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Why Don't the Poor Save More? Evidence from Health Savings Experiments[†]

By Pascaline Dupas and Jonathan Robinson*

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 and reduce vulnerability to health shocks. Simply providing a safe place to keep money was sufficient to increase health savings by 66 percent. Adding an earmarking feature was only helpful when funds were put toward emergencies, or for individuals that are frequently taxed by friends and relatives. Group-based savings and credit schemes had very large effects. (*JEL* C93, D14, D91, I12, O12)

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. 2013) or clean water connections (Devoto et al. 2012), the up-front 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.

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 secure place to put money, but did not provide any commitment to make deposits or limit withdrawals. Thus, the product provided only a very soft form of commitment through labeling (a form of mental accounting). Two other products offered stronger commitment through earmarking (the money saved could only be used for the prespecified purpose). A final product, in addition to earmarking, offered credit as well as a social commitment to make regular

* Dupas: Economics Department, Stanford University, 579 Serra Mall, Stanford, CA 94305 (e-mail: pdupas@stanford.edu); Robinson: Economics Department, University of California at Santa Cruz, 457 Engineering 2, Santa Cruz, CA 95064 (e-mail: jmrtwo@ucsc.edu). We thank two anonymous referees, Sandro Ambuehl, Nava Ashraf, Esther Duflo, Sarah Green, Seema Jayachandran, Anthony Keats, Erik Snowberg, John Strauss, and Diego Ubfal for helpful comments, as well as numerous seminar audiences. We are grateful to the California Center for Population Research for funding, to IPA Kenya for administrative assistance coordinating the project, and to Jacob Bor, Sefira Fialkoff, Katie Hubner, Stephanie Ruiz, and Kim Siegal for research assistance in the field. The study received IRB approval from KEMRI/Kenya National Ethical Review Committee, UCLA, UCSC, and IPA Kenya. We declare having no relevant or material financial interests that relate to the research described in this paper. All errors are our own.

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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.

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), and lack of cash is commonly reported by households as a major barrier to health investments.

Our main outcomes are (i) take-up of the savings technologies; (ii) investment in preventative health products; and (iii) whether households are able to deal with health emergencies when they arise. We compare 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.

Our first main result is that the take-up of all four saving technologies was very high. After 12 months, the take-up rates were between 66 and 97 percent. These take-up figures suggest that the primary appeal of the devices 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 health savings was by facilitating mental allocation of the savings to a specific use, a form of mental accounting called labeling (Thaler 1999). In follow-up surveys, respondents reported that once the money was set aside, they were better able to avoid "unplanned expenditures," including transfers to friends and relatives and luxury spending. In other words, money set aside in the savings devices was labeled as health savings and became non-fungible with other sources of cash, even though the money was physically easily accessible.

Turning to impacts on health investment, our second main result is that earmarking for preventative health investments was ineffective for the average individual. By contrast, earmarking for health emergencies increased people's ability to cope with shocks. The reason that earmarking for preventative health was not an attractive feature is that earmarking brings with it the substantial liquidity cost of not being able to access money when it is needed for other purposes (in particular health emergencies). By contrast, earmarking for health emergencies allows precisely the types of emergency withdrawals that people are most concerned about, and so was highly valued.

Our third main result is that providing credit and social pressure to make deposits for health in a group setting (in this case, a Rotating Savings and Credit Association, or ROSCA) is a highly effective means of increasing health investments.

We provide further but somewhat more speculative evidence on the savings barriers that these devices helped overcome by examining how impacts varied with background characteristics. First, we find that 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) are the only subgroup which continued to save when deposits were earmarked for preventative health. We conjecture that the demands on their income are strong enough that limiting liquidity is not as costly for them. While we cannot entirely rule out that the differential effects we see for these

"providers" are potentially driven by some unobservable characteristics correlated with provider status, it is worth noting that our 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.[1]

Second, our results suggest that time-inconsistency might be another important constraint. As might be expected, those with time-inconsistent preferences (who make up about 16 percent of our sample) did not benefit from gaining access to a simple savings device in which withdrawals were not restricted. They also did not benefit from earmarking, but did save in the product which offered credit and social commitment to make deposits. We conjecture that this combination worked because the credit aspect induced people to begin saving, and the social pressure aspect compelled them to make regular deposits. These results suggest that people with such preferences may 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 United States (Thaler and Benartzi 2004; Choi, Laibson, and Madrian 2011) to bank savings in the Philippines (Ashraf, Karlan, and Yin 2006a) to agricultural investments in Kenya (Duflo, Kremer, and Robinson 2011) and Malawi (Brune et al. 2012). 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, Karlan, and Yin (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 tentative evidence of intrahousehold barriers to individual saving. We find somewhat larger effects for married women than for unmarried women. Here again, we cannot entirely rule out that this is driven by some other characteristic correlated with marital status, but we note that the heterogeneity we observe is consistent with evidence of savings misallocation due to intrahousehold 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 intrahousehold decision-making structures.

All in all, our results suggest that devices which simply help individuals harness the power of mental accounting are beneficial to the majority of people in our sample. Since much of the value of a savings product appears to be in the mental labeling it facilitates, a product which does not severely limit liquidity is preferred

[1] Baland, Guirkinger, and Mali (2011) present evidence from Cameroon consistent with a model in which middle-class individuals take on (costly) loans they do not 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. However, our results do contrast somewhat with 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).

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 puts the emphasis on self-control problems. Bernheim, Ray, 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, Karlan, and Yin 2006a; Duflo, Kremer, and Robinson 2011; Brune et al. 2012). A more recent strand of literature puts emphasis on limited attention. Karlan et al. (2011) 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. Likewise, Kast, Meier, and Pomeranz (2011) show that interventions to encourage deposits (through peer groups or text message reminders) can increase savings rates.

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 66 percent, and increase the likelihood that people reach their savings goal by 14 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, Karlan, and Yin (2006a) in the Philippines. They find an 81 percent increase in bank savings after 12 months, but the effect fades to (a statistically insignificant) 33 percent increase after 2.5 years (Ashraf, Karlan, and Yin 2006b). Also, in that study, only 10 percent of those offered the commitment product actively used

[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. Banerjee and Duflo (2007), looking at detailed household survey data from 13 countries, find that even extremely poor households do not use all of their income to afford basic necessities. Dupas and Robinson (2013a) find that simple bank accounts can increase savings and investments among market vendors in rural Kenya.

it. In contrast, the take-up rate of our most basic product was 71 percent in the first year, and still close to 40 percent after three years.[3]

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

I. Experimental Design

A. *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, they are still representative of a relatively large share of the population, since over 40 percent 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 study arms (one control and four different experimental treatment arms). Individuals in all study arms were encouraged to save for health and were asked to set a health goal for themselves at the beginning of the study, 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. 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

[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.

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

program officer would then meet the participant and open the *Lockbox* at the shop where the product could be purchased.[5,6]

In the third experimental treatment, we encouraged participants to use their existing ROSCA structure to create a "*Health Pot*." The *Health Pot* was simply a side pot that the members could contribute to in addition to the regular ROSCA pot. As with the regular pot, people would contribute to the health pot at each meeting. The only difference was that this pot would be earmarked for a specific health product. To keep the logistics manageable, we encouraged people to save for the same product (so that contribution amounts and cycle lengths did not vary across people). 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 *HSA*s 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 toward mobilizing savings for preventative health products (the *Lockbox* and the *Health Pot*), one was geared toward building savings to rely on in case health shocks occur (the *HSA*), and one

[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 into 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 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 percent) 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 percent said they thought they could. 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 online Appendix Table A1.

		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	

FIGURE 1. FEATURES OF EXPERIMENTAL SAVING TECHNOLOGIES

was geared toward both these aims (the *Safe Box*). Thus, in our empirical analysis, we separately examine the two types of savings in estimating effects.

B. *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 bundled with credit.

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: 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 of the *Health Pot* 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 preventative health 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.[9]

[9] Note that since the *Safe Box* offered the flexibility to save toward something other than health, the impact of having a safe and designated storage technology on overall savings may well be larger than the sum of the effects we estimate with P_1 and T_1.

C. *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, if people use the storage technology to save toward a specific goal, people may consider the money saved as non-fungible with other sources of cash, even if the money is in effect completely liquid. Such violation of fungibility through the labeling of uses of funds is one component of what Thaler (1990) coined mental accounting. Creating a mental account that is labeled for a specific use sets the bracket under which the choice regarding the use of funds is viewed, and in that bracket or narrow frame using funds for any purpose other than the labeled one is perceived as a loss (Thaler 1999). If it facilitates such labeling of saved funds, a designated storage place may lead people to forgo unplanned expenditures and to resist pressure to share with others—because the utility loss of depleting one's labeled mental account overrides the utility gain from satisfying the unplanned craving or money request.

Of course this mental accounting effect, as its name indicates, could take place *without* a physical storage place: it could be sufficient for people to keep track mentally of what amount is designated for which use without physically putting aside the designated savings. In practice, such pure mental record keeping may be difficult, and labeling may be most likely when people have access to physically separate accounts (Thaler and Sunstein 2008, p. 51). Thus, even though everyone in our experiment (including the control group) was encouraged to set a specific health savings goal for themselves, only those that accessed a storage technology may have been able to label their savings.

Finally, asking people to set up a health goal may have changed their reference consumption basket toward health goods and this may have in turn affected health savings and investments (since not reaching one's goal would be experienced as a loss).[10] In our experiment, both the control and the treatment individuals were asked to set a health goal. The extent to which setting a health goal led

[10] Labeling can also be thought of in terms of changes in reference points, but in the savings domain: each dollar added to the health savings fund increases the reference point for accumulated health savings by a dollar, and any fall below the new reference point is framed as a loss. This is distinct from the loss experienced by failing to reach one's reference consumption basket by the end of the goal period.

to a shift in the reference consumption basket toward health goods may have been affected by the presence of a storage technology, however. Indeed, in the Kőszegi and Rabin (2006) framework, the reference point is set endogenously and corresponds to the rational expectation of the outcome. If there are multiple personal equilibria, and if gaining access to a storage technology changed people's beliefs regarding the likelihood with which they would achieve their goal, it could have led them to switch from a personal equilibrium with a low health investment reference point to a personal equilibrium with a high health investment reference point.

In Section VI, we will discuss results from in-depth exit interviews we conducted with a random subset of respondents. Those interviews yield evidence which suggests that labeling played an important role in the large observed impacts of the *Safe Box.* On the other hand, because people did not anticipate the power of such mental accounting (which is the reason many respondents gave to explain why they had never thought of investing in a simple storage box on their own prior to our experiment), it is not obvious that getting access to a storage technology led individuals to immediately shift to a higher investment personal equilibrium. In fact, as discussed in Section IID, we see no significant differences in the magnitude of the goals chosen by treatment individuals, immediately after receiving the storage technology, compared to the control group. Treatment individuals may have changed their reference consumption plan over the course of the year, however.

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 intrapersonal barriers (those with time-inconsistent preferences). Among this group, only "sophisticated" individuals should value earmarking to impose self-control, however, since "naïve" individuals, by definition, lack the awareness to see the value of it.

An important point is 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 ($T_4 - T_1$). In particular, in our study context, it is likely that earmarking for emergencies is valued more than earmarking for preventative health. This is because the most important form of risk facing rural households in Western Kenya is illness, and the *HSA* was specifically designed to allow withdrawals for such shocks. This means that the *HSA* had a much lower "liquidity cost" than the *Lockbox*. In addition, people may simply value savings for emergencies more than for preventative health.

Social Commitment and Credit (C).—This bundle, 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 naïve present-biased individuals, for whom neither a designated storage place nor earmarking alone would be enough, as discussed above.

II. Sample and Data

A. *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 marketplaces 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 five 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).

B. *Baseline ROSCA Information*

We were not able to enroll all 143 ROSCAs in the study. By the time we attempted to meet with ROSCAs to conduct the baseline (between August and October 2008), 11 ROSCAs (7.7 percent) had been discontinued, and 19 (13.3 percent) others were not interested in the program. This left us with 113 ROSCAs in the final sample. Online Appendix Table A1 provides characteristics on these 113 ROSCAs. We present means by treatment groups, as well as *p*-values for tests comparing means across treatment groups. Despite the fact that we lost 21 percent 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 to be expected 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 percent of ROSCA participants are women, and 32 percent of ROSCAs have only female members. The average ROSCA in our sample 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 percent provide loans to members, and 54 percent have an insurance fund (principally for funerals or, in some cases, illnesses which require hospitalization). Finally, 98 percent of ROSCAs use a fixed, rather than a random order or a bidding process to allocate the pot.

C. *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 toward investing in these products. Since the control group was given the exact same information and encouragement as the treatment groups, any observed post-treatment differences in health investments across groups can and should be interpreted as the impacts of the saving technologies introduced, rather than as differences in encouragement. For this reason, the comparison group should be thought of as an "Encouragement Group" rather than as a pure control which received no treatment whatsoever. 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 across the four treatment groups).[11]

D. *Baseline Data*

A random subset of ROSCA members were sampled (using a random number table) for data collection during the same meeting at which the encouragement and treatment offer (when applicable) were provided. In total, we enrolled 771 respondents into the surveys across all 113 participating ROSCAs. After obtaining consent, those respondents selected for data collection 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 the respondent needed to save to reach the goal, and how long the respondent thought it would take 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 percent, around US$7.31), 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, 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 online 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.[12]

[11] 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).

[12] We also tested whether knowing one's experimental treatment status affected the time and risk preferences we measured in the baseline survey. We find no evidence that it did (see Table 1).

E. *Follow-Up Data*

We conducted two follow-up surveys, a midline after six months and an endline after one year, both of which included modules similar to those administered at baseline. 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 percent of the sample could be interviewed for the 6-month follow-up, and 92 percent could be interviewed for the 12-month follow-up. Attrition was not differential across experimental arms, either at 6 or 12 months (see online Appendix Table A3).

F. *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. Since randomization was done at the ROSCA level, the standard errors are adjusted for clustering 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. First, since our sample is representative of ROSCA participants, it is heavily female (74 percent). Second, the great majority of respondents are married (75 percent of women and 88 percent of men). Respondents are around 39 years old, and have close to four children on average. Education levels are relatively low (average years of education is just 6.3, much less than the eight 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—the average respondent owns just over 1.5 bednets for a household size of five or more, and only about half of respondents report using chlorine to treat their water. Consequently, health is also very poor. Respondents reported that 34 percent of their children under five had malaria in the month preceding the baseline survey, and 20 percent of respondents reported having malaria in that month themselves.[13]

[13] These are likely overestimates since malaria is typically self-diagnosed and households tend to call "malaria" any illness episodes with fever (Cohen, Dupas, and Schaner 2011). However, self-reported malaria episodes are still relatively severe sicknesses.

Table 1—Individual Level Summary Statistics and Balance Check

	Sample mean SD	Coefficient (SE) on treatment dummies: Safe Box	Lockbox	Health Pot	HSA	Equality of means *p*-value	Obs.
Demographic characteristics							
Female	0.74	0.08	0.02	0.07	−0.07	0.29	771
	(0.44)	(0.08)	(0.08)	(0.08)	(0.09)		
Age	39.35	−4.99	−3.18	−4.32	−2.87	0.32	771
	(13.12)	(2.40)**	(2.50)	(2.36)*	(2.51)		
Married	0.78	−0.01	0.01	0.03	0.07	0.59	771
	(0.42)	(0.09)	(0.06)	(0.07)	(0.06)		
Number of children	3.84	−0.14	−0.62	−0.29	−0.13	0.15	771
	(2.38)	(0.30)	(0.28)**	(0.33)	(0.27)		
Years of education	6.27	−0.64	−0.42	1.06	−0.07	0.19	753
	(3.81)	(0.61)	(0.64)	(0.76)	(0.56)		
Can write in Swahili	0.73	−0.03	0.00	0.10	0.03	0.25	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	0.24	750
	(0.42)	(0.09)	(0.07)	(0.08)	(0.07)		
Provider[1]	0.16	0.12	0.04	0.08	0.04	0.13	771
	(0.37)	(0.05)**	(0.04)	(0.05)	(0.04)		
Weekly income (Ksh)	602.28	−9.06	−84.32	120.18	13.60	0.23	715
	(589.52)	(83.54)	(73.86)	(88.21)	(73.51)		
Health status and behavior							
Probability children under five had malaria episode in past month	0.34	0.00	−0.01	−0.06	−0.05	0.85	398
	(0.42)	(0.07)	(0.07)	(0.08)	(0.07)		
Respondent had malaria in past month	0.20	0.03	0.00	0.03	−0.01	0.87	669
	(0.40)	(0.05)	(0.04)	(0.05)	(0.04)		
Treats drinking water with chlorine	0.52	0.02	−0.07	−0.01	−0.05	0.74	669
	(0.50)	(0.08)	(0.08)	(0.07)	(0.06)		
Number of bednets owned	1.69	−0.05	−0.39	0.05	−0.01	0.15	674
	(1.55)	(0.25)	(0.22)*	(0.31)	(0.24)		
Time and risk preferences[2]							
Somewhat patient	0.19	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	0.00	0.02	0.01	0.07	0.49	771
	(0.37)	(0.05)	(0.05)	(0.05)	(0.05)		
More patient now than in the future	0.18	0.00	0.04	0.01	−0.01	0.67	771
	(0.38)	(0.04)	(0.04)	(0.04)	(0.04)		
Maximal discount rate in present and in future	0.45	−0.06	−0.09	−0.05	−0.08	0.70	771
	(0.50)	(0.07)	(0.07)	(0.07)	(0.06)		
Amount invested in risky asset (out of 100 Ksh)	67.87	−0.90	−3.25	−0.26	0.62	0.59	771
	(23.47)	(2.65)	(2.68)	(2.69)	(3.16)		
Number of ROSCA memberships	1.61	0.17	−0.07	0.07	0.18	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 on my own	0.94	−0.02	0.00	−0.01	−0.02	0.86	770
	(0.23)	(0.03)	(0.02)	(0.03)	(0.03)		
To have time to talk to my friends in the group/socialize	0.51	−0.05	0.07	0.01	0.01	0.30	770
	(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.

[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 for 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 one month to 40 Ksh now. "Present-biased" is a dummy equal to 1 if the respondent exhibits a higher discount rate between today and one month from today than between one month from today and two months from today.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

In terms of time preferences, only about 19 percent of people are what we call "somewhat patient" (i.e., prefer 55 Ksh or less in one month to 40 Ksh now). About 16 percent of respondents are present-biased.[14] Surprisingly, about 18 percent appear to be more patient in the present than in the future.[15] Finally, a large fraction of respondents (45 percent) exhibit extreme impatience in both present and future.

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 21 dependent variables, and therefore $21 \times 4 = 84$ 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 percent 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 than 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 is representative only of the roughly 40 percent of people who participate in ROSCAs. In online Appendix A1, 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, but to fix ideas, online Appendix A2 ventures a few hypotheses as to how the savings devices that we identify as effective in our sample would likely affect non-ROSCA participants.

III. 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.[16]

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

[15] Though this seems counterintuitive, previous studies have found similar results: about 10 percent of respondents from India in Bauer, Chytilová, and Morduch (2012) and 15 percent of respondents from the Philippines in Ashraf, Karlan, and Yin (2006a) had preferences of this type. We also found similar levels in a previous study in the same area of study (Dupas and Robinson 2013a).

[16] Our take-up analysis is limited by the fact that we do not observe total deposits. For the *Safe Box* and the *Lockbox* treatments, we only observe savings balances when the boxes were opened at follow-up. We attempted to collect information on total deposits by asking respondents to show us the passbooks they had been given along with the boxes, but most respondents did not keep their passbook up to date. For the *Health Pot* treatment, we also do

TABLE 2—DESCRIPTIVE STATISTICS ON TAKE-UP OF EXPERIMENTAL SAVING TECHNOLOGIES

	After 6 months				After 12 months			
	Safe Box	Lockbox	Health Pot	HSA	Safe Box	Lockbox	Health Pot	HSA
Panel A. Overall take-up								
Currently uses the saving technology[a]	0.74	0.65	0.65	0.93	0.71	0.66	0.72	0.97
If uses technology: current balance (in Ksh)								
Median	200	200	N/A	71	200	248	N/A	90
Mean	634	321	N/A	145	311	573	N/A	192
SD	1,248	446	N/A	228	423	866	N/A	375
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			0.92	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 six-month follow-up		0.75						
Panel C. Health Pot only								
If participates: ever received health pot			0.30				0.58	
Received health product in kind			0.48				0.55	
Accompanied to buy health product at shop by ROSCA member			—				0.13	
Encouraged by others to use health pot funds to buy health product			—				0.36	
Panel D. Health Savings Account only								
Deposits								
Total number of deposits				4.54				6.50
Sum of all deposits (in Ksh)				148				222
Withdrawals								
If uses technology: ever withdrew				0.32				0.48
Mean withdrawal size, in Ksh				153				197
Purpose of withdrawal								
Health emergency				0.82				0.75
Funeral				0.00				0.04
To buy preventative health product				0.18				0.21
Observations	102	197	137	202	101	180	113	209

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.

[a]Currently uses the technology = 1 if there is a nonzero amount in the box/*HSA*, or if contributes to health pot.

Overall take-up was very high for all four devices. At the six-month mark, 74 percent of those sampled for a *Safe Box* and 65 percent 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 percent of the *Safe Box* group and 66 percent of the *Lockbox* group still had positive amounts in their box. For the ROSCA-level interventions, take-up was equally high. About 65 percent of respondents had elected to participate in a *Health Pot* with fellow ROSCA members at the six-month follow-up, and this figure had increased to 72 percent after one year.[17] Take-up of the *HSA*s was even higher: 93 percent of respondents elected to create an *HSA* within 6 months and 97 percent created

not have good measures of actual contribution amounts, since those were collected at the ROSCA and the ROSCA records were spotty.

[17] 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 percent. Not all ROSCA members elected to participate in the scheme, however, so the take-up figure at the individual level is lower.

one within 12 months. The high take-up rates for both the *Health Pot* and the *HSA* are quite striking given the fact that they both required some level of cooperation between ROSCA members. For the *Health Pot*, members had to agree on a specific health product that everybody wanted. For the *HSA*, members had to trust the treasurer.

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 634 Ksh (US$8.4) after 6 months and 311 Ksh (US$4.1) after 12 months. Since these are total balances, not deposits, they are lower bounds on amounts saved. The lower balance (and lower variance) after 12 months suggests that most respondents withdrew money from the box to make a purchase between the first and second follow-ups. Amounts saved in the *Lockbox* were also relatively large, but lower than those observed in the *Safe Box*. While the median balance in the *Lockbox* was comparable to that of the *Safe Box* group at both 6 and 12 months, the average balance was about half that of the *Safe Box* after 6 months. The average balance in the *Lockbox* had increased to 570 Ksh at 12 months. For the majority of lockbox users, 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 percent of respondents had called the program officer and asked for their box to get opened within the first six months. This had increased to 31 percent by 12 months. Overall, while the *Lockbox* appears to be dominated by the *Safe Box*, the data suggests that the *Lockbox* was still better than nothing, and that people would have eventually saved up significant sums if given enough time.

The median and mean balance among those who opened an *HSA* reached 90 and 192 Ksh (US$2.5) after 12 months, respectively. These figures are somewhat lower than those observed for the boxes.[18]

Panels B, C, and D provide additional details on how respondents used the four devices. To start, panel B suggests that the demand for the earmarking feature (the unavailability of the key) remained very high over time. After six months, lockbox owners were asked: "Do you want the key now, or do you want me to hold on to the key?" Of the 88 percent who still had the box after six months, the majority (75 percent) 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 percent asked if it was possible to extend the program and for the officer to keep the 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 seemed to have valued the earmarking that the *Lockbox* afforded.[19] For both box groups, secrecy (at least from the spouse) was not a major reason for usage. After six months, 78 percent of *Safe Box* spouses and

[18] For both boxes and the *HSA*, the balances observed are relatively small compared to average monthly ROSCA contributions, which are around 393 Ksh per month (see online Appendix Table A1). However, since the median balance is always lower than the mean, some people used these technologies very intensively.

[19] This could be due to *status quo* bias. Ideally, to quantify the importance of the *status quo* bias, we would have asked *Safe Box* holders if they were interested in letting the research team hold the key for them. We did not offer them that option, but we note that at the follow-up only 4 percent of *Safe Box* holders reported storing the key with someone else, suggesting that the *status quo* bias is likely large.

79 percent of *Lockbox* spouses knew about the box. This increased to over 90 percent after one 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 (i.e., they received the agreed upon health product rather than the cash equivalent), or were accompanied to the shop to buy the product.

Finally, 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*.

It is possible that the money put into these various devices displaced other types of savings. Some of the evidence we show in Section VIC 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 (data not shown). 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.

IV. Results: Impacts on Health Investments

A. *Average Impacts*

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

$$Y_i = a + \mathbf{T}_i' b + \mathbf{X}_i' c + \mathbf{R}_i' d + e_i, \tag{1}$$

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

We consider three measures of health savings/investments: (i) how much the individual spent on preventative health products in the year between the baseline and endline; (ii) 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 (iii) whether the respondent reached her baseline saving goal.[20]

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.[21]

[20] As can be seen in online Appendix Table A2, most respondents reported a preventative health product as a goal, but about 16 percent 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 percent of the sample, the likelihood of reaching one's goal is more than double that of those with a preventative investment goal.

[21] After six 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 online Appendix Table A2.

TABLE 3—AVERAGE IMPACTS OF SAVING TECHNOLOGIES AFTER 12 MONTHS

	Amount (in Ksh) spent on preventative health products since baseline		Could not afford full medical treatment for an illness in past three months		Reached health goal	
	(1)	(2)	(3)	(4)	(5)	(6)
(P_1) *Safe Box*	193.85	169.47	−0.10	−0.08	0.15	0.14
	(82.11)**	(85.62)*	(0.06)	(0.06)	(0.06)**	(0.06)**
(P_2) *Lockbox*	64.84	57.54	−0.03	−0.03	−0.02	−0.03
	(67.26)	(62.88)	(0.06)	(0.06)	(0.06)	(0.06)
(P_3) *Health Pot*	356.33	331.00	−0.03	−0.01	0.15	0.13
	(103.89)***	(98.91)***	(0.06)	(0.06)	(0.07)**	(0.07)**
(P_4) *Health Savings Account*	33.70	18.42	−0.14	−0.12	0.04	0.04
	(61.74)	(62.12)	(0.06)**	(0.06)*	(0.05)	(0.06)
Individual controls	No	Yes	No	Yes	No	Yes
ROSCA controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	771	771	771	771	771	771
R^2	0.06	0.1	0.08	0.11	0.04	0.05
Mean of dep. var. (control group)	257.83	257.83	0.31	0.31	0.34	0.34
SD of dep. var. (control group)	306.66	306.66	0.47	0.47	0.48	0.48
p-value for joint significance	*0.01***	*0.01***	*0.18*	*0.25*	*0.01***	*0.02***
Implied impacts of products' features						
Storage ($S = P_1$)	193.85	169.47	−0.10	−0.08	0.15	0.14
	(82.11)**	(85.62)**	(0.06)	(0.06)	(0.06)**	(0.06)**
Earmarking for preventative health ($E_p = P_2 - P_1$)	−129.02	−111.93			−0.17	−0.17
	(81.39)	(81.57)			(0.06)***	(0.06)***
Social commitment and credit ($C = P_3 - P_2$)	291.50	273.46			0.17	0.17
	(108.6)***	(99.5)***			(0.06)***	(0.06)***
Earmarking for emergency treatment ($E_e = P_4 - P_1$)			−0.04	−0.04	−0.11	−0.10
			(0.06)	(0.06)	(0.06)	(0.06)

Notes: Data from 12-month follow-up survey. OLS regressions. Columns 3–6: Linear probability model estimates. All regressions include an indicator variable for having been sampled for multiple treatments as well as ROSCA-level controls (monthly ROSCA contribution and the stratification dummies). Individual baseline controls in columns 2, 4, and 6 include gender, age, time preferences, marital status, whether the respondent is a net provider of loans/gifts in the community, and number of ROSCA memberships. Standard errors in parentheses, clustered at the ROSCA-level. Columns 1–2: Dependent variable is the total amount spent on preventative 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 three 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.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

Columns 1 and 2 present the results for preventative investments, columns 3 and 4 present the results inability 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 variable for the control group are presented in each column under the R^2 of the regression.

Columns 1 and 2 show that both the *Safe Box* and the *Health Pot* had significant 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 66–75 percent while the *Health Pot* increased investment by 128–138 percent.[22] By contrast, the *HSA* treatment had no effect on

[22] 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,

investment, which is not surprising in that it was to be used for saving for health emergencies only.

Interestingly, the *Lockbox* had no effect on investment over the year following its introduction. This suggests that the liquidity cost of holding money in the *Lockbox* outweighed the benefit of earmarking for the average individual. While the take-up results shown in Table 2 indicated that people did save in the *Lockbox* so that it is likely that it would have enabled them to increase preventative health investment if given more time, what is striking is that the *Lockbox* was ineffective over a year, 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 percent in the control group (column 4).[23] 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.

The last two columns in Table 3 show how the experimental treatments affected the likelihood that people reached their baseline health goal. While only 34 percent of those in the control group had reached their goal after 12 months, this probability increased by 14 percentage points in the *Safe Box* group and 13 percentage points in the *Health Pot* group (column 6). 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 online Appendix 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). As discussed in Section IA, the relationship between estimates of impacts on preventative health investments and attributes can be summarized as follows:

$$P_1 = S$$

$$P_2 = S + E_p$$

$$P_3 = S + E_p + C,$$

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.

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.

[23] 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 about 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 percent in the specifications with individual controls), but the confidence interval includes 32 percent.

TABLE 4—HETEROGENEITY OF IMPACTS ON PREVENTATIVE HEALTH INVESTMENTS

	Full sample				Women only			
	OLS	Total effect if **TRAIT** *p*-value	OLS	Total effect if **TRAIT** *p*-value	OLS	Total effect if **TRAIT** *p*-value	OLS	Total effect if **TRAIT** *p*-value
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Safe Box	237.15		223.25		141.10		155.55	
	(102.28)**		(103.42)**		(84.95)*		(92.85)*	
× **TRAIT**	−19.30	217.85	−4.75	218.5	9.49	150.59	70.75	226.3
= provider	(83.52)	*0.01***	(113.36)	*0.08**	(116.04)	*0.22*	(130.09)	*0.1**
× **TRAIT**	−263.95	−26.8	−209.73	13.51	−319.03	−177.92	−401.01	−245.46
= present-bias	(99.40)***	*0.71*	(134.17)	*0.88*	(123.54)**	*0.13*	(172.84)**	*0.14*
× **TRAIT**	—	—	—	—	243.56	384.66	225.82	381.37
= married	—	—	—	—	(150.47)	*0.02***	(172.23)	*0.03***
Lockbox	51.33		30.20		−25.86		−8.33	
	(69.47)		(65.29)		(90.48)		(103.33)	
× **TRAIT**	194.79	246.12	252.45	282.64	127.79	101.93	216.46	208.14
= provider	(97.69)**	*0.03***	(143.47)*	*0.07**	(107.23)	*0.46*	(138.92)	*0.24*
× **TRAIT**	−67.36	−16.04	19.90	50.1	−66.14	−92	−110.02	−118.35
= present-bias	(79.73)	*0.84*	(105.99)	*0.60*	(104.29)	*0.38*	(137.09)	*0.35*
× **TRAIT**	—	—	—	—	157.07	131.21	126.24	117.92
= married	—	—	—	—	(83.44)*	*0.21*	(116.06)	*0.26*
Health Pot	267.1		238.97		461.71		438.32	
	(102.28)**		(98.31)**		(322.00)		(289.58)	
× **TRAIT**	454.02	721.11	480.07	719.04	483.22	944.93	569.46	1,007.78
= provider	(195.02)**	*0.01****	(206.77)**	*0.01****	(198.60)**	*0.01***	(182.63)***	*0.01****
× **TRAIT**	44.03	311.13	138.26	377.23	−121.88	339.84	−184.89	253.43
= present-bias	(215.40)	*0.18*	(235.05)	*0.13*	(155.13)	*0.19*	(169.94)	*0.30*
× **TRAIT**	—	—	—	—	−219.87	241.84	−207.81	230.51
= married	—	—	—	—	(322.66)	*0.01****	(288.35)	*0.01***
ROSCA level controls included	Yes		Yes		Yes		Yes	
Individual level controls included	No		Yes		No		Yes	
Observations	771		771		568		568	
R^2	0.09		0.12		0.09		0.13	
Mean of dep. var. (control group)	257.83		257.83		232.81		232.81	
SD of dep. var. (control group)	306.66		306.66		264.43		264.43	
Share of sample with **TRAIT** = provider	0.16		0.16		0.14		0.14	
Share of sample with **TRAIT** = present-bias	0.16		0.16		0.16		0.16	
Share of sample with **TRAIT** = married					0.74		0.74	

Notes: Dependent variable: Amount spent on preventative health products (Ksh). Data from one-year follow-up survey. Columns 1, 3, 5, and 7 present results of OLS regressions with standard errors in parentheses, clustered at the ROSCA-level. Columns 1 and 5 include only ROSCA-level controls (monthly ROSCA contribution and the stratification dummies) and an indicator variable for having been sampled for multiple treatments. Columns 3 and 7 add individual controls (age, gender, the three "**TRAITS**," and number of ROSCA memberships at baseline). Columns 2, 4, 6, and 8 show the sum of the main effect and the interaction effect, for each **TRAIT** and each experimental treatment, as estimated in the previous column, along with the *p*-values for these sums.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

From Table 3, column 2, the *Safe Box* increased investment by 169.5 Ksh, the *Lockbox* by 57.5 Ksh, and the *Health Pot* by 331 Ksh. Thus, we estimate that simply having access to a safe storage place for money (S) accounts for an additional 169.5 Ksh in investment. Earmarking for preventative health (E_p) is negatively valued at $57.5 - 169.5 = -112.0$ Ksh. This implies that the liquidity cost of earmarking discourages investment on average, compared to a storage technology without

earmarking. Finally, social commitment and credit (C) have the largest impact, estimated at $331 - 57.5 = 273.5$ Ksh. The standard errors on these estimates are presented at the bottom of Table 3.

A similar calculation can be performed for the risk-coping results in column 4. We find that the *Safe Box* reduced vulnerability by 8 percentage points, while the *HSA* reduced vulnerability by more (12 percentage points). Thus, we estimate the effect of storage (S) at 8 percentage points, and the effect of earmarking for emergency treatment (E_e) at an additional 4 percentage points. This result suggests that people in our sample positively value earmarking for emergency health savings (a first order concern to many households), while the column 2 result showed that earmarking for preventative health is negatively valued. These two results are likely not independent: it is precisely the emergency health risk that seems to discourage people from tying up money for lumpy preventative health investments.

B. *Heterogeneity*

This section tests for heterogeneity in the treatment effects based on observable characteristics. We run the following set of regressions:

$$y_i = \alpha + \mathbf{T}_i'\beta + \mathbf{TRAIT}_i' \times \mathbf{T}_i'\gamma + \mathbf{X}_i'\zeta + \mathbf{R}_i'\delta + \varepsilon_i, \tag{2}$$

where $\mathbf{TRAIT}_i$ is the vector of background characteristics along which theory predicts heterogeneity in the impact of the experimental treatments (note that the elements in $\mathbf{TRAIT}_i$ are included in the vector $\mathbf{X}_i$). The effect of the treatment for the subgroup of people with a given trait is thus the sum of the coefficients $\beta + \gamma$ for that trait.

We estimate equation (2) with three traits based on our ex ante hypotheses as to what savings barriers are most important, as discussed in Section IC. These are (i) 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); (ii) whether the individual exhibits present-biased preferences in survey questions; and (iii) whether the individual is married. For this latter trait, we must restrict the analysis to women only, since there are very few unmarried men in our sample (only 25).

The results are presented in Tables 4 (preventative investments) and 5 (ability to cope with emergencies). We show four specifications in each table, two with the full sample (without and with controls), and two restricted to women only (again, without and with controls). In the first two specifications with the full sample, we include only "provider" and "present-bias" dummies in our vector of traits. In the specifications for women, we add "married" in the vector of traits. The estimates and the p-values for the sums $\beta + \gamma$, i.e., the total estimated impacts for those exhibiting a given "trait," are presented in the column on the immediate right of the regression results.

Preventative Investment.—The results on preventative health investments presented in Table 4 suggest substantial heterogeneity in impacts along the three traits considered. First, we find a significant, positive interaction between "provider" and

"lockbox." 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 even for non-providers, this bundle of features appears to be even more valued by providers.

People who are not present-biased benefit from the *Safe Box*, but not from the *Lockbox*. This result suggests that people who do not need strong commitment are reluctant to tie up money in the *Lockbox* because earmarking has little value for them, and so the liquidity cost dominates. By contrast, we find no benefit of the *Safe Box* for present-biased people.[24] This is likely because the money is too easily accessible. Interestingly, they also do not benefit from the individual earmarking feature offered by the *Lockbox*, which suggests that they are naïve about their present-bias or that they need commitment to actively save in the device. And indeed, they do benefit from the combination of the stronger commitment to make regular contributions and credit provided by the *Health Pot*.

Finally, the analysis on the female sample in columns 5 to 8 suggests that intra-household issues might be important, but the results are unclear: on one hand, married women seem to benefit from the *Safe Box* and the *Lockbox* more than unmarried women, but on the other hand they benefit less from the *Health Pot*. None of these differences between married and unmarried women are statistically significant, however.

Coping with Emergencies.—Table 5 presents the results on treatment effects heterogeneity for the technologies used for emergency savings (the *Safe Box* and *HSA*). 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. We find that the effects of both the *Safe Box* and the *HSA* are larger for providers than non-providers, larger for those who do not exhibit present-bias than for those who do, and larger for married women than unmarried women. While these differences are not always statistically significant, they are all in line with the predictions discussed in Section IC.

Discussion.—A possible concern with the heterogeneity analysis is that the various "traits" we study (being a provider, present-biased, or married) are not randomly assigned. These could be correlated with other characteristics. While we cannot entirely rule out that the heterogeneous treatment effects we observe are due to some unobservable heterogeneity in other traits correlated with those we focus on, we take comfort in the fact that the heterogeneity in treatment effects along the three traits we had prespecified matches the underlying theoretical framework presented in Section IC.[25,26]

[24] Note, however, that we cannot reject equality of effects for present-biased and non-present-biased people.

[25] The results are mostly robust to the inclusion of interactions between the experimental treatments and other observable characteristics such as income (see online Appendix Tables A4 and A5 for these regressions). Inclusion of these control interactions is problematic, however, since baseline income is likely endogenous to social networks and to time preferences.

[26] Online Appendix Table A6 tests how take-up of each savings technology varies along the three traits of interest. Those figures must be taken with caution since the sample size for each regression is small (and the standard errors are large), and our measures of take-up are only weak measures of actual usage (especially for the box groups, since we only know the balance that was in the box at follow-up and not the total amount saved). The results

TABLE 5—HETEROGENEITY OF IMPACTS ON INABILITY TO COPE WITH EMERGENCIES

	Could not afford full medical treatment for an illness in the past three months							
	Full sample				Women only			
	OLS	Total effect if **TRAIT** *p*-value	OLS	Total effect if **TRAIT** *p*-value	OLS	Total effect if **TRAIT** *p*-value	OLS	Total effect if **TRAIT** *p*-value
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Safe Box	−0.11		−0.10		−0.09		−0.06	
	(0.07)		(0.07)		(0.14)		(0.15)	
× **TRAIT**	−0.07	−0.17	−0.26	−0.36	0.01	−0.08	−0.05	−0.11
= provider	(0.07)	*0.05***	(0.19)	*0.05**	(0.09)	*0.67*	(0.26)	*0.74*
× **TRAIT**	0.14	0.04	0.30	0.2	0.16	0.08	0.16	0.1
= present-bias	(0.10)	*0.75*	(0.13)**	*0.13*	(0.13)	*0.62*	(0.19)	*0.61*
× **TRAIT**	—	—	—	—	−0.10	−0.18	−0.10	−0.16
= married	—	—	—	—	(0.14)	*0.01***	(0.20)	*0.1**
Health Savings	−0.09		−0.08		0.05		0.06	
	(0.07)		(0.07)		(0.11)		(0.13)	
× **TRAIT**	−0.17	−0.26	−0.38	−0.46	−0.16	−0.12	−0.25	−0.19
= provider	(0.05)***	*0.01****	(0.19)**	*0.01****	(0.06)**	*0.28*	(0.27)	*0.56*
× **TRAIT**	−0.10	−0.19	0.09	0.01	−0.18	−0.14	−0.17	−0.11
= present-bias	(0.07)	*0.02***	(0.11)	*0.96*	(0.09)**	*0.24*	−0.18	*0.54*
× **TRAIT**	—	—	—	—	−0.18	−0.13	−0.16	−0.11
= married	—	—	—	—	(0.09)*	*0.12*	(0.19)	*0.32*
Individual level controls included	No		No		No		No	
Observations	771		771		568		568	
R^2	0.10		0.12		0.13		0.15	
Mean of dep. var. (control group)	0.31		0.31		0.32		0.32	
SD of dep. var. (control group)	0.47		0.47		0.47		0.47	
Share of sample with **TRAIT** = provider	0.16		0.16		0.14		0.14	
Share of sample with **TRAIT** = present-bias	0.16		0.16		0.16		0.16	
Share of sample with **TRAIT** = married					0.74		0.74	

Notes: See Table 4 notes. Negative coefficient estimates imply the treatments increase ability to cope with health emergencies.

V. 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 the devices we introduced spread to non-treatment ROSCAs.

To answer these questions, we conducted a long-term follow-up 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 survey included a number of open-ended questions to better

are nevertheless supportive of our other results. Providers saved more in the *Lockbox* and in the *Health Pot*, and those exhibiting present-bias saved less in the *Safe Box*.

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.[27]

A. *Long-Run Usage*

The longer run take-up results are presented in Table 6. 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 three years: 39 percent 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. Most of the people still saving in their box reported saving toward a specific goal (83 percent). The majority of them have maintained at least one health goal (63 percent), but people often reported saving toward a multiplicity of goals, including for their business, or schools fees.

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, 71 percent 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 3,369 Ksh. An additional 21 percent report depositing "a lot."[28]

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

B. *Diffusion*

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.

To test for the presence of such diffusion, in the long-run follow-up we asked each ROSCA whether it had adopted a *Health Pot* or *HSA* scheme. The results are presented in Table 7. We find evidence consistent with diffusion: at the three-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, two adopted the *Health Pot* scheme and four 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

[27] We present evidence in online Appendix Table A7 that the sample surveyed in the long-term follow-up is representative of the initial sample. As we focus on usage and take-up, the key question is whether those in the long-term follow-up 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 follow-up and the entire sample.

[28] All of these figures are similar between the *Safe Box* and *Lockbox* groups.

Table 6—Long-Term Impacts: Usage of Savings Technologies at 33 Months

	After three years		
	Box[1]	Health Pot	HSA
Currently uses the saving technology[a]	0.39	0.48	0.53
If uses technology: current balance (in Ksh):			
Median	210	—	100
Mean	729	—	253
SD	1,660	—	443
If uses: reports that technology "helped save more"	0.69	0.97	0.84
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	0.71		
Median	1,850		
Mean	3,369		
SD	5,959		
Proportion reporting "a lot"	0.21		
If ever used box: total of all withdrawals:			
Proportion giving numerical estimate	0.71		
Median	1,500		
Mean	2,033		
SD	2,207		
Proportion reporting "a lot"	0.21		
Health Pot			
Participated in first health pot cycle		0.81	
If participated to first health pot cycle: received pot		0.95	
Received health product in kind		0.65	
Health Savings only			
If uses technology: ever withdrew			0.74
Mean withdrawal size, in Ksh			309
Purpose of withdrawal			
Health emergency			0.78
Funeral			0.03
To buy preventative health product			0.06
Other			0.16
Total number of observations	165	60	181

Notes: [a]Currently uses the technology = 1 if there is a nonzero 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 two years prior to this follow-up).

in the box groups is due in part to the fact that the ROSCAs in those groups were more likely to dissolve, as we will see in Section VIC. In any case, the results in Table 7 suggest nontrivial adoption of the *Health Pot* and *HSA* saving strategies in the study area. These adoption rates are unlikely to reflect a general trend among local ROSCAs that would have preexisted our study, since the technologies we introduced simply did not exist beforehand. The diffusion we observe is therefore almost certainly due to the treatments we implemented.[29]

[29] The ideal way to study diffusion would be to examine whether technologies diffused to ROSCAs which were geographically close or which had strong social ties to treatment ROSCAs. We are unable to do this, however, because we only interviewed a subsample of people in each ROSCA, and so do not have the full set of links

TABLE 7—SPILLOVERS: DIFFUSION OF SAVING TECHNOLOGIES

	Has a functioning *Health Pot* scheme at three-year follow-up	Has a functioning *HSA* scheme at three-year follow-up	Observations
	(1)	(2)	(3)
Initial treatment assignment			
Control group	0.111	0.222	18
Safe Box	0.105	0.053	19
Lockbox	0.038	0.038	26
Health Pot	0.565	0.043	23
Health Savings Account	0.038	0.654	26
Total			112

Notes: These are averages by group. Data is from follow-up conducted approximately 33 months after start of experiment. ROSCAs that were not functioning at the time of the follow-up are coded as not having a functioning *Health Pot* nor an *HSA* scheme. Data missing for one ROSCA (in *Safe Box* group) for which no member could be traced for follow-up.

VI. Mechanisms

A. *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 health savings and investment behavior. How is this possible? All the *Safe Box* provided was 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*? This section presents evidence from open-ended survey questions that we administered to our study participants throughout the study period. All in all, the data strongly suggests that the box facilitated labeling, which, as discussed in Section II, is a form of mental accounting that can act as a commitment device: once money was put into the box, it was labeled as health savings, which made it less fungible and therefore less susceptible to friends' requests and daily spending. Indeed, the labeling creates a mental account with an adaptive reference point, and as savings put toward the mental account increase, the reference point for health savings increases. Since falling short of the reference point in the account generates a utility loss, the individual has both greater bargaining power against demands from others, as well as better self-control, than in the absence of labeling.

During the long-run follow-up, we asked respondents, in an open-ended way, why they felt that the box was helpful. We then coded their answers into seven different categories. The results are presented in panel A of Table 8. Thirty-three percent said it made it easier to save small change and 19 percent said it helped them to reduce spending on luxury items (an example of such an item is ready-made food bought on the market, like chips). By contrast, only 6 percent said the box helped because it reduced theft, and only 2 percent said it was because the box was secure in a secret

between ROSCAs. We are similarly unable to exploit geographic location in that we do not have GIS coordinates for ROSCAs.

TABLE 8—QUALITATIVE SURVEY EVIDENCE ON MECHANISMS

	12-month follow-up	33-month follow-up
Panel A. Mechanisms behind the Safe Box effect		
Why did the box help you save more?		($N = 110$)
Way to save small change		0.33
Money in box is not immediately on hand		0.32
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
Panel B. Safe Box and requests from others		
Whole sample	($N = 694$)	
Agree with statement: if somebody asks me for money and I have cash on hand, I am obligated to give them something (1–5; higher values = disagree)	2.35 (1.34)	
Safe Box group	($N = 93$)	
Agree with statement: if someone asks me for money and I have cash on hand, I am obligated to give them something (1–5; higher values = disagree)	2.70 (1.46)	
Agree with statement: if somebody asks me for money and I have cash in the box, I am obligated to give them something (1–5; higher values = disagree)	4.30 (1.20)	
Both box groups[a]		
If somebody from outside your household comes to ask for money, is it easier to say no if money is in the box? (0 = no, 1 = yes)		($N = 159$) 0.81
If your spouse asks for money, is it easier to say no if the money is in the box? (0 = no, 1 = yes)—*married respondents only*		($N = 119$) 0.43
Why did the box help you to refuse requests for money?		($N = 111$)
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
The box is secret/other people don't know about it		0.06
Can't easily access box since it is hidden		0.05
I can pretend I don't have the key		0.01
Panel C. Did peer pressure play a role in the HSA effect?		($N = 42$)
Knew how much all others in the ROSCA were saving in their HSA		0.24
Knew how much some but not all others in the ROSCA were saving in their HSA		0.52
Reports that own HSA savings behavior was influenced by what others were doing		0.12

Notes: See Section VI of text for details.

[a] We pool the two box groups because the *Lockbox* group was given the key after one year, effectively transforming the *Lockbox* into a *Safe Box*.

place that others didn't know about. Finally, 32 percent said that the box helped because the money in the box was not on hand or "out of sight," suggesting a role for the physical distance channel discussed in Section IC.

Panel B of Table 8 presents answers to questions about obligations to share money with others. In the endline conducted after one year, we asked people how much they agreed 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 one to five where one indicated that they "strongly agreed" and five was "strongly disagreed." Thus a response less than three indicates agreement with the statement. Overall, respondents agree that there is pressure to share: across the entire sample, the average response 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 to share when the money was in the box (the average was 4.30).

In the longer-term follow-up, 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 about requests from a hypothetical person outside the household, as well as requests from the spouse (for married respondents). Eighty-one percent of respondents reported that the box helps say no to people outside the household, and 43 percent reported that it helps say no to the spouse (despite the fact that the vast majority of spouses knew about the box, as shown in Tables 2 and 6). 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.

The question then becomes: 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? In other words, why isn't the money in the box fungible? In the long-run follow-up, we directly asked people why they thought it was easier to say no to requests for money. A sizable fraction (51 percent) report that this is because the money in the box is for a specific goal. We interpret this to mean that the money in the box is mentally allocated to savings, and considered less fungible.[30] Of the remainder, 24 percent say that others don't know about the box; 9 percent say it can't be accessed immediately because it's kept elsewhere; and 5 percent say that it's not easily accessed because it is hidden (the remainder report various other reasons).

While this evidence from self-reports seems quite compelling, it would have been interesting 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. 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.

B. *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.

In particular, one could question whether the large *Safe Box* and *HSA* effects (and the high take-up of the *Lockbox*, even if it did not translate into an impact on 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

[30] A referee suggested the following alternative explanation for this result: friends and relatives experience higher disutility of asking for money when the target of the request has allocated money to a specific goal. In other words, requesters may simply withdraw their request once they are told "Well, I was saving that money for [goal]." We consider this alternative story as consistent with our mental accounting interpretation, since the effect in that case would also stem from the fact that it enabled people to label (for both themselves and others) the money in the box as savings for a specific goal.

done at the ROSCA level, and the delivery of the boxes happened at a group meeting, where everyone could see others receive a box and set a goal?

There are four main channels through which this could matter. First, 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*. Likewise, if people discussed their progress with their box savings at ROSCA meetings, this could have had an independent effect. For example, Kast, Meier, and Pomeranz (2011) 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. What's more, the effects we observe are an order of magnitude larger than those observed in Kast, Meier, and Pomeranz (2011).

Second, given that deposits onto *HSA* accounts were made at ROSCA meetings, 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 in panel C of Table 8. We find that 23 percent knew how much every other ROSCA member was saving and 53 percent knew about the savings of at least some of them. Only 14 percent reported that others' behavior influence their savings, however. This suggests that social pressure likely played a minor role in the effectiveness of the *HSA*.

Third, one could be concerned that ROSCAs offer some features (such as insurance funds or credit) that could have interacted with our treatment effects. We do not find much heterogeneity in treatment impacts by baseline ROSCA characteristics, however (data not shown).

Finally, the fact that the experimental treatments were introduced in groups could matter if there are large complementarities in health behavior (for example, if the private returns to investing in a given health product are low unless everyone else also invests in that product). 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 2012), this would bias our results downwards, as the private returns to a given product would be highest in the control group.

C. *Epilogue: Long-Run Impacts on ROSCA Survival*

This last 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, Coate, and Loury (1993) argue that ROSCAs enable individuals to acquire indivisible goods faster than through individual saving. More recent papers have put the emphasis on ROSCAs offering a commitment function

for individuals to overcome inconsistencies in preferences across household members (Anderson and Baland 2002) or across time periods (Gugerty 2007). 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, Coate, and Loury (1993) argue that in the absence of cheaper forms of credit, ROSCAs can exist if defaulters face the threat of being barred from entering any ROSCA in the future, and Anderson, Baland, and Moene (2009) show that this threat works better in fixed-order ROSCAs (such as those in our study sample) than in random-order ROSCAs. In contrast, Basu (2011) shows that if ROSCAs are composed of people with quasi-hyperbolic time preferences, 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. 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[31] 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 23–30 percentage points higher among ROSCAs where saving boxes were distributed.[32]

What do these results imply for our understanding of ROSCAs in the study context? While the box did not offer any form of strong commitment, it helped individuals to overcome both interpersonal and intrapersonal saving barriers through a mental accounting effect. This appears to have reduced the incentive to participate in ROSCAs and suggests that, while the credit motive 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 offer might be somewhat stronger than what the majority of individuals need. None of the ROSCAs in our sample 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. But when better individual saving strategies are introduced, the appeal of ROSCAs appears to somewhat diminish.[33]

[31] Though we pool the box groups together, results are very similar for both treatments individually (estimated effects are statistically indistinguishable from each other).

[32] 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. Also note that if we perform the analysis at the individual member level, we find the exact same pattern of results.

[33] Interestingly, the negative effect of the Box treatment on ROSCA survival is concentrated among ROSCAS that do not offer loans to their members in addition to the regular pot (data not shown).

Table 9—Impacts on ROSCA Survival

Dependent Variable:	ROSCA was still functioning at long-run follow-up		
Specification:	LPM	LPM	Probit (marginal effects)
	(1)	(2)	(3)
Box[a]	−0.23	−0.30	−0.26
	(0.10)**	(0.11)***	(0.14)*
Health Pot	−0.07	−0.09	−0.12
	(0.12)	(0.12)	(0.17)
Health Savings Accounts	−0.02	−0.12	−0.04
	(0.11)	(0.12)	(0.15)
ROSCA-level controls	No	Yes	No
Number of ROSCAs	112	112	112
R^2	0.07	0.20	—
Mean in control group	0.94	0.94	0.94

Notes: Regression estimates. Standard errors in parentheses. Data is from follow-up conducted approximately 33 months after start of experiment. Data missing for one ROSCA (in *Safe Box* group) for which no member could be traced for follow-up.

[a]The *Safe Box* and *Lockbox* groups are pooled since individuals in the *Lockbox* group were given the key after one year, i.e., approximately two years before the long-run follow-up.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

VII. 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 effect. The money put into the box was mentally labeled by respondents as "for savings" and therefore less fungible, and as such was 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, it appears insufficient to enable individuals with present-biased preferences to save more. For them, 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, Karlan, and Yin (2006a) and Banerjee and Duflo (2011). Thus, in the same way that people in the United States 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 pre-commit to a direct deposit (as in Thaler and Benartzi 2004; or Brune et al. 2012) 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 savings difficulties.

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, and 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 2013a). 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.

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 safe box reduced ROSCA participation over time. Potentially, access to such a technology could cause people to exit insurance networks entirely (Ligon, Thomas, and Worrall 2000). The only empirical evidence to date on this issue comes from a lab experiment implemented with real social networks in India by Chandrasekhar, Kinnan, and Larreguy (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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