TYING ODYSSEUS TO THE MAST: EVIDENCE FROM A COMMITMENT SAVINGS PRODUCT IN THE PHILIPPINES*

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We designed a commitment savings product for a Philippine bank and implemented it using a randomized control methodology. The savings product was intended for individuals who want to commit now to restrict access to their savings, and who were sophisticated enough to engage in such a mechanism. We conducted a baseline survey on 1777 existing or former clients of a bank. One month later, we offered the commitment product to a randomly chosen subset of 710 clients; 202 (28.4 percent) accepted the offer and opened the account. In the baseline survey, we asked hypothetical time discounting questions. Women who exhibited a lower discount rate for future relative to current trade-offs, and hence potentially have a preference for commitment, were indeed significantly more likely to open the commitment savings account. After twelve months, average savings balances increased by 81 percentage points for those clients assigned to the treatment group relative to those assigned to the control group. We conclude that the savings response represents a lasting change in savings, and not merely a short-term response to a new product.

I. INTRODUCTION

Although much has been written, little has been resolved concerning the representation of preferences for consumption over time. Beginning with Strotz [1955] and Phelps and Pollak [1968], models have been put forth that predict individuals will exhibit more impatience for near-term trade-offs than for future trade-offs. These models often incorporate hyperbolic or quasi-

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hyperbolic preferences [Ainslie 1992; Laibson 1997; O'Donoghue and Rabin 1999; Frederick, Loewenstein, and O'Donoghue 2001], theories of temptation [Gul and Pesendorfer 2001, 2004], or dual-self models of self-control [Fudenberg and Levine 2005] to generate this prediction. One implication is consistent across these models: individuals who voluntarily engage in commitment devices ex ante may improve their welfare. If individuals with time-inconsistent preferences are sophisticated enough to realize it, we should observe them engaging in various forms of commitment (much like Odysseus tying himself to the mast to avoid the tempting song of the sirens).

We conduct a natural field experiment[1] to test whether individuals would open a savings account with a commitment feature that restricts their access to their funds but has no further benefits. We examine whether individuals who exhibit hyperbolic preferences in hypothetical time preference questions are more likely to open such accounts, since theoretically these individuals may have a preference for commitment. Second, we test whether such individuals save more as a result of opening the account.

We partnered with the Green Bank of Caraga, a rural bank in Mindanao in the Philippines. First, independently of the Green Bank, we administered a household survey of 1777 existing or former clients of the bank. We asked hypothetical time discounting questions in order to identify individuals with hyperbolic preferences. We then randomly chose half the clients and offered them a new account called a "SEED" (Save, Earn, Enjoy Deposits) account. This account was a pure commitment savings product that restricted access to deposits as per the client's instructions upon opening the account, but did not compensate the client for this restriction.[2] The other half of the surveyed individuals were assigned to either a control group that received no further contact or a marketing group that received a special visit to encourage savings using existing savings products only (i.e., these individuals were encouraged to save more but were not offered the new product).

We find that women who exhibit hyperbolic preferences were more likely to take up our offer to open a commitment savings product. We find a similar, but insignificant, effect for men. Fur-

1. As per the taxonomy put forth in Harrison and List [2004].

2. Clients received the same interest rate in the SEED account as in a regular savings account (4 percent per annum). This is the nominal interest rate. The inflation rate as of February 2004 is 3.4 percent per annum. The previous year's inflation was 3.1 percent.

ther, we find after twelve months that average bank account savings for the treatment group increased by 411 pesos relative to the control group (Intent to Treat effect (ITT)).[3] This increase represents an 81 percentage point increase in preintervention savings levels.

This paper presents the first field evidence that links reversals on hypothetical time discount questions to a decision to engage in a commitment device. While the experimental literature provides many examples of preferences that are roughly hyperbolic in shape, entailing a high discount rate in the immediate future and a relatively lower rate between periods that are farther away [Ainslie 1992; Loewenstein and Prelec 1992], there is little empirical evidence to suggest that individuals identified as having hyperbolic preferences (through a survey or stylized decision game) desire commitment savings devices. Furthermore, a debate exists about whether to interpret preference reversals in survey questions on time discounting as evidence for (1) temptation models [Gul and Pesendorfer 2001, 2004], (2) hyperbolic discounting models [Laibson 1996, 1997; O'Donoghue and Rabin 1999][4], (3) a nonreversal model in which individuals discount differently between different absolute time periods,[5] (4) higher uncertainty over future events relative to current events, or (5) simply noise or superficial responses. Explanations (1) and (2) both suggest a preference for commitment, whereas explanations (3), (4), and (5) do not. By showing a preference for commitment, we find support for both (or either) the temptation model and the hyperbolic discounting model.

These findings also have implications regarding the development of best savings practices for policy-makers and financial institutions, specifically suggesting that product design influences both savings levels as well as the selection of clients that take up a product. The closest field study to the one in this paper is Benartzi and Thaler's [2004] Save More Tomorrow Plan, "SMarT."[6] Our project complements the SMarT study in that we

3. ITT represents the average savings increase from being *offered* the commitment product. Four hundred and eleven pesos is approximately equivalent to U.S. $8, 2.7 percent of average monthly household income from our baseline survey, and 0.8 percent of GDP per capita in 2004.

4. See Fudenberg and Levine [2005] for a more general dual-self model of self-control which makes similar predictions as the hyperbolic models.

5. The discount rate between two particular time periods t and period $t + 1$ is different than the rate of discount between $t + 1$ and $t + 2$, but is the same conditional on whether period t or $t + 1$ is the "current" time period.

6. This plan offered individuals in the United States an option to commit (albeit a nonbinding commitment) to allocate a portion of future wage increases

also use lessons from behavioral economics and psychology to design a savings product. Aside from the product differences, our methodology differs from SMarT in two ways: (1) we introduce the product as part of a randomized control experiment in order to account for unobserved determinants of participation in the savings program, and (2) we conduct a baseline household survey in order to understand more about the characteristics of those who take up such products; specifically, we link hyperbolic preferences to a demand for commitment.

