effects have the expected sign but none of them are large, nor significant, which is not surprising since the amounts needed for the goals were quite large, as shown in Table A2. The 6-months results are available upon request.

[16] Note that these increases are not driven by just a few large purchases by a small subsample. While the median and mean amounts spent on preventative health products are, respectively, 105 and 207 Ksh in the control group, they both increase substantially in the treatment groups: the median and mean are 235 and 407 Ksh in the *Safe Box* group, and 335 and 563 Ksh in the *Health Pot* group.

of the *Lockbox* over a longer time period. But the point remains that the *Lockbox* was ineffective over this timeline, while the *Safe Box* was highly effective.

Columns 3 and 4 show that the *HSA*, which was designed mostly to encourage people to build savings to deal with shocks, significantly reduced the likelihood that people would be unable to afford medical care. Again, the effect is extremely large: people in the *HSA* group were 12 percentage points less likely to be unable to afford treatment, on a base of 31% in the control group.[17] The *Safe Box* also appeared to be helpful, but the effects are not statistically significant. As expected, the *Health Pot* and *Lockbox* had minimal effect (since they were not designed for this type of saving).

Columns 5 and 6 shows how the experimental treatments affected the likelihood that people reached their health savings goal. While only 34 percent of those in the control group had reached their goal after 12 months, this probability increased by 13 percentage points in both the *Safe Box* and the *Health Pot* groups. Of course, as discussed earlier, these results should be taken with a grain of salt since people chose their goals after having received the savings technology, and therefore the goals chosen varied somewhat with the technology received (though not too much, as shown in Table A2).

With these estimates, we can attribute the impacts of the experimental saving technologies to one of the three distinct set of attributes: Storage (S), Earmarking (E) and Social Credit + Commitment (C). We focus on our two cleanest outcomes (the preventative health and emergency savings results). As discussed in Section 2, we have the following relationships between estimates of impacts on preventative health investments and the three attributes:

$$\begin{aligned} P1 &= S \\ P2 &= S + E \\ P3 &= S + E + C \end{aligned}$$

where P_1, P_2 and P_3 are the increase in preventative health investments due to the *Safe Box*, the *Lockbox* and the *Health Pot*, respectively.

From Table 3, Column 2, the *Safe Box* increased savings by 175 Ksh, the *Lockbox* by 50 Ksh, and the *Health Pot* by 332 Ksh. Thus, we estimate that simply having access to a safe storage place for money (S) accounts for an additional 175 Ksh in savings. Earmarking (E) is negatively valued at $50 - 175 = -125$ Ksh. This implies that the liquidity cost

[17] This effect size appears reasonable. Recall from Table 2, Panel D, that the total deposits recorded in the *HSAs* at the time of the unannounced 12-month follow-up was just above 200 Ksh on average. We asked those people who couldn't afford full treatment how much they would have needed to do so. In the control group, 200 Ksh corresponded to the 32nd percentile of answers listed. This suggests that the HSA could reduce inability to afford full treatment by about one third. The actual effect is a bit higher than this (39% in the specifications with individual controls), but the confidence interval includes 32%.

of earmarking discourages savings on average, compared to a storage technology without earmarking. Finally, social commitment and credit (C) have the largest impact, estimated at $332 - 175 - (-125) = 282$ Ksh.

5.2 Heterogeneity

We then look for heterogeneity in the treatment effects based on observable characteristics. We run the following set of regressions:

$$y_i = \alpha + T_i'\beta + TRAIT_i \times T_i'\gamma + X_i'\zeta + R_i'\delta + \varepsilon_i \tag{2}$$

where $TRAIT_i$ is a background characteristic along which theory predicts heterogeneity in the impact of the experimental treatments (note that $TRAIT_i$ is included in the vector X_i). The effect of the treatment for the subgroup of people with a given trait is thus the sum of the coefficients $\beta + \gamma$.

We estimate equation 2 for three traits based on our ex-ante hypotheses as to what savings barriers are most important, as discussed in Section 2.3. These are (1) whether the individual supports other members of the community (this is a dummy equal to 1 if an individual reported giving money to at least one friend or relative in the three months prior to the baseline survey, but did not report receiving any money from a friend or relative over that same period); (2) whether the individual exhibits present-biased preferences in survey questions; and (3) whether the individual is married.

The results are presented in Tables 4 (preventative investments) and 5 (savings for emergencies). The p-values for the sums $\beta+\gamma$, i.e. the total estimated impacts for those exhibiting the given "trait", are presented at the bottom of each column. We find substantial heterogeneity in impacts according to the level of social tax and present-bias. We then estimate which attributes are most valued by mapping the estimated effects into the three features of interest, for each type of individual. Those results are presented in two panels in Table 6, discussed in turn below.

Preventative Investment We first compare providers to non-providers (Panel A, columns 1 and 2 in Table 6). The value of having a designated storage place is larger for providers than for non-providers, though the difference is insignificant. What is striking, however, is that while earmarking discourages savings for non-providers, it does not do so for providers. This suggests that providers are more willing to pay the liquidity cost of earmarking than non-providers (likely because having liquidity is less valuable for them since the money would be given away anyway). Similarly, while social commitment and credit are valuable for both

types, it is even more valued by providers.

The next set of results compares those exhibiting present-biased preferences to those who do not (Panel A, columns 3 and 4 in Table 6). The results here are quite intuitive. Those who are not present-biased benefit from having a simple storage place, but do not benefit from earmarking. This is because people who are not present-biased should have less of a need for commitment, so that the liquidity cost of earmarking exceeds its benefit. However, such individuals do respond to the social commitment and credit offered by the *Health Pot*, likely due to the credit aspect. By contrast, those exhibiting present-bias are not able to benefit from the simple storage place offered by the *Safe Box*, since the money is too easily accessible. Interestingly, they also do not benefit from the individual earmarking feature, which suggests that they are naive about their present-bias or that they need commitment to actually use the device. However, they do benefit from the combination of the stronger commitment to make regular contributions and credit provided by the *Health Pot*.

We then present results broken down by marital status. For this comparison, we must restrict the analysis to women only, since there are very few unmarried men in our sample. The main finding here is that intra-household issues are important - married women benefit more from having a designated, safe storage place than do unmarried women. Future work might explore whether these differences apply to men as well.

Saving for Emergencies We find similar results for the technologies used for emergency savings (the *Safe Box* and *HSA*) - see Table 5 and Panel B of Table 6. Note that the dependent variable here is not having enough money to afford full treatment, so that negative coefficients imply that the experimental technologies were effective. Again, a designated storage place is most valuable for those who are providers, and for those who are not present-biased. A notable difference is that, across the entire sample, earmarking is much more valuable here than it was for preventative investment (which can also be seen by comparing the overall *Lockbox* effect in Table 4 to the overall *HSA* effect in Table 5). This result suggests that people in our sample value earmarking for emergency health savings (a first order concern to many households) more than for preventative health.

6 Long-Run Results

The discussion to this point has focused on impacts in the year following the intervention. Given the large impacts observed, an important question is whether respondents continued using these savings devices in the long-run, and whether they spread to non-treatment ROSCAs.

To answer these questions, we conducted a long-term follow-up interview in May 2011, almost three years (33 months) after the rollout of the savings devices in the treatment arms. We randomly selected a subset of 359 study participants, and successfully followed up with 310 of them (86 percent). In the interview, we updated information on the status of the ROSCAs and on whether respondents were using the savings products. Perhaps most importantly, the interviews included a number of open-ended questions to better understand why people were using the various savings products and what they thought of them. In this section, we review the findings of that longer-term follow-up.[18]

6.1 Long-Run Usage

The longer run take-up results are presented in Table 7. We combine the two box groups (*Safe Box* and *Lockbox*) into one (called *Box*), since the key was given to all lockbox holders at either the 6- or the 12-month follow-up survey, thereby transforming the *Lockbox* into a *Safe Box*.

Usage of the boxes is still substantial after almost 3 years: 39% of people are still saving in their box, and for those, the average amount of cash found in the box at the time of the survey was above 700 Ksh. In addition to observing the amount present in the box at the time of the survey, the enumerator asked respondents how much they had deposited in total over the past 33 months. Since most people had not kept records of how much they had been using the box, we allowed people to answer qualitatively if they were unable to estimate: i.e. "a lot," "a little," etc. Overall, 32% of people with a box could give a numerical answer about their total deposits. For these people, the average amount deposited is very high, at around 3,300 Ksh. An additional 21% report depositing "a lot." Most of the people still saving in their box report saving towards a specific goal (83%). The majority of them have maintained at least one health goal (63%), but people often reported saving towards a multiplicity of goals, including for their business, or schools fees.

We find strong evidence of lasting impacts in the two other treatment groups as well: 48% of people are still participating in the *Health Pot* and 53% in the *Health Savings Account*. Of those still saving in an *HSA*, 73% had made a withdrawal, and the majority of withdrawals continue to be for health emergencies.

[18] We present evidence in Appendix Table A4 that the sample surveyed in the long-term followup is representative of the initial sample. As we focus on usage and take-up, the key question is whether those in the long-term followup were using the technologies similarly to the entire sample in earlier follow-ups. Reassuringly, we find that the patterns of take-up and usage of the four experimental saving technologies at the 12-month follow-up are statistically indistinguishable between those in the long-term followup and the entire sample.

6.2 Spillovers

The long-run usage results suggest that the program had a lasting effect on the savings behavior for many individuals. If these technologies are meeting an unmet demand for secure savings and are indeed beneficial for people, then it seems possible that the technologies diffused to non-treatment ROSCAs. In the longer-term follow-up, for every ROSCA in our study, we asked whether the ROSCA had adopted a *Health Pot* or *HSA* scheme. The results are presented in Table 8. We find evidence of spillover effects: at the 3-year follow-up, 11 percent of control group ROSCAs had adopted the *Health Pot* scheme, and 22 percent had adopted the *HSA* scheme. In other words, out of 18 ROSCAs in the control group, 2 adopted the *Health Pot* scheme and 4 adopted the *HSA* scheme. Adoption of these schemes in the *Safe Box* and *Lockbox* group was lower, with only one or two ROSCAs adopting these schemes. The lower adoption figures in the box groups is due in part to the fact that those ROSCAs in those groups were more likely to dissolve, as we will see in next section. In any case, the results in Table 8 suggest non-trivial diffusion of the *Health Pot* and *HSA* saving strategies over time.

6.3 Long-run Impacts on ROSCA survival

This section examines how ROSCA participation was affected by the introduction of the individual saving technologies (the *Safe Box* and *Lockbox*). Understanding the motivation to join a ROSCA has been the subject of a rich theoretical and empirical literature. Besley et al. (1993) argue that ROSCAs enable individuals to save for indivisible goods. Since everybody in the group gets the pot earlier than they would on their own (other than the last person), ROSCAs are efficiency-improving. More recent papers have put the emphasis on ROSCAs offering a commitment function for individuals to overcome inconsistencies in preferences across household members or across time periods. Specifically, Anderson and Baland (2002) study ROSCAs in urban Kenya and find evidence that ROSCA participation arises out of intra-household conflict. In a study of female ROSCAs in rural Kenya, Gugerty (2007) presents evidence suggesting that ROSCAs serve as a commitment device for those who are time inconsistent.

In addition to the question of why they exist in the first place, the organization of ROSCAs raises a second fundamental question: why don't those people who get the pot early in the cycle quit the ROSCA? Besley et al. (1993) argue that in the absence of cheaper forms of credit, ROSCAs can exist if the community is able to punish defaulters by barring them from entering any ROSCA in the future. Basu (2008) studies ROSCA survival in the context of within-individual time-inconsistency. He shows that if ROSCAs are composed of

people with quasi-hyperbolic time preferences (who join ROSCAs as a way to tie their hands to save), ROSCAs can survive even if social sanctions are absent.

Our experimental setting lends itself well to studying the question of why ROSCAs exist and how they survive. Indeed, by randomizing access to individual saving strategies (the *Safe Box* and the *Lockbox*), we created exogenous variation in the "autarkic" option. By testing how these changes in the autarkic option affect ROSCA survival, we can test some of the explanations proposed in the earlier literature.

We collected data on ROSCA survival as part of the long-term follow-up, almost three years after the distribution of the saving technologies in the treatment groups. Note that this data was collected after several cycles would have been completed, so the discontinuation of a ROSCA is not equivalent to the "collapse" of a group mid-cycle in which some people might lose money. In Table 9, we regress the likelihood that the ROSCA has been discontinued on the various experimental treatment arms. We find a very strong effect of the individual saving boxes on ROSCA exit: while the exit rate was only 6 percent over the 33-month study period among ROSCAs where no individual saving strategy was introduced, the exit rate was 23-29 percentage points higher among ROSCAs where saving boxes were distributed.

What do these results imply for our understanding of ROSCAs in the study context? While the boxes did not offer any form of strong commitment, they did serve a "mental accounting" function (as we will show in the next section). For this reason, even the simplest savings technology imaginable (boxes) helped individuals to overcome both inter-personal and intra-personal saving barriers. This appears to have reduced the incentive to participate in ROSCAs and suggests that while the credit motive discussed by Besley et al. (1993) is an important reason to join ROSCAs (as evidenced by the very large effects of the *Health Pot* on savings for health), it does not fully explain ROSCA participation. Our results also suggest that the form of commitment that ROSCAs in this study area offer might be somewhat stronger than what the majority of individuals need. None of the ROSCAs in this study allocate the pot through a bidding process, so that savings are not available for emergencies. In the absence of softer-commitment alternatives, people may choose to participate in ROSCAs even if the liquidity restriction is a major cost for them.

7 Mechanisms

7.1 Mental Accounting

Our most striking result is that getting access to a safe and designated storage technology as simple as a safe box can have large and lasting impacts on savings and investment behavior.

How is this possible? To answer this question, over the course of the study, we conducted semi-structured interviews with our study participants in order to shed some light on mechanisms. While the long-term follow-up featured the most questions of this sort, we have some responses in earlier surveys as well. In this section, we report responses to these questions. In particular, we try to use these questions to understand why it is that the *Safe Box* could have such big effects. Practically, all the *Safe Box* provided is some protection against theft, but in focus groups conducted before starting the study, theft did not seem to be a primary concern for people. What then accounts for the large impact of the *Safe Box*? We find evidence in this section that the box served a sort of mental accounting purpose - the money in the box was to be saved, and it was easier to refuse requests or limit consumption with money mentally allocated to savings.

Table 10 presents answers to questions about obligations to share money with others. In the endline conducted after one year, we asked people how much they agree with the following statement: "If somebody comes to ask me for money and I have the money in cash, I am obligated to give her something." Respondents answered on a scale of 1 to 5 where 1 indicated that they "strongly agreed" and 5 was "strongly disagreed." Thus a response greater than 3 indicates disagreement and a response less than 3 indicates agreement with the statement. Across the entire sample, the average to this question was 2.35. We then asked the *Safe Box* group the same question, but this time for the case in which the money was in the box. While the average *Safe Box* group had a similar response to the cash question as the whole sample (their average was 2.70), they felt much less obligated when the money was in the box (the average was 4.31).

In the longer-term followup, we asked a similar question to both box groups: "If somebody comes to ask for money, is it easier to say no if the money is in the box?" We asked for both a hypothetical person outside the household, and for the spouse (for married respondents). Eighty-one percent of respondents answered yes in the case of someone outside the household, and 43% reported yes in the case of the spouse (despite the fact that the vast majority of spouses knew about the box - see Tables 2 and 7). Thus, part of the explanation for why the *Safe Box* had such a large impact appears to be because it made it easier to say no to money requests from others.

But why does the box make it easier to say no? Why don't people just open up the box to give people the money they ask for? We explore that issue in Table 11. For those who thought the box helped them to save, we asked in an open-ended way why they felt that the box was helpful. We then coded their answers into 7 different categories. Thirty-two percent of people say that the box helped because the money in the box was not on hand, or "out of sight"; 33% said it made it easier to save small change; and 19% said it helped them

to reduce spending on luxury items (an example of such an item is ready-made food items bought on the market, like chips). Another 6% said the very presence of the box encouraged them to save. By contrast, only 6% said the box helped because it reduced theft, and only 2% said it was because the box was in a secret place that others didn't know about.

We also asked people why they thought it was easier to say no to requests for money. Fifty-one percent report that this is because the money in the box is for a specific goal (which we interpret to mean that the money in the box is mentally allocated to savings). Here, people do report that the hidden aspect of the box was important: 24% say that others don't know about the box, 9% say it can't be accessed immediately because it's kept elsewhere, and 5% say that it's not easily accessed because it's hidden. However, while the secrecy that the box enables might be a factor, it seems to be overwhelmed by the mental accounting effect.

While this evidence seems quite compelling, another way to check whether this is indeed the mechanism through which the *Safe Box* mattered would be to look directly at expenditures, and test whether people in the *Safe Box* group reduced spending on treats and transfers to friends/relatives. We cannot do this since we did not attempt to collect such outcomes. In any case, collecting data with enough granularity to observe small decreases in daily spending would have been extremely difficult without detailed high-frequency surveys, which were not feasible in this case.

7.2 Ruling out Alternative Explanations

We can also use the answers observed in our qualitative survey questions to address some possible alternative explanations for our findings. One set of possible concerns is that the experimental treatments offered a fuller set of attributes than we have focused on so far.

The first question is whether the large *Safe Box* effect (and the high take-up of the *Lockbox*, even if it did not translate into an impact in health investments within the study period) would have been observed if these saving technologies had been offered to individuals independently of the ROSCA structure. In other words, how much of the effects come from the fact that the randomization was done at the ROSCA level, and the delivery of the boxes happened at a group meeting, when everyone could see others receive a box and set a goal? This would matter in particular if there are large complementarities in health behavior. None of the health products that were chosen seem to have that property, however. In fact, if anything, we would expect the opposite effect: many of the products chosen as goals generate positive health externalities, and thus free-riding should have been optimal. In other words, even if study participants knew about the social returns (which we do not think

is the case, based on results in Dupas (2010)), this would bias our results downwards, as the private returns to a given product would be highest in the control group.

Another potential issue is that we have considered the *HSA* an individual savings account, but deposits were actually made onto this account at ROSCA meetings. Thus it may be the case that people observed what others were doing (especially how much people were saving) and that this influenced behavior directly. For example, if some members of the ROSCA are also part of one's informal insurance network, people might be less willing to help others if they can see they are not saving enough on their own in their *HSA*. To test for this, we asked respondents in the *HSA* group whether they knew how much other ROSCA members were saving in their *HSA*. We present the results at the bottom of Table 11. We find that 29% knew how much every other ROSCA member was saving and 53% knew about the savings of at least some of them. However, only 12% reported that others' behavior influence their savings.

Yet another possibility is that, given that deposits onto the *HSA* were typically made during regular ROSCA meetings, those meetings might have acted as "reminders" to save in the *HSA*. For example, Kast et al. (2010) find evidence that such self-help group meetings can increase saving rates through a reminder effect. While we cannot rule out this possibility, we want to point out that those in the control group also had frequent ROSCA meetings that could have acted as reminders to save for health.

7.3 Why Didn't ROSCAs Start These Programs on Their Own?

The last important question is why, if these interventions had such big effects, individuals did not come up with them on their own. After all, none of the technologies we introduced required anything new. In fact, the *Health Pot* was simply applying the concept of the ROSCA specifically to health products. The idea of earmarking was not novel either, since many ROSCAs use spending agreements for their main pot (Gugerty 2007). The only "novelty" we brought was the focus on health. Likewise, ROSCAs could easily implement the *HSA* scheme on their own. We provided those sampled for the *HSA* encouragement with a nice-looking ledger to record deposits and withdrawals, but a cheap exercise book available at the local store could have served the same purpose. The boxes we offered were made by hand by a local artisan. They cost about $2 each, including the lock. People could make the box themselves and would only have to invest in a lock, at a cost of $1. In fact, in other parts of Africa, people make lockboxes that do not actually require a lock - they just have a narrow slit that allows deposits but not withdrawals (Shipton 1990). Why didn't people in our study area do this on their own?

We asked people this question directly (in an open ended way) in our long-term follow-up, and coded their answers. Results are presented in Table 11. For the box, only 3% of respondents reported that they were using a savings box already (typically made out of wood). Almost all other respondents answered that they had "never thought of it" (88%). Only 8% reported the problem was the expense. For the *Health Pot*, 72% said they had never thought of it. The remainder said that they had not thought of ROSCAs as something that could be used for health-specific savings (rather than for savings for other purposes). For the *HSA*, the answers were similar: 77% reported that they had not thought of the idea and 23% reported that they had not thought of ROSCAs as a place to save for health.

While these answers are not really satisfactory in the sense that they do not really get at the bottom of *why* people did not think of it on their own, they suggest that once these ideas have been introduced, they should diffuse, which is exactly what we observe in Table 8.

8 Conclusion

In both developed and developing countries, many people have difficulty saving as much as they would like. But while households in developed countries have access to many products to help them surmount their saving difficulties (certificates of deposits, automatic transfers to 401(k)s, HSAs, etc.), households in developing countries tend to rely on much more informal arrangements (Collins et al. 2009; Rutherford 2000). This paper suggests that existing informal mechanisms in rural Kenya are insufficient - introducing a technology as basic as a simple box with a lock and key allows the average individual to substantially increase her investment in preventative health and to reduce her household's vulnerability to health shocks. We present evidence that the mechanism through which this simple safe box enables savings is through a mental accounting purpose. The money put into the box was seen by respondents as "for savings" and was therefore less likely to be spent on luxuries or given away to others. Usage of the box remained high for (at least) 33 months after it was introduced.

Such a simple technology is not valuable for everybody, however. In particular, mental accounting appears insufficient to enable individuals with present-biased preferences to save more. An individual commitment savings account or lockbox is not effective either, however. While present-biased people may realize the need to commit money to savings and be interested in a commitment device, actually putting money into the lockbox itself requires an act of self-control, as discussed in Ashraf et al. (2006a) and Banerjee and Duflo (2011)). Thus, in the same way that people in the US buy gym memberships but subsequently fail to exercise enough to amortize the cost (DellaVigna and Malmendier 2006), people who are

present-biased may sign up for a commitment savings account but never deposit a single penny in it, unless they can precommit to a direct deposit (as in Thaler and Benartzi (2004) or Brune et al. (2011)) or unless they face social pressure. In our study, we find that present-biased individuals enthusiastically accepted the *Lockbox*, but failed to save much in it. In contrast, the enthusiasm that led them to sign up for the *Health Pot* tied their hands not only to spend the money a certain way, but also to continue to save on a regular basis (i.e., at each ROSCA meeting). This strong social commitment feature is the only one that enabled present-biased individuals in our sample to overcome their barriers to savings.

Our sample frame was restricted to those already participating in ROSCAs at baseline. While this sampling strategy means that our sample is not fully representative of the population of rural Kenya (since everybody in the sample had at least some ability to save to start with), it is not too selected either since ROSCA participation is common in our area of study. ROSCA participation rates are even higher in other parts of sub-Saharan Africa (Anderson and Baland 2002). Another piece of evidence which suggests that our results are not specific to our sample is that they are generally consistent with previous research we conducted in the same area of Kenya, in which we found that simple bank accounts had substantial impacts on savings and investment levels for about 40 percent of women who run a small vending business, but were not used by the remaining 60 percent of women vendors, nor by men in the sample (mostly bicycle taxi drivers) (Dupas and Robinson 2009). Since the bank accounts did not provide any form of earmarking or a strong commitment feature, their primary function was likely to provide a designated place to save. The present study suggests that more sophisticated devices that include stronger commitment features might be better suited for some of those individuals who did not use the simple savings account. For others, it appears that a less sophisticated but more easily accessible device such as a *Safe Box* would be better suited to save small sums on a regular basis. Future work could examine whether the results of these studies generalize to other populations.

A key outstanding question is what these individual savings products would do to existing social structures such as informal insurance networks. We find evidence that getting access to a box reduced continued ROSCA participation. Potentially, access to such a technology could cause people to exit insurance networks entirely (Ligon et al. 2000). The only empirical evidence to date comes from a lab experiment implemented with real social networks in India by Chandrasekhar et al. (2011), who find that access to individual saving has only a small impact on informal risk sharing, and overall improves welfare as it allows individuals to smooth consumption over risk that cannot be shared interpersonally. Future research may usefully explore this issue outside the laboratory.

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Table 1. Individual Level Summary Statistics and Balance Check

	Sample Mean (Std. Dev.)	Coefficient (std. errors) on Treatment Dummies:				Equality of means *p-val*	Obs.
Demographic Characteristics		Safe Box	Lock Box	Health Pot	HSA		
Female	0.74	0.08	0.02	0.07	-0.07	0.27	771
	(0.44)	(0.08)	(0.08)	(0.08)	(0.09)		
Age	39.29	-5.01	-3.32	-4.47	-2.91	0.30	771
	(13.09)	(2.40)**	(2.46)	(2.36)*	(2.51)		
Married	0.78	-0.01	0.01	0.03	0.07	0.58	771
	(0.42)	(0.09)	(0.06)	(0.07)	(0.06)		
Num. of Children	3.84	-0.16	-0.59	-0.32	-0.14	0.19	771
	(2.38)	(0.30)	(0.28)**	(0.33)	(0.26)		
Years of Education	6.26	-0.65	-0.46	1.06	-0.07	0.17	753
	(3.80)	(0.61)	(0.64)	(0.75)	(0.56)		
Can write in Swahili	0.73	-0.03	-0.01	0.10	0.03	0.24	753
	(0.44)	(0.06)	(0.07)	(0.06)	(0.06)		
Cement floor at home	0.23	0.02	-0.02	0.13	0.04	0.22	750
	(0.42)	(0.09)	(0.07)	(0.08)	(0.07)		
Provider[1]	0.16	0.12	0.04	0.08	0.04	0.14	771
	(0.37)	(0.05)**	(0.04)	(0.05)	(0.04)		
Weekly income (Ksh)	603	-12	-83	119	11	0.24	715
	(589.68)	(83.25)	(74.07)	(88.05)	(73.44)		
Health Status and Behavior							
Prob. Children under 5 had malaria	0.33	0.00	-0.01	-0.07	-0.05	0.83	399
episode in past month	(0.42)	(0.07)	(0.07)	(0.08)	(0.07)		
Respondent had malaria	0.20	0.03	0.00	0.02	-0.01	0.88	669
in past month	(0.40)	(0.05)	(0.04)	(0.05)	(0.04)		
Treats drinking water with chlorine	0.52	0.02	-0.08	-0.02	-0.05	0.72	669
	(0.50)	(0.08)	(0.08)	(0.07)	(0.06)		
Num. of bednets owned	1.69	-0.05	-0.39	0.04	-0.01	0.15	674
	(1.55)	(0.25)	(0.22)*	(0.31)	(0.24)		
Time and Risk Preferences [2]							
Somewhat Patient	0.18	0.02	-0.01	0.00	-0.02	0.91	771
	(0.39)	(0.05)	(0.05)	(0.05)	(0.04)		
Present-biased	0.16	0.01	0.02	0.01	0.06	0.54	771
	(0.37)	(0.06)	(0.05)	(0.05)	(0.05)		
More patient now than in the future	0.18	0.00	0.04	0.01	-0.01	0.71	771
	(0.38)	(0.04)	(0.04)	(0.04)	(0.04)		
Maximal Discount Rate in Present	0.45	-0.07	-0.09	-0.05	-0.08	0.72	771
and in Future	(0.50)	(0.07)	(0.07)	(0.07)	(0.06)		
Number of ROSCA memberships	1.61	0.18	-0.07	0.07	0.19	0.05*	771
	(0.88)	(0.11)	(0.11)	(0.14)	(0.13)		
Why do you participate in ROSCAs? (Unprompted; More than one response possible)							
It's easier to save in a group than	0.94	-0.02	0.00	-0.01	-0.02	0.88	770
on my own	(0.23)	(0.03)	(0.02)	(0.03)	(0.03)		
To have time to talk to my friends	0.51	-0.05	0.07	0.01	0.01	0.32	770
in the group/socialize	(0.50)	(0.07)	(0.06)	(0.06)	(0.07)		

*Notes: Exchange rate was roughly 75 Ksh to US $1 during the study period. Standard errors in parentheses, clustered at the rosca-level. ***, **, * indicates significance at 1, 5 and 10%. [1] "Provider" is a dummy equal to 1 if the individual declared having given money to a relative or friend in the three months preceding the baseline survey, but not having asked money from a relative or friend over the same time period. [2] "Somewhat Patient" is a dummy equal to 1 if the respondent prefers 55 Ksh (or less) in 1 month to 40 Ksh now. "Present-Biased" is a dummy equal to 1 if the respondent exhibits a higher discount rate between today and 1 month from today than between 1 month from today and 2 months from today.*

Table 2. Descriptive Statistics on Take-up of Experimental Saving Technologies

	After 6 Months				After 12 months			
Panel A. Overall Take-up	Safe Box	Lock Box	Health Pot	HSA	Safe Box	Lock Box	Health Pot	HSA
Currently uses the saving technology*	0.74	0.69	0.65	0.93	0.71	0.66	0.71	0.97
If uses technology: Current Balance (in Ksh):								
Median	200	150	N/A	70	200	200	N/A	90
Mean	634	286	N/A	142	311	477	N/A	189
Std. Dev	1248	432	N/A	224	423	817	N/A	369
If uses: reports that technology "helped save more"	0.95	0.78	0.98	0.90	0.97	0.79	0.99	0.92
Panel B. Safe Box and Lockbox only								
Still has box	0.94	0.88			0.91	0.87		
If married: Spouse knows about the box	0.78	0.79			0.93	0.90		
Ever Called Program Officer to get Lockbox opened		0.18				0.31		
Refused key when offered at 6-month follow-up		0.75						
Panel C. Health Pot only								
If participates: Ever received health pot			0.34				0.57	
Received health product in kind			0.81				0.85	
Accompanied to buy health product at shop by ROSCA member			-				0.02	
Encouraged by others to use health pot funds buy health product			-				0.10	
Panel D. Health Savings Account only								
Deposits								
Total number of deposits				4.53				6.53
Sum of all deposits (in Ksh)				146				219
Withdrawals								
If uses technology: Ever withdrew				0.32				0.48
Median withdrawal size, in Ksh				125				198
Mean withdrawal size, in Ksh				150				196
Purpose of Withdrawal								
Health Emergency				0.82				0.76
Funeral				0.00				0.03
To buy Preventative Health Product				0.18				0.21
Number of observations	102	198	137	221	102	181	114	221

Notes: The data comes from unannounced home visits as well as ROSCA visits conducted after 6 months and 12 months. Data on balances in the boxes are based on direct observation by enumerators. Data on balances and withdrawals for the HSA group come from the HSA record book kept by treasurers for ROSCAs sampled for HSA.
Exchange rate was roughly 75 Ksh to US $1 during the study period.
**Currently uses the technology = 1 if there is a non-zero amount in the box /HSA, or if contributes to health pot.*

Table 3. Average Impacts of Saving Technologies after 12 months

	(1)	(2)	(3)	(4)	(5)	(6)
	Amount (in Ksh) spent on preventative health products since baseline		Could not Afford Full Medical Treatment for an Illness in Past 3 Months		Reached Health Goal	
Safe Box	190.30	169.99	-0.10	-0.08	0.14	175.53
	(80.83)**	(83.05)**	(0.06)	(0.06)	(0.06)**	(88.29)**
Lockbox	50.49	35.36	-0.03	-0.02	-0.01	0.82
	(63.54)	(61.06)	(0.06)	(0.06)	(0.06)	(57.81)
Health Pot	354.14	328.34	-0.03	-0.01	0.15	248.01
	(103.78)***	(99.47)***	(0.06)	(0.06)	(0.07)**	(100.06)**
Health Savings Account	33.11	27.00	-0.14	-0.12	0.05	-21.44
	(62.10)	(59.28)	(0.06)**	(0.06)*	(0.05)	(58.25)
Individual Controls	No	Yes	No	Yes	No	Yes
ROSCA Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	770	770	770	770	771	770
R-Squared	0.06	0.09	0.08	0.11	0.03	0.11
Mean of Dep. Var. (Control Group)	257.83	257.83	0.31	0.31	0.34	257.83
Std Dev of Dep. Var. (Control Group)	306.66	306.66	0.47	0.47	0.48	306.66
P-value for joint significance	*0.01***	*0.01***	*0.16*	*0.19*	*0.02***	*0.03***

*Notes: Data from 12-month follow-up survey. OLS regressions. Individual controls include gender, age, time preferences, marital status, whether the respondent is a net provider of loans/gifts in the community, and an indicator variable for having been sampled for multiple treatments. Rosca level controls include the monthly ROSCA contribution as well as the stratification dummies. Standard errors in parentheses, clustered at the rosca-level. ***, **, * indicates significance at 1, 5 and 10%.*

Columns 1-2: Dependent variable is the total amount spent on preventive health products between baseline and endline survey conducted after 12 months.

Columns 3-4: Dependent variable is a dummy equal to 1 if the respondent answered yes, at endline, to the question: "Was there a time in the last 3 months when you or somebody in your household needed a specific medicine or a specific treatment, but you didn't have enough to purchase it?"

Columns 5-6: Dummy equal to 1 if the health goal listed at baseline was reached.

Table 4. Heterogeneity of Impacts (Preventative Health Investments)

	(1)	(2)	(3)
Dep. Var:	Amt spent on preventative health products (Ksh)		
TRAIT:	Provider[1]	Present-Bias	Married[2]
Sample:	ALL	ALL	WOMEN ONLY
(a1) Safe Box	-0.05	226.42	96.04
	(0.07)	(91.80)**	(99.16)
(a2) TRAIT X Safe Box	-0.28	-214.83	104.00
	(0.19)	(129.13)*	(148.48)
(b1) Lockbox	16.97	100.62	62.19
	(63.26)	(68.61)	(105.21)
(b2) TRAIT X Lockbox	282.66	-245.00	-36.49
	(140.49)**	(105.52)**	(113.89)
(c1) Health Pot	251.98	340.32	614.75
	(100.75)**	(99.87)***	(278.41)**
(c2) TRAIT X Health Pot	514.58	-30.49	-371.20
	(193.42)***	(207.33)	(276.35)
Observations	770	770	770
R-Squared	0.12	0.10	0.10
Mean of Dep. Var. (Control Group)	0.31	257.83	257.83
Std Dev of Dep. Var. (Control Group)	0.47	306.66	306.66
Share of sample with TRAIT	0.16	0.26	0.78
Total effect of Safe Box if TRAIT (a1+a2)	-0.33	11.59	200.04
p-val a1+a2= 0	*0.06**	*0.92*	*0.07**
Total effect of Lock Box if TRAIT (b1+ b2)	299.63	-144.38	25.70
p-val b1+b2= 0	*0.04***	*0.13*	*0.71*
Total effect of Health Pot if TRAIT (c1+ c2)	766.56	309.83	243.55
p-val c1+c2= 0	*0.01****	*0.12*	*0.01***

*Notes: Data from 1-year follow-up survey. OLS regressions with individual and ROSCA-level controls. Individual controls inlude age, gender, and the "TRAITS" (provider, present-biased, and married). Rosca level controls include the monthly ROSCA contribution as well as the stratification dummies. Standard errors in parentheses, clustered at the rosca-level. ***, **, * indicates significance at 1, 5 and 10%.*

[1] *"Provider" is a dummy equal to 1 if the individual declared having given money to a relative or friend in the three months preceding the baseline survey, but not having asked money from a relative or friend over the same time period.*

[2] *There are extremely few unmarried men in each treatment group (88% of men are married), therefore the coefficient estimate on "married" is in practice estimated off of married women only.*

Table 5. Heterogeneity of Impacts (Ability to Cope with Emergencies)

		(1)	(2)	(3)
	Dep. Var:	Could not Afford Full Medical Treatment for an Illness in Past 3 Months		
	TRAIT:	Provider[1]	Present-Bias	Married[2]
	Sample:	ALL	ALL	WOMEN ONLY
(a1) Safe Box		196.75	-0.10	-0.03
		(97.51)**	(0.07)	(0.11)
(a2) TRAIT X Safe Box		-138.31	0.07	-0.07
		(130.14)	(0.12)	(0.14)
(b1) HSA		-0.07	-0.13	-0.04
		(0.07)	(0.07)*	(0.08)
(b2) TRAIT * HSA		168.01	0.04	-0.10
		(99.49)*	(0.11)	(0.11)
Observations		770	770	770
R-Squared		0.10	0.11	0.11
Mean of Dep. Var. (Control Group)		257.83	0.31	0.31
Std Dev of Dep. Var. (Control Group)		306.66	0.47	0.47
Share of sample with TRAIT		0.16	0.26	0.78
Total effect of Safe Box if TRAIT (a1+a2)		58.44	-0.03	-0.10
p-val a1+a2= 0		*0.50*	*0.76*	*0.20*
Total effect of HSA if TRAIT (b1+ b2)		167.94	-0.09	-0.14
p-val b1+b2= 0		*0.01***	*0.33*	*0.07**

Notes: see Table 4 notes.

Table 6. Impact of Specific Product Features, by saver's trait

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Trait:	Provider		*p-val* No=Yes	Present-Biased		*p-val* No=Yes	If female: Married		*p-val* No=Yes
	No	Yes		No	Yes		No	Yes	
Sample Share:	*0.84*	*0.16*		*0.84*	*0.16*		*0.74*	*0.26*	
Panel A. Impact on Preventive Health Investments									
Storage (S)	0	0*	*0.14*	226**	12	*0.10*	96	200*	*0.49*
	(0)	(0)		(92)	(116)		(99)	(108)	
Earmarking (E)	-164*	64	*0.1**	-126	-156	*0.79*	-34	-174*	*0.30*
	(92)	(113)		(90)	(99)		(98)	(100)	
Social Commitment and Credit (C)	235**	467***	*0.22*	240**	454**	*0.28*	553*	218**	*0.23*
	(109)	(179)		(94)	(210)		(288)	(85)	
Panel B. Impact on Vulnerability to Health Shocks									
Storage (S)	197**	58.44	*0.29*	-0.10	-0.03	*0.58*	-0.03	-0.10	*0.60*
	(97.51)	(86.07)		(0.07)	(0.11)		(0.11)	(0.07)	
Earmarking (E)	-0.02	-0.12*	*0.19*	-0.03	-0.0600	*0.76*	-0.01	-0.04	*0.82*
	(0.06)	(0.07)		(0.06)	(0.09)		(0.13)	(0.06)	

*Notes: Panel A (B) based on results presented in Table 4 (5). Standard errors in parentheses, clustered at the rosca level. ***, **, * indicates significance at 1, 5 and 10%.*

The table reads as follows. Column 1: 84% of individuals in our sample are non-providers. For those, the value of having a designated, safe saving storage technogloy (S) in terms of increased investments in preventive health is 181 Ksh (Panel A, row 1). For the 16% who are providers (column 2), this value is greater, at 236 Ksh (Panel, A row 1), but the difference between the two is not significant (the p-value is 0.65, Panel A row 1 column 3). In contrast, there is difference significant at exactly 10% (p-value of 0.10) between the value of earmarking for non-providers and providers. Namely, earmarking is negatively valued by non-providers (-164Ksh), but modestly valued by providers (64 Ksh).

Table 7. Long-term Impacts: Usage of savings technologies af 33 months

	After 3 Years		
		Health	
	Box[1]	Pot	HSA
Currently uses the saving technology*	0.39	0.82	0.51
If uses technology: Current Balance (in Ksh):			
Median	200	-	105
Mean	706	-	251
Std. Dev	1640	-	434
If uses: reports that technology "helped save more"	0.69	0.97	0.86
Safe Box and Lockbox			
Still has box	0.65		
If married: Spouse knows about the box	0.91		
Reports saving in the box for at least one specific goal	0.83		
Reports saving in the box for at least one goal that is health related	0.63		
If ever used box: Total of all deposits			
Proportion giving numerical estimate	0.32		
Median	1850		
Mean	3369		
Std. Dev	5959		
Proportion reporting "a lot"	0.21		
If ever used box: Total of all withdrawals			
Proportion giving numerical estimate	0.27		
Median	1500		
Mean	2033		
Std. Dev	2207		
Proportion reporting "a lot"	0.21		
Health Pot			
Participated in first health pot cycle		0.70	
If participated to first health pot cycle: received pot		0.94	
Received health product in kind		0.34	
Health Savings only			
If uses technology: Ever withdrew			0.74
Median withdrawal size, in Ksh			200
Mean withdrawal size, in Ksh			308
Purpose of Withdrawal			
Health Emergency			0.77
Funeral			0.03
To buy Preventative Health Product			0.06
Other			0.16
Total Number of observations	72	53	75

** Currently uses the technology = 1 if there is a non-zero amount in the box /HSA, or if contributes to health pot.*

[1] We pool the Safe and Lockboxes because we gave the key back after 12 months (almost 2 years prior to this follow-up).

Table 8. Spillovers: Diffusion of Saving Technologies

	(1)	(2)	(3)
	Has a functioning *Health Pot* scheme at 3-year Followup	Has a functioning *HSA* scheme at 3-year Followup	N
Initial Treatment Assignment			
Control Group	0.111	0.222	18
Safe Box	0.100	0.050	20
Lockbox	0.038	0.038	26
Health Pot	0.565	0.043	23
Health Savings Account	0.038	0.654	26
Total			113

Notes: Data is from follow-up conducted approximately 33 months after start of experiment. ROSCAs

Table 9. Impacts on ROSCA survival

	(1)	(2)
	Dependent Variable: ROSCA was still functioning at Long-Run Follow-up	
Box[1]	-0.14	-0.21
	(0.12)	(0.126)*
Health Pot	-0.29	-0.35
	(0.112)**	(0.120)***
Health Savings Accounts	-0.08	-0.09
	(0.12)	(0.12)
Constant	-0.02	-0.12
	(0.11)	(0.12)
ROSCA-level controls	No	Yes
Number of ROSCAs	1	1
R-squared	(0.086)***	(0.173)***
Mean in control group	113.00	113.00

Notes: Data is from follow-up conducted approximately 33 months after start of experiment.
[1] The Safe Box and Lockbox groups are pooled since individuals in the Lockbox group were given the key after 1 year, i.e. approximately 2 years before the long-run follow-up.

Table 10. Self-reported evidence on Obligations to Share Money

	(1)	(2)
	All	
	Mean	N
Panel A. Data Collected After 12 months		
Whole Sample		
Agree with statement: if somebody asks me for money and I have cash on hand,	2.35	695
I am obligated to give them something (1-5; higher values = disagree)	(1.34)	
Safe Box Group		
Agree with statement: if somebody asks me for money and I have cash on hand,	2.57	114
I am obligated to give them something (1-5; higher values = disagree)	(1.46)	
Agree with statement: if somebody asks me for money and I have cash in the box,	4.31	94
I am obligated to give them something (1-5; higher values = disagree)	(1.20)	
Panel B. Data Collected after 33 months (Box Groups Only)		
If somebody from outside your household comes to ask for money, is it	0.81	159
easier to say no if money is in the box? (0=no, 1=yes)	(0.40)	
(married respondents only) If your spouse asks for money, is it easier to say no	0.43	119
if the money is in the box? (0=no, 1=yes)	(0.50)	

Notes: Standard deviations in parentheses.

Table 11. Answers to semi-qualitative surveys administered at Long-Term Follow-up

	(1)	(3)	(5)
	Box[1]	Health Pot	HSA
Why didn't you adopt this saving technology on your own?			
N/A, was already using this technology	0.03	0.00	0.00
Never thought of it	0.88	0.74	0.79
Expensive	0.08	-	-
ROSCAs are not for health	-	0.26	0.21
Afraid money would be stolen	0.01	0.00	0.00
Box Groups Only			
Why did the savings product help you save more?			
Money in box is not immediately on hand	0.32		
Way to save small change	0.33		
Reduces spending on luxury items	0.19		
The presence of the box encouraged me to save	0.06		
Less prone to theft	0.06		
The box is secret / other people don't know about it	0.02		
Why did the savings product allow you to refuse requests for money?			
Money in box is for a specific goal	0.51		
People don't know there is money in the box	0.24		
Can't access money since the box is kept elsewhere	0.09		
Can't easily access box since it's hidden	0.05		
I can pretend I don't have the key	0.01		
The box is secret / other people don't know about it	0.06		
Lockbox Group Only			
While the key was held in the IPA office, did you think it would be possible to call the program officer and withdraw money for non-health expenses?	0.06		
Health Savings Only			
Knew how much all others in the ROSCA were saving in their HSA			0.29
Knew how much some but not all others in the ROSCA were saving in their HSA			0.53
Reports that own HSA savings behavior was influenced by what others were doing			0.12

Notes: Data is from follow-up conducted 33 months after project started.

[1] *We pool the two box groups because the Lock Box group was given the key after 1 year.*

Appendix Table A1. Summary Statistics and Balance Check (ROSCA Level)

	Control Group	*Treatment Groups:*				P-Values for Test of:				
		Safe Box	Lockbox	Health Pot	HSA	1=2=3 =4=5	*2=1*	*3=1*	*4=1*	*5=1*
	1	2	3	4	5	6	7	8	9	10
Number of Members in ROSCA	17.78	17.70	17.62	13.52	18.08	0.29	0.98	0.95	0.10	0.91
	(7.00)	(10.41)	(9.84)	(6.07)	(6.75)					
Female Only ROSCA	0.33	0.30	A	0.30	0.27	0.93	0.83	0.73	0.85	0.66
	(0.49)	(0.47)	(0.50)	(0.47)	(0.45)					
Share of Female Members	0.70	0.77	0.77	0.79	0.68	0.62	0.44	0.43	0.33	0.82
	(0.31)	(0.25)	(0.25)	(0.23)	(0.32)					
Number of meetings per month	2.33	1.95	2.39	2.26	2.15	0.75	0.31	0.88	0.84	0.61
	(1.14)	(1.03)	(1.27)	(1.14)	(1.12)					
Contribution Size, Monthly Equivalent (in Ksh)	522	353	344	380	397	0.44	0.11	0.08*	0.17	0.21
	(483)	(292)	(288)	(282)	(277)					
Pot Size (in Ksh)	4209	3295	3115	3100	3397	0.84	0.41	0.29	0.30	0.44
	(4309)	(3068)	(3388)	(3648)	(2523)					
ROSCA provides loans to members	0.61	0.60	0.58	0.61	0.77	0.63	0.94	0.82	0.99	0.29
	(0.50)	(0.50)	(0.50)	(0.50)	(0.43)					
ROSCA has an insurance pot	0.39	0.45	0.60	0.52	0.65	0.41	0.71	0.18	0.40	0.09*
	(0.50)	(0.51)	(0.50)	(0.51)	(0.49)					
Predetermined Order	1.00	1.00	0.96	1.00	0.96	0.67	1.00	0.34	1.00	0.35
	0.00	0.00	(0.20)	0.00	(0.20)					
"Health Script" happened during regular meeting	0.94	0.84	0.88	0.91	0.88	0.89	0.33	0.49	0.73	0.52
	(0.24)	(0.38)	(0.34)	(0.29)	(0.33)					
"Health Script" happened in the morning	0.17	0.35	0.15	0.13	0.19	0.41	0.16	0.92	0.77	0.83
	(0.38)	(0.49)	(0.37)	(0.34)	(0.40)					
Number of Roscas (Total = 113)	18	20	26	23	26					

Appendix Table A2. Baseline Health Savings Goal

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
			Specific Goal						
	Money needed to reach Goal (self-assessed)	Months needed to reach Goal (self-assessed)	Chlorine to Treat Water	Water Filter	Water Container	Bednet	Latrine	Gum Boots	Money in Case of Emergencies
Safe Box	-64.12	-0.53	-0.08	-0.03	0.00	0.10	0.01	0.02	-0.06
	(64.56)	(0.24)**	(0.05)*	(0.02)	(0.03)	(0.07)	(0.01)	(0.04)	(0.03)**
Lockbox	81.79	0.08	-0.14	0.01	0.06	0.05	0.01	0.06	-0.06
	(91.58)	(0.27)	(0.04)***	(0.03)	(0.03)**	(0.05)	(0.02)	(0.03)**	(0.03)*
Health Pot	106.54	-0.23	-0.02	0.04	0.03	-0.06	-0.01	-0.02	0.02
	(90.55)	(0.24)	(0.05)	(0.03)	(0.03)	(0.06)	(0.01)	(0.04)	(0.04)
Health Savings	46.38	0.11	-0.09	-0.01	0.04	0.01	0.00	0.02	0.04
	(77.06)	(0.27)	(0.04)***	(0.03)	(0.03)	(0.06)	(0.01)	(0.03)	(0.03)
p-value for F-test joint significance	0.38	0.04**	0***	0.24	0.33	0.30	0.79	0.19	0.001***
Control Mean	548.26	2.56	0.25	0.07	0.06	0.32	0.04	0.10	0.16
Control Std. Dev.	742.71	3.14							
Observations	823	829	832	832	832	832	832	832	832

Notes: Data collected at baseline. Individual controls include gender, age, time preferences, marital status, whether the respondent is a net provider of loans/gifts in the community, and an indicator variable for having been sampled for multiple treatments. Rosca level controls include the monthly ROSCA contribution as well as the stratification dummies.

Appendix Table A3. Attrition in 6- and 12-month follow-ups

	(1)	(2)
	Could not be interviewed at midline (after 6 months)	Could not be interviewed at endline (after 12 months)
Safe Box	0.057	-0.004
	(0.057)	(0.033)
Lock Box	0.013	-0.012
	(0.034)	(0.031)
Health Pot	0.037	0.039
	(0.042)	(0.030)
HSA	0.071	-0.023
	(0.050)	(0.029)
Age	0.011	-0.015
	(0.010)	(0.007)**
Female	-0.035	0.005
	(0.032)	(0.028)
Married	-0.011	0.036
	(0.035)	(0.019)*
Provider	0.028	-0.037
	(0.041)	(0.022)*
More patient now than in the future	-0.076	-0.015
	(0.027)***	(0.022)
Present-Biased	0.041	-0.018
	(0.038)	(0.030)
Maximal Discount Rate in Present and in Future	-0.024	-0.005
	(0.031)	(0.031)
Observations	0	0
R-squared	(0.114)	(0.064)*
Mean of Dep. Var. (Control Group)	833.000	833.000
Std Dev of Dep. Var. (Control Group)	0.280	0.050

Notes: see Table 1 notes for the definitions of the variables. All regressions include strata fixed effects.
*Standard errors in parentheses, clustered at the rosca-level. ***, **, * indicates significance at 1, 5 and 10%.*

Appendix Table A4. Representativeness of 3-year Follow-up Sample

	(1)	(2)	(3)	(4)
Panel A. Unlocked Box	Uses Box		Amount in Box	
	6 months	1 Year	6 months	1 Year
Completed long-term follow-up survey	0.045	-0.048	-8.817	72.317
	(0.090)	(0.091)	(223.412)	(76.511)
Mean for those not completing survey	0.72	0.74	469.48	187.25
S.D. for those not completing survey	0.45	0.45	1139.30	359.63
Observations	102	101	102	101
Panel B. Locked Box	Uses Box		Amount in Box	
	6 months	1 Year	6 months	1 Year
Completed long-term follow-up survey	-0.114	-0.034	34.061	22.970
	(0.069)	(0.072)	(59.275)	(113.560)
Mean for those not completing survey	0.73	0.67	206.55	365.68
S.D. for those not completing survey	0.45	0.47	325.44	679.68
Observations	188	180	188	180
Panel C. Health Pot	Contributes to Pot		Reports "Health Pot Helped Save More"	
	6 months	1 Year	6 months	1 Year
Completed long-term follow-up survey	0.092	0.006	-0.015	0.022
	(0.087)	(0.089)	(0.033)	(0.027)
Mean for those not completing survey	0.62	0.71	0.98	0.98
S.D. for those not completing survey	0.49	0.46	0.13	0.15
Observations	137	114	89	75
Panel D. Health Savings Account	Uses Account		Balance	
	6 months	1 Year	6 months	1 Year
Completed long-term follow-up survey	-0.020	-0.028	-8.611	-22.317
	(0.058)	(0.057)	(31.133)	(51.718)
Mean for those not completing survey	0.79	0.81	138.10	194.32
S.D. for those not completing survey	0.41	0.39	246.55	425.56
Observations	220	220	220	220

*Notes: To check the representativeness of the long-term follow-up sample, this table compares the 6-month and 12-month take-up figures among those interviewed for the long-term follow-up (after 33 months) and the full sample. All regressions include strata fixed effects. Standard errors in parentheses, clustered at the rosca-level. ***, **, * indicates significance at 1, 5 and 10%.*

Appendix

Who participates in ROSCAs?

To study the determinants of ROSCA participation, we use data from an ongoing savings project we are conducting with a random sample of households in Western Kenya. Unlike the current study, participants in that study were sampled from a census of *all* households in three villages, and should therefore be representative of households in the area. We collected background characteristics and ROSCA participation from every respondent in that sample. In total, we have data on 2,580 adults in 1,693 households. We present this data in Appendix Table A5, in which we regress ROSCA participation on several background characteristics.

In Column 1, we include standard demographic variables including gender, marital status, age, and a measure of wealth (the value of animals owned).[19] Consistent with other studies, we find that women are much more likely to join ROSCAs than men (by close to 15 percentage points, on an average participation rate of 41 percent), but marital status does not appear to be a driver. We also find that more educated and richer individuals are more likely to join ROSCAs, and that older people are less likely. The fact that women and richer respondents are more likely to participate in ROSCAs is consistent with the experimental results in our earlier work in this study area, in which we found that women are more likely to take up savings accounts in a village bank (Dupas and Robinson 2009).

In Column 2, we include other controls, including measures of risk aversion and time discounting identical to those presented in Table 1. We find that people who are more risk loving are more likely to join. We find no evidence that patience or time inconsistency affect participation. These results suggest that present-bias may not be the primary driver of ROSCA participation in our study context.

[19] We also include village fixed-effects in this regression.

Appendix Table A5. Determinants of ROSCA Participation

	(1)	(2)
Female	0.145	0.146
	(0.051)***	(0.051)***
Years education	0.019	0.018
	(0.003)***	(0.003)***
Age	-0.002	-0.001
	(0.001)**	(0.001)**
Married	0.018	0.018
	(0.048)	(0.048)
Female * Married	-0.020	-0.024
	(0.055)	(0.055)
Value of animals (1000 Ksh)	0.003	0.003
	(0.001)***	(0.001)***
Percentage Invested (out of 100 Ksh) in Risky Asset[a]		0.121
		(0.043)***
Somewhat Patient		-0.002
		(0.036)
Present-Biased		-0.027
		(0.036)
Patient Now, Impatient Later		-0.032
		(0.037)
Maximal Discount Rate in Present and Future		-0.042
		(0.033)
Observations	2580	2580
# of households	1693	1693
R-squared	0.047	0.051
Mean of the dependant variable	0.412	0.412

Notes: Data taken from a random sample of households in Western Kenya. Standard errors, clustered at the household level, in parentheses. ***, **, * indicates significance at 1, 5 and 10%.
See Table 1 for definition of time preference measures.
[a]The risky asset paid off 4 times the amount invested with probability 0.5 and 0 otherwise.