A natural question arises concerning why, if commitment products appear to be demanded by consumers, the market does not already provide them. There is, in fact, substantial evidence that such commitment mechanisms exist in the informal sector, but the institutional evolution of such devices is slow.[7] From a policy perspective, the mere fact that hyperbolic individuals did take up the product and save more suggests that whatever was previously available was not meeting the needs of these individuals. From a market demand perspective, not all consumers want such products: in our experiment, for example, 28 percent of clients took up the product. Whether a bank provides the commitment device depends, in part, on their assessment of the proportion of their client base who are "sophisticated" hyperbolic discounters; i.e., who recognize their self-control problems and demand a commitment device. If they believe that a sufficiently large proportion of consumers are either without self-control problems or "naïve" about their self-control problems, they might not find it profitable to offer a commitment savings product. In the Philippines, some banks in the Mindanao region had been offering products with commitment features, including locked boxes where the bank holds the key, before our field experiment was launched. The partnering bank is now preparing for a larger launch of the SEED commitment savings product in their other

toward their retirement savings plan. When the future wage increase occurs, these individuals typically leave their commitment intact and start saving more: savings increased from 3.5 percent of income to 13.6 percent over 40 months for those in the plan. Individuals who do not participate in SMarT do not save more (or as much more) when their wage increases occur.

7. In the United States, Christmas Clubs were popular in the early twentieth century because they committed individuals to a schedule of deposits and limited withdrawals. In more recent years, defined contribution plans, housing mortgages, and withholding too much tax now play this role for many people in developed economies [Laibson 1997]. In developing countries, many individuals use informal mechanisms such as rotating savings and credit organizations (ROSCAs) in order to commit themselves to savings [Gugerty 2001].

branches, and other rural banks in the Philippines have inquired about how to start similar products.

This paper proceeds as follows. Section II describes the SEED Commitment Savings Product and the experimental design employed as part of the larger project to assess the impact of this savings product. Section III presents the empirical strategy. Section IV describes the survey instrument and data on time preferences from the baseline survey. Section V presents the empirical results for predicting take-up of the commitment product, and Section VI presents the empirical results for estimating the impact of the commitment product on financial institutional savings. Section VII concludes.

II. SEED Commitment Savings Product and Experimental Design

We designed and implemented a commitment savings product called a SEED (Save, Earn, Enjoy Deposits) account with the Green Bank of Caraga, a small rural bank in Mindanao in the Philippines, and used a randomized control experiment to evaluate its impact on the savings level of clients. The SEED account requires that clients commit to not withdraw funds that are in the account until they reach a goal date or amount, but does not explicitly commit the client to deposit funds after opening the account.

There are three critical design features, one regarding withdrawals and two regarding deposits. First, individuals restricted their rights to withdraw funds until they reached a goal. Clients could restrict withdrawals until a specified month when large expenditures were expected, e.g., school, Christmas purchases, a particular celebration, or business needs. Alternatively, clients could set a goal amount and only have access to the funds once that goal was reached (e.g., if a known quantity of money is needed for a new roof). The clients had complete flexibility to choose which of these restrictions they would like on their account. Once the decision was made, it could not be changed, and they could not withdraw from the account until they met their chosen goal amount or date.[8] Of the 202 opened accounts, 140

8. Exceptions are allowed for medical emergency, in which case a hospital bill is required, for death in the family, requiring a death certificate, or relocating outside the bank's geographic area, requiring documentation from the area government official. The clients who signed up for the SEED product signed a contract with the bank agreeing to these strict requirements. After six months of the project, no instances occurred of someone exercising these options. For the

TABLE I
CLIENTS' SPECIFIC SAVINGS GOALS

	Frequency	Percent
Christmas/birthday/celebration/graduation	95	47.0%
Education	41	20.3%
House/lot construction and purchase	20	9.9%
Capital for business	20	9.9%
Purchase or maintenance of machine/automobile/appliance	8	4.0%
Did not report reason for saving	6	3.0%
Agricultural financing/investing/maintenance	4	2.0%
Vacation/travel	4	2.0%
Personal needs/future expenses	3	1.5%
Medical	1	0.5%
Total	202	100.0%
Date-based goals	140	69.3%
Amount-based goals	62	30.7%
Total	202	100.0%
Bought ganansiya box	167	82.7%
Did not buy ganansiya box	35	17.3%
Total	202	100.0%

opted for a date-based goal, and 62 opted for an amount-based goal. We conjecture that the amount-based goal is a stronger device, since there is an incentive to continue depositing after the initial deposit (otherwise the money already deposited can never be accessed), whereas with the date-based goal there is no explicit incentive to continue depositing.[9]

In addition, all clients, regardless of the type of restriction they chose, were encouraged to set a specific savings goal as the purpose of their SEED savings account. This savings goal was written on the bank form for opening the account, as well as on a "Commitment Savings Certificate" that was given to them to keep. Table I reports a tabulation of the stated goals. Forty-seven percent of clients reported wanting to save for a celebration, such

amount-based goals, the money remains in the account until either the goal is reached or the funds withdrawn or the funds are requested under an emergency.

9. However, it should be noted that the amount-based commitment is not fool-proof. For instance, in the amount-based account, someone could borrow the remaining amount for five minutes from a friend or even a moneylender in order to receive the current balance in the account. No evidence suggests that this occurred.

as Christmas, birthdays, or fiestas.[10] Twenty percent of clients chose to save for tuition and education expenses, while a total of 20 percent of clients chose business or home investments as their specific goals.

On the deposit side, two optional design features were offered. First, a locked box (called a "ganansiya" box) was offered to each client in exchange for a small fee. This locked box is similar to a piggy bank: it has a small opening to deposit money and a lock to prevent the client from opening it. In our setup, only the bank, and not the client, had a key to open the lock. Thus, in order to make a deposit, clients need to bring the box to the bank periodically. Out of the 202 clients who opened accounts, 167 opted for this box. This feature can be thought of as a mental account with a small physical barrier, since the box is a small physical mechanism that provides individuals with a way to save for a particular purpose. The box permits small daily deposits even if daily trips to the bank are too costly. These small daily deposits keep cash out of one's pocket and (eventually) in a savings account. The barrier, however, is largely psychological; the box is easy to break and hence is a weak physical commitment at best.

Second, we offered the option to automate transfers from a primary checking or savings account into the SEED account. This feature was not popular. Many clients reported not using their checking or savings account regularly enough for this option to be meaningful. Even though preliminary focus groups indicated demand for this feature, only 2 out of the 202 clients opted for automated transfers.

Last, the goal orientation of the accounts might inspire higher savings due to mental accounting [Thaler 1985, 1990; Shefrin and Thaler 1988]. If this is so, it implies that the impact observed in this study comes in part from the labeling of the account for a specific purpose; the rules on the account would thus serve not only to provide commitment but also to create more mental segregation for this account.

Other than providing a possible commitment savings device, no further benefit accrued to individuals with this account. The

10. Fiestas are large local celebrations that happen at different dates during the year for each barangay (smallest political unit and defined community, on average containing 1000 individuals) in this region. Families are expected to host large parties, with substantial food, when it is their barangay's fiesta date. Families often pay for this annual party through loans from local high-interest-rate moneylenders.

interest rate paid on the SEED account was identical to the interest paid on a normal savings account (4 percent per annum).

Our sample for the field experiment consists of 4001 adult Green Bank clients who have savings accounts in one of two bank branches in the greater Butuan City area, and who have identifiable addresses. We randomly assigned these individuals to three groups: commitment-treatment (T), marketing-treatment (M), and control (C) groups. One-half the sample was randomly assigned to T, and a quarter of the sample each were randomly assigned to groups M and C. We verified at the time of the randomization that the three groups were not statistically significantly different in terms of preexisting financial and demographic data.

We then performed a second randomization to select clients to interview for our baseline household survey. Of the 4001 individuals, 3154 were chosen randomly to be surveyed. Of the 3154, 1777 were found by the survey team, and a survey was completed. We tested whether the observable covariates of *surveyed* clients are statistically similar across treatment groups. The top half of Table II (A) shows the means and standard errors for the seven variables that were explicitly verified to be equal after the randomization was conducted, but before the study began, for clients who completed the survey. The right column gives the p-value for the F-test for equality of means across assignment. The bottom half of Table II shows summary statistics for several of the demographic and key survey variables of interest from the *post*-randomization survey (i.e., not available at the time of the randomization, but verified ex post to be similar across treatment and control groups). Of the individuals not found for the survey, the majority had moved (i.e., the surveyor went to the location of the home and found nobody by that name). This introduces a bias in the sample selection toward individuals who did not relocate recently. See Appendix 1 for an analysis of the observable differences between those who were and were not surveyed. This paper focuses on those who completed the baseline survey.[11]

Next, we trained a team of marketers hired by the partnering bank to go to the homes or businesses of the clients in the commitment-treatment group, to stress the importance of savings

11. Appendix 1 shows that the survey response rate did not vary significantly across treatment groups (Panel B), and that the outcome of interest, change in savings balances, did not vary across treatment groups for the nonsurveyed individuals. If participants were not surveyed, they were offered neither the SEED product nor the marketing treatment.

TABLE II
SUMMARY STATISTICS OF VARIABLES, BY TREATMENT ASSIGNMENT
MEANS AND STANDARD ERRORS

	Control	Marketing	Treatment	*F*-stat *P*-value
A. VARIABLES AVAILABLE AT TIME OF RANDOMIZATION				
Client savings balance (hundreds)	5.307	4.990	5.027	0.554
	(0.233)	(0.234)	(0.174)	
Active account	0.360	0.363	0.349	0.861
	(0.022)	(0.022)	(0.017)	
Barangay's distance to branch	21.866	23.230	22.709	0.542
	(0.842)	(0.887)	(0.672)	
Bank's penetration in barangay	0.022	0.022	0.022	0.824
	(0.000)	(0.000)	(0.000)	
Standard deviation of balances in barangay (hundreds)	4.871	4.913	4.880	0.647
	(0.350)	(0.335)	(0.244)	
Mean savings balance in barangay (hundreds)	4.733	4.770	4.476	0.757
	(0.374)	(0.371)	(0.260)	
Population of barangay (thousands)	5.854	5.708	5.730	0.858
	(0.213)	(0.203)	(0.153)	
B. VARIABLES FROM SURVEY INSTRUMENT				
Education	18.194	17.918	18.222	0.200
	(0.137)	(0.145)	(0.105)	
Female	0.616	0.547	0.600	0.078
	(0.022)	(0.023)	(0.017)	
Age	42.051	42.871	42.108	0.556
	(0.594)	(0.658)	(0.458)	
Impatient (now versus one month)	0.808	0.890	0.869	0.309
	(0.040)	(0.040)	(0.030)	
Hyperbolic	0.262	0.275	0.278	0.816
	(0.020)	(0.021)	(0.015)	
Sample size	469	466	842	1777

Standard errors are listed in parentheses below the means. The sequence of events for the experiment were as follows: Step 1: Randomly assigned individuals to Treatment, Marketing, and Control groups. Step 2: Household survey conducted on each individual in the sample frame of existing Green Bank clients (random assignment not released to survey team, hence steps 1 and 2 effectively were done simultaneously). Step 3: Individuals reached by the survey team and in the "Treatment" group were approached via a door-to-door marketing campaign to open a SEED account. Individuals reached by the survey team and in the "Marketing" group were approached via a door-to-door marketing campaign to set goals and learn to save more using their existing accounts (hence not offered the opportunities to open a SEED account). The "Control" group received no door-to-door visit from the Bank. "Active" (row 2) defined as having had a transaction in their account in the past six months. Mean balances of savings accounts include empty accounts. Barangays are the smallest political unit in the Philippines and on average contain 1000 individuals. Exchange rate is 50 pesos for U.S. $1.

to them—a process which included eliciting the clients' motivations for savings and emphasizing to the client that even small amounts of saving make a difference—and then to offer them the SEED product. We were concerned, however, that this special (and unusual) face-to-face visit might in and of itself inspire higher savings. To address this concern, we created a second treatment, the "marketing" treatment. We used the same exact script for both the commitment-treatment group and the marketing-treatment group, up to the point when the client was offered the SEED savings account. For instance, members of both groups were asked to set specific savings goals for themselves, write those savings goals into a specific "encouragement" savings certificate, and talk with the marketers about how to reach those goals. However, members of the marketing-treatment group were not offered (nor allowed to take up) the SEED account. Bank staff were trained to refuse SEED accounts to members of the marketing-treatment and control groups, and to offer a "lottery" explanation: clients were chosen at random through a lottery for a special trial period of the product, after which time it would be available for all bank clients. This happened fewer than ten times as reported to us by the Green Bank.[12]

III. Empirical Strategy

The two main outcome variables of interest are take-up of the commitment savings product (D) and savings at the financial institution (S). Financial savings held at the Green Bank refers to both savings in the SEED account and savings in normal deposit accounts. Hence, this measure accounts for crowd-out to other savings vehicles at the bank.

First, we analyze the take-up of the savings products for the individuals randomly assigned to the treatment group. Let D_i be an indicator variable for take-up of the commitment savings product. Let Z_{T1} be an indicator variable for assignment to treatment group $T1$—the commitment product treatment group. Let Z_{T2} be an indicator variable for assignment to treatment group $T2$—the marketing treatment group.

We compute the percentage of the commitment treatment group that takes up the product as α_{T1} (for use later in computing

12. In only one instance did an individual in the control group open a SEED account. This individual is a family member of the owners of the bank and hence was erroneously included in the sample frame. Due to the family relationship, the individual was dropped from the analysis.

the Treatment on the Treated effect). Then, in equation (1) we examine the predictors of take-up. We use a probit model to analyze the decision to take up the SEED product:

$$D_i = \gamma X_i + \mu_i, \tag{1}$$

where X_i is a vector of demographic and other survey responses and μ_i is an error term for individual i.

The primary characteristic of interest is reversal of the time preference questions. For each category of money, rice, and ice cream, we code individuals as hyperbolic if they wanted immediate rewards in the short term, but were willing to wait for the higher amount in the long term. Another variable of interest is "impatience." We classify individuals as impatient if the smaller rewards are consistently taken over larger delayed rewards.

Then, we measure the impact of the intervention on savings. The dependent variable is S, the change in total deposit account balances at the financial institution. We estimate the following equation on the full sample of surveyed clients:

$$S_i = \beta_{T1} Z_{T1,i} + \beta_{T2} Z_{T2,i} + \varepsilon_i. \tag{2}$$

β_{T1} provides an estimate for the ITT effect—an average of the causal effects of receiving encouragement to take up a commitment savings product—and β_{T2} captures the impact of receiving the marketing treatment. The clients in the control group have the same access to normal banking services as clients in both the commitment savings group and the marketing group. Since the estimate of β_{T2} gives the base effect of being encouraged to use a standard savings product, $\beta_{T1} - \beta_{T2}$ gives an estimate of the differential impact of a savings product with a commitment mechanism relative to being encouraged to save more in their normal noncommitment savings account.

Under the assumption that the offer has no direct effect on savings except to cause someone to use the product, one can estimate the Treatment on the Treated (TOT) effect by dividing the ITT by the take-up rate (β_{T1}/α_{T1}), or by the equivalent instrumental variable procedure of using random assignment to treatment as an instrument for take-up.

We also examine whether any particular subsamples experience larger or smaller impacts:

$$S_i = \beta_{T1} Z_{T1,i} + \beta_{T2} Z_{T2,i} + \gamma X_i + \phi(X_i Z_{T1,i}) + \varepsilon_i. \tag{3}$$

In equation (3) ϕ estimates heterogeneous treatment effects. Covariates (X_i) are interacted with commitment-treatment assign-

ment to estimate whether being offered the commitment product has a larger impact on savings for certain types of individuals. The presence of heterogeneous treatment effects suggest that any impact we find cannot be broadened to include the effect on those who do not take up the product. Hence, the results should not be used to predict, for example, the consequence of a state-mandated pension program.[13] It can, however, be used to project the impact of a savings program where participation is voluntary.

IV. Survey Data and Determinants of Time Preference

The survey data serve two purposes: they allow us to understand the determinants of take-up of the commitment savings product, and they serve as a baseline instrument for a later impact study. The survey included extensive demographic and household economic questions.[14]

The primary variable of interest for the current analysis is a measure of time-preference. As is common in the related literature, we measure time preferences by asking individuals to choose between receiving a smaller reward immediately and receiving a larger reward with some delay [Tversky and Kahneman 1986; Benzion, Rapoport, and Yagil 1989; Shelley 1993]. The same question is then asked at a further time frame (but with the same rewards) in an attempt to identify time-preference reversals. Sample questions are as follows:

1) Would you prefer to receive P200[15] guaranteed today, or P300 guaranteed in 1 month?

13. The presence of heterogeneous treatment effects may imply that we cannot interpret the treatment effect we observe as entirely due to the treatment; it may be that the type of individuals who respond to the encouragement for a commitment savings product are different from those who respond to the encouragement for a regular savings product. Thus, the difference we observe in their outcomes is due more to the difference in types of individuals who take up the two products than to the difference in treatment. Regardless, this does not imply that the commitment product is not effective relative to a normal savings product; rather it suggests that financial institutions should offer both a commitment product and a normal savings product to clients in order to attract both types of clients. In the empirical section we test for heterogeneous treatment effects across different observable characteristics but do not find any significant differences in outcomes.

14. These included aggregate savings levels (fixed household assets, financial assets, business assets, and agricultural assets), levels and seasonality of income and expenditures, employment, ability to cope with negative shocks, remittances, participation in informal savings organizations, and access to credit.

15. The exchange rate is P50 to the U.S. $, and the median household daily income of those in our sample is 350 pesos.

2) Would you prefer to receive P200 guaranteed in 6 months, or P300 guaranteed in 7 months?[16]

We call the first question the "near-term" frame and the second question the "distant" frame choice. We interpret the choice of the immediate reward in either of the frames as "impatient." We interpret the choice of the immediate reward in the near-term frame combined with the choice of the delayed reward in the distance frame as "hyperbolic," since the implied discount rate in the near-term frame is higher than that of the distant frame. We also identify inconsistencies in the other direction, where individuals are patient *now* but in six months are *not* willing to wait; we refer to these as individuals as "patient now and impatient later." One explanation for such a reversal is that an individual is flush with cash now, but foresees being liquidity constrained in six months. Table III describes the cell densities for each of these categories. Approximately 27.5 percent of individuals were hyperbolic, that is more patient over future trade-offs than current trade-offs, whereas 19.8 percent were less patient over future trade-offs than current trade-offs.

We also include similar questions for rice (a pure consumption good), and for ice cream (a superior good which is easily consumed—an ideal candidate for temptation). Although money is fungible, we wanted to test whether the context of these questions influences the prevalence and predictive power of hyperbolic preferences. We focus our analysis on the questions referring to money.[17]

IV.A. Determinants of Time Preference

We measure three individual characteristics: impatience, present-biased time inconsistency (hyperbolic), and future-biased time inconsistency ("patient now and impatient later"). After analyzing determinants of these measures, we will discuss alternative explanations (other than hyperbolic preferences) for response reversals.

Table IV (columns (1), (2), and (3)) shows the determinants of

16. The two frames, now versus one month and six months versus seven months, were asked roughly 10–15 minutes apart in the survey in order to avoid individuals answering consistently merely for the sake of being consistent, and not proactively considering the question anew. The notes to Table III detail the exact procedures for these questions.

17. Results from the rice and ice cream questions are not reported in this version of the paper, but they are available from the authors. Only the money questions predicted take-up of SEED, despite the fact that responses to these questions were fairly correlated (correlation coefficient for hyperbolic is 0.4 and 0.2 between money and rice and money and ice cream, respectively).

TABLE III
TABULATIONS OF RESPONSES TO HYPOTHETICAL TIME PREFERENCE QUESTIONS

			Indifferent between 200 pesos in 6 months and X in 7 months			
			Patient $X < 250$	Somewhat impatient $250 < X < 300$	Most impatient $300 < X$	Total
Indifferent between 200 pesos now and X in one month	Patient	$X < 250$	606 34.4%	126 7.2%	73 4.1%	805 45.7%
	Somewhat impatient	$250 < X < 300$	206 11.7%	146 8.3%	59 3.3%	411 23.3%
	Most impatient	$300 < X$	154 8.7%	93 5.3%	299 17%	546 31%
	Total		966 54.8%	365 20.7%	431 24.5%	1,762 100%

"Hyperbolic": More patient over future trade-offs than current trade-offs.
"Patient now, Impatient later": Less patient over future trade-offs than current trade-offs.
Time inconsistent (direction of inconsistency depends on answer to open-ended question).
The rows in the above table are determined by the response to #1, #2, and #3 below.

Question #1: "Would you prefer 200 pesos now or 250 pesos in one month?" If the respondent preferred 200 pesos now over 250 pesos in one month, Question #2 was asked. "X" (in above table) is assumed to be less than 250 if the person prefers 250 pesos in one month.

Question #2: "Would you prefer 200 pesos now or 300 pesos in one month?" If the respondent preferred 200 pesos now over 300 pesos in one month, Question #3 was asked. "X" (in above table) is assumed to be between 250 and 300 if the person prefers 300 pesos in one month.

Question #3: "How much would we have to give you in one month for you to choose to wait?" "X" (in the above table) is assumed to be more than 300 if the person is asked Question #3.

These three questions are then repeated in the survey (about fifteen minutes after the above three questions) but with reference to six versus seven months. The response to this second set of three questions determines the "X" used for the columns in the above table. For those in the bottom right cell, "most patient" for both the current and future trade-off, individuals were identified as "hyperbolic" if their answer to the open-ended Question #3 revealed a larger discount rate for the current relative to the future trade-off.

impatience in the near term ("Impatient, Now versus 1 month") with respect to money. We find no gender difference, although we do find that married women are more impatient than unmarried women (and this is not true for men). Education is uncorrelated with impatience, unemployed individuals are more impatient, and higher income households are more patient. Last, being unsatisfied with one's current level of savings is significantly correlated with being impatient, particularly for women.

Table IV (columns (4), (5), and (6)) shows that few observable characteristics predict hyperbolic time inconsistency. For the specification which includes both males and females, the only statistically significant results are that those who are less satisfied with their current savings habits are more likely to be hyperbolic. This result is driven by females as indicated by column

(5). For males, no independent variable predicts time inconsistency with statistical significance.

Last, we examine the determinants of being patient now but impatient later. We suggest three explanations for this reversal: noise in survey response, inability to understand the survey question, and the timing and riskiness of a respondent's expected cash flows. If noise is the explanation, then no covariate should predict response of this type. We more or less find this to be the case. Nearly twice as many individuals reversed in the "hyperbolic" direction than in this direction (see Table III). If the hyperbolic measure also includes such noise, then attenuation bias will cause our estimates of the effect of time inconsistency on take-up of the SEED product (see next section) to be biased downward. Inability to understand the question may be driving these responses; if education makes individuals more able to grasp hypothetical questions and answer them in a consistent fashion, then education should negatively predict this reversal. We find no such statistically significant relationship. Last, we examine a simple cash flow story. In the survey, we ask the individuals what months are high- and low-income months. For females (but not males), individuals who report being in a high-income month now but in a low-income month in six months are in fact more likely to demonstrate the patient now, impatient later reversal.[18] We do not have data on the riskiness of the future cash flows, which would allow us to test whether risky future cash flows, combined with credit constraints and being flush with cash now, led to this type of reversal.

Since little else predicts this particular reversal (see Table IV, columns (7), (8), and (9)), we believe that reversals in this direction represent mostly noise. Most importantly, as we will show next, unlike the hyperbolic reversals, these reversals do not predict real behavior, such as taking up (or not taking up) the SEED product, as the hyperbolic reversals do. If this reversal was in fact about being flush with cash now, then one might be more likely to save now in order to be ready for the low-income months later.

IV.B. Alternative Interpretations of the Time Preference Reversal

Here we consider explanations other than hyperbolic preferences for the present-oriented (hyperbolic) time preference rever-

18. A similar prediction suggests that individuals in low-income months now but high income in six months should appear to be hyperbolic. Table IV shows that this conjecture does not in fact hold.

TABLE IV
DETERMINANTS OF RESPONSES TO TIME PREFERENCE QUESTIONS
PROBIT

	Impatient, now versus 1 month			Impatient now, patient later (hyperbolic)			Patient now, impatient later		
	All (1)	Female (2)	Male (3)	All (4)	Female (5)	Male (6)	All (7)	Female (8)	Male (9)
Satisfied with savings, 1–5	−0.055**	−0.073**	−0.035	−0.017*	−0.026*	−0.003	−0.001	−0.001	−0.002
	(0.026)	(0.034)	(0.042)	(0.010)	(0.013)	(0.015)	(0.009)	(0.011)	(0.015)
Female	−0.099			0.098			−0.095*		
	(0.165)			(0.062)			(0.055)		
Married * female	0.227			−0.032			0.013		
	(0.153)			(0.060)			(0.052)		
Married	−0.036	0.198**	−0.053	0.075	0.044	0.063	0.009	0.027	0.007
	(0.130)	(0.082)	(0.133)	(0.048)	(0.031)	(0.045)	(0.043)	(0.027)	(0.045)
Some college	0.045	0.091	−0.015	0.020	0.051	−0.020	−0.008	−0.042	0.030
	(0.062)	(0.084)	(0.094)	(0.024)	(0.033)	(0.035)	(0.021)	(0.029)	(0.033)
Number of household members	0.009	0.011	0.009	0.000	−0.003	0.005	−0.004	−0.006	0.001
	(0.012)	(0.016)	(0.020)	(0.005)	(0.006)	(0.007)	(0.004)	(0.005)	(0.007)
Unemployed	0.318*	0.438**	0.087	0.046	0.015	0.101	−0.037	0.016	−0.135**
	(0.184)	(0.222)	(0.338)	(0.070)	(0.083)	(0.125)	(0.054)	(0.074)	(0.060)
Age	0.002	0.002	0.002	0.001	0.000	0.001	−0.001	−0.002	−0.001
	(0.002)	(0.003)	(0.003)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Total household income	−0.072***	−0.109***	0.036	−0.011	−0.011	−0.009	−0.007	−0.001	−0.041
	(0.028)	(0.035)	(0.078)	(0.013)	(0.017)	(0.025)	(0.009)	(0.011)	(0.027)
Total household monthly income—squared	0.002*	0.005***	−0.010	−0.000	−0.000	−0.001	0.001**	0.000	0.004
	(0.001)	(0.002)	(0.008)	(0.001)	(0.001)	(0.002)	(0.000)	(0.000)	(0.003)
Low income now, high in 6 months	−0.084	−0.093	−0.077	−0.063	−0.061	−0.066	0.000	−0.050	0.115
	(0.117)	(0.142)	(0.209)	(0.039)	(0.049)	(0.066)	(0.037)	(0.040)	(0.078)
High income now, low in 6 months	−0.011	−0.058	0.113	−0.067	−0.096	−0.007	0.071	0.148**	−0.105
	(0.159)	(0.200)	(0.266)	(0.053)	(0.064)	(0.100)	(0.058)	(0.075)	(0.073)

Client's own income in fraction of household income	0.352**	0.234**	0.356**	0.035	0.001	0.046	−0.078*	0.052	−0.099**
	(0.143)	(0.114)	(0.153)	(0.054)	(0.045)	(0.055)	(0.047)	(0.038)	(0.050)
Female * Client's own income in fraction of hh income	−0.126			−0.025			0.116**		
	(0.177)			(0.068)			(0.059)		
Active	0.018	0.041	−0.015	−0.028	−0.041	−0.015	−0.006	0.019	−0.034
	(0.058)	(0.076)	(0.092)	(0.023)	(0.030)	(0.035)	(0.020)	(0.026)	(0.033)
Observations	1746	1028	718	1746	1028	718	1746	1028	718
Mean dependent variable	0.864	0.841	0.896	0.275	0.292	0.251	0.199	0.195	0.206

Marginal effects are reported for coefficients. Robust standard errors are in parentheses. * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

In columns (1), (2), and (3), dependent variable equals zero, one, or two: zero if the respondent preferred 250 pesos in one month more than 200 pesos now; one if the respondent preferred 300 pesos (but not 250 pesos) in one month over 200 pesos now; zero if the respondent preferred 250 pesos in one month over 200 pesos now. Columns (4), (5), and (6): the dependent variable is either one (hyperbolic) or zero. Respondents were coded as hyperbolic if the imputed discount rate was higher for the trade-off between now and in one month than for the imputed discount rate for the trade-off between six and seven months. Columns (7), (8), and (9): the dependent variable, "Patient now, impatient later," is an indicator variable equal to one if the respondent's imputed discount rate was higher for the trade-off between six and seven months than it was for the trade-off between now and one month.

The independent variable "Low income now, high in 6 months," is an indicator variable equal to one if the respondent reported being in a lower than average income month at the time of the survey, but expected to be in a higher than average income month six months after the survey. Each respondent was asked which months tend to be their high (low) (average) months of the year. Three individuals did not completely answer the time preference questions with respect to money.

sals and present evidence for or against these alternatives. We present four alternative explanations: 1) pure noise, 2) inability to understand the questions, 3) lack of trust/transactions costs, and 4) personal cash flows which match time trade-offs in the questions.

Two pieces of evidence suggest that individuals who we code as hyperbolic do indeed reverse their time preferences, rather than just answer noisily. First, note from Table III that typically more than twice as many individuals reverse time preferences in the "hyperbolic" direction than in the other. Second, if this were pure noise, then it should not predict real behavior, such as take-up of a commitment savings product. Table V shows that this is not the case.

Regarding inability to understand the hypothetical questions, we examine whether education predicts reversals. We test whether less-educated individuals are more likely to report preference reversals (in either direction). If this is the case, and less-educated individuals are more likely to take up the SEED product, then we would spuriously conclude that take-up of SEED was due to hyperbolic preferences, rather than just being uneducated. However, Table IV shows that hyperbolic preferences are uncorrelated with education (or if anything, *positively* correlated with attending college for women). Reversals in the other direction, "patient now but impatient later," are also uncorrelated with higher education (again, positively correlated but insignificant statistically).

One could suggest that the reversal is not indicative of inconsistent time preferences, but rather of projected transaction costs for having to receive the future payoff or lack of trust in the administrator to deliver money in the future. For instance, Fernandez-Villaverde and Mukherji [2002] argue that uncertainty in future rewards will lead individuals to choose immediate rewards. We argue that the "barangay lottery" context of the questions rules this explanation out. This context is well-known to individuals and as such (in this hypothetical question) we do not believe that individuals discounted the future trade-off because of uncertainty of the cash flow. Furthermore, although such concerns provide alternative explanations for observed preference reversals, they do not imply that time preference reversals should be correlated with a preference for commitment (which we show in the next section).

Last, we examine a precise story about cash flows: individuals who report patience (impatience) now and impatience (pa-

tience) later are flush with cash now (later) but expect to be short cash later (now). In order to make sense, such a story also requires some element of savings constraints. Although we are unable to test this precisely, we did ask individuals what months are their high-income and low-income months. Females who report being in a high-income month at the time of the survey and a low-income month six months after the survey are in fact more likely to reverse time preferences, indicating patience now and impatience later (Table IV, column (8)). Hyperbolic reversals, however, are not predicted by the timing of expected cash flow (Table IV, columns (4), (5), and (6), "Low income now, High in six months" row).

V. Empirical Results: Take-up

In this section we analyze predictors of taking up the SEED commitment savings product, with particular focus on the ability of the time discounting questions (and specifically preference reversals) to predict this decision.

V.A. Predicting Take-up of a Commitment Savings Product

Here we analyze the take-up of the savings products for the individuals randomly assigned to the commitment-treatment group. Table V shows the determinants of take-up. We find that those who are time inconsistent (impatient now, but patient for future trade-offs) are in fact more likely to take up the SEED product. Little else predicts take-up of the product. Table V, columns (1), (2), and (3), show the results using a probit specification for the entire sample, women and men, respectively. The time preference questions allow us to categorize individuals into one of three categories: Most Impatient, Middle Impatient, and Least Impatient. The omitted indicator variable is "Most Impatient." We include indicator variables for impatience level over current trade-offs as well as future trade-offs, and then we include the interaction term which captures the preference reversal ("Hyperbolic"). Hyperbolic preference strongly predicts take-up of the SEED product for women. Preference reversals in the opposite direction (patient now and impatient later) do not predict take-up.

We find that females who exhibit hyperbolic preferences (with respect to money) are 15.8 percentage points more likely to

TABLE V
DETERMINANTS OF SEED TAKE-UP
PROBIT

	(1) All	(2) All	(3) Female	(4) Male
Time inconsistent	0.125*	0.005	0.158*	0.046
	(0.067)	(0.080)	(0.085)	(0.098)
Impatient, now versus 1 month	−0.030	−0.039	−0.036	−0.041
	(0.050)	(0.050)	(0.062)	(0.075)
Patient, now versus 1 month	0.076	0.070	0.035	0.119
	(0.072)	(0.072)	(0.089)	(0.110)
Impatient, 6 months versus 7 months	0.097	0.108*	0.124	0.078
	(0.065)	(0.065)	(0.087)	(0.091)
Patient, 6 months versus 7 months	0.015	0.022	0.057	−0.021
	(0.064)	(0.064)	(0.081)	(0.093)
Female	0.099	0.070		
	(0.137)	(0.138)		
Female X time inconsistent		0.191**		
		(0.090)		
Married X female	−0.113	−0.117		
	(0.091)	(0.090)		
Married	0.049	0.050	−0.080	0.054
	(0.077)	(0.076)	(0.051)	(0.068)
Some college	0.083**	0.081**	0.081	0.079
	(0.038)	(0.038)	(0.050)	(0.055)
Number of household members	0.000	−0.000	0.003	−0.006
	(0.008)	(0.008)	(0.010)	(0.011)
Unemployed	0.040	0.033	0.039	0.059
	(0.109)	(0.108)	(0.115)	(0.290)
Age	−0.002	−0.002	−0.001	−0.003
	(0.001)	(0.001)	(0.002)	(0.002)
Lending client from bank	−0.014	−0.014	−0.059	0.036
	(0.036)	(0.036)	(0.046)	(0.053)
Lending client with default	−0.032	−0.036	−0.019	−0.057
	(0.072)	(0.071)	(0.088)	(0.103)
Total household income	0.049	0.050	0.136***	−0.026
	(0.031)	(0.031)	(0.045)	(0.043)
Total household monthly income—squared	−0.008*	−0.008*	−0.024***	0.001
	(0.004)	(0.004)	(0.008)	(0.004)
Female X Income share > 0 & <= 25%	0.015	−0.000		
	(0.182)	(0.175)		
Female X Income share > 25 & <= 50%	0.048	0.037		
	(0.169)	(0.164)		
Female X Income share > 50 & <= 75%	0.135	0.110		
	(0.182)	(0.175)		
Female X Income share > 75 & <= 100%	0.018	−0.002		
	(0.155)	(0.148)		
Income share > 0 & <= 25%	−0.011	0.007	−0.020	0.046
	(0.154)	(0.155)	(0.090)	(0.172)
Income share > 25 & <= 50%	−0.047	−0.038	−0.035	0.027
	(0.141)	(0.139)	(0.071)	(0.160)
Income share > 50 & <= 75%	−0.034	−0.019	0.061	0.024
	(0.139)	(0.138)	(0.084)	(0.156)
Income share > 75 & <= 100%	0.025	0.036	0.020	0.062
	(0.142)	(0.139)	(0.076)	(0.148)
Active	−0.036	−0.040	−0.033	−0.033
	(0.034)	(0.034)	(0.043)	(0.052)
Observations	715	715	429	286
Mean dependent variable	0.28	0.28	0.31	0.24

Robust standard errors are in parentheses. * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

"Time inconsistent" is defined with respect to "money" questions. Full details are in the notes to Table III.

take up the SEED product.[19] This effect is small (4.6 percentage points) and insignificant for men. Table V shows that this result on hyperbolic preferences is robust to controlling for income, assets, education, household composition, and other potentially influential characteristics.

Education, income, and being female also predict take-up of the commitment savings product. Women on average are 9.9 percentage points more likely to take up the product (insignificant statistically). Individuals who have received some college education are more likely to take up—a result which only remains significant for women. The relationship between income and take-up is parabolic for women, with our lowest and highest observed income households less likely to take up than those we observe in the middle.

This suggests that perhaps spousal control (or household power issues in general) is another motivating factor in the take-up of a commitment product. Indeed, a body of literature addresses take-up of commitment savings mechanisms for reasons associated with intrahousehold allocation rather than with self-control. Anderson and Baland [2002] argue that Rotating Savings and Credit Associations (ROSCAs) provide a forced savings mechanism that a woman can impose on her household; if men have a greater preference than women for present consumption (or steal from their wives), women are better off saving in a ROSCA than at home. They find that women's bargaining power in the household, proxied by the fraction of household income that she brings in, predicts ROSCA participation through an inverted U-relationship. They also find that married women are much more likely to participate in ROSCAs.

We therefore analyze the impact of household composition on the likelihood to take up the commitment product over the normal savings product. Although women are more likely than men to take up the commitment product, the interaction term of married and female is negative, though not statistically significant.[20] This suggests that *single* women are in fact more likely to take up than

19. With respect to rice, females are 7.7 percent points more likely to take up, whereas with respect to ice cream females are only 4 percent points more likely to take up. However, the effects with respect to rice and ice cream are not significant.

20. We may be concerned that familial control issues, i.e., keeping money out of the hands of demanding relatives or parents, may be just as important as spousal control, and affect single income earners as well. Only 5 percent of the individuals live in a household with no other adult. Although this subsample is neither more or less likely to take up the product, little inference should be drawn from this small sample of 34 individuals. This result is not shown in the tables.

married women, which is counter to the typical spousal control story. However, in the Philippines most single women live in extended households before getting married, so this still could be a result of familial control issues for single women needing to find a (perhaps secret) mechanism to maintain savings outside the control of the household head. Furthermore, most Philippine households report that the female controls the household finances, hence social norms help married women maintain control over household cash and expenditures.[21] Indeed, Ashraf [2004] finds that in 84 percent of households surveyed in the Butuan region the wife holds the money for the household, and in 75 percent she is responsible for the budgeting. This division of responsibility may lead to an internalizing of the externalities time inconsistency incurs. Men and women could be equally hyperbolic, but women, because of their financial responsibilities, are both more aware of their time inconsistency and more motivated to find solutions to their time inconsistency problem for the benefit of the household. This may be one main reason why we find that time inconsistency predicts take-up of a commitment device among women, but not as much among men.[22]

VI. Empirical Results: Impact of the SEED Product on Financial Savings

In this section we present estimates of the impact of the savings product on financial savings held at the financial institution (both in the SEED account and in other accounts). We measure change in total balances held in the financial institution (which includes the SEED and the preexisting "normal" savings account) six and twelve months after the randomized intervention began. We perform the impact analysis over both six and twelve months in order to test whether the overall positive savings response to the commitment product was merely a short-term response to a new product, or rather representative of a lasting change in savings. Clients who took up the SEED account

21. In interpreting these results on female and married, it is important to recognize that our sample of women is a selected sample of women who already hold their own bank accounts.

22. Another possibility is that hyperbolic women (as measured by survey responses) exhibit hyperbolic behavior in the marriage market. That is, such women may disproportionately marry men from whom they will later desire to shield savings. This would explain why hyperbolic women take up the commitment product and not hyperbolic men; but it does not explain why single women are as likely (if not more) to have taken up the SEED product.

may have had different withdrawal dates for their accounts; however, we use the same timing for evaluating the impact on all subjects: all preintervention data are from July 2003; six-month postintervention data were taken in January 2004; and twelve-month postintervention data were taken in July 2004.

The impact analysis takes on several steps. Subsection VI.A presents descriptive results of the accounts opened under this program. Subsections VI.B and VI.C show the impact using Intent to Treat specifications as well as quantile regressions, and using both change in savings balance as well as binary outcomes for increasing savings over certain percentage thresholds. We find significant impacts, both economically and statistically. Subsection VI.D examines impact broken down by several subsamples, using demographic and behavioral data from the baseline survey, and subsection VI.E examines crowd-out of other savings held at the same financial institution.

VI.A. SEED Account Savings: Descriptive Results

Two hundred and two SEED accounts were opened. After twelve months about half of the clients deposited money into their SEED account after the initial opening deposit. Fifty percent of all accounts are at P100, the minimum opening deposit. Of 202 SEED accounts, 147 were established as date-based accounts. After twelve months, 110 of the 147 date-based SEED accounts had reached maturity. The savings in 109 of these accounts were not withdrawn; instead, clients opted to roll over their savings. After twelve months clients of six of the 62 amount-based SEED accounts had reached their savings goal, and all of these clients opted to roll over their savings into a new SEED account. Time deposits pay higher interest, so these clients are forgoing higher interest rates that could accrue for their now-large balances (some up to 10,000 pesos) in order to retain their savings in the SEED account.[23]

VI.B. Intent to Treat Effect

We estimate the intent-to-treat (ITT) effect—the average effect of simply being offered the commitment product—on changes in savings balances after six and twelve months of the

23. At Green Bank, time deposits begin at amounts of 10,000–49,999, which earn an interest rate of 4.5 percent if deposited for 30 days, and 4.8 percent if the time deposit is for 360 days or longer.

intervention.[24] The coefficient on assignment to the commitment-treatment group (β_{T1} of equation (2) from Section III) of P235 is positive and significant at the 90 percent level (Table VI, column (1)). This estimate corresponds to a 47 percent increase in savings for the commitment treatment group relative to the control group (Table II shows baseline savings of P503 for the treatment group). After twelve months the coefficient estimate is P411—positive and significant at the 90 percent level (Table VI, column (3)), which corresponds to an 82 percent increase in savings for the commitment treatment group relative to the control. The marketing effect, denoted by the coefficient on the second treatment group, β_{T2}, is insignificant in both intervention periods. The estimate for $\beta_{T1} - \beta_{T2}$ (the differential effect of being offered the commitment savings product beyond being offered only a marketing treatment) is positive, but it is statistically indistinguishable from zero. We repeat the estimation of equation (2) using only the clients in the treatment and marketing groups. Hence, here the marketing group (rather than the control group) serves as the comparison for the treatment group. The estimate of the commitment treatment effect is positive, but statistically insignificant in both the six- and twelve-month intervention periods (Table VI, columns (2) and (4)). The regressions in Table VI are repeated while controlling for a host of demographic and financial variables. The qualitative results change little after controlling for these variables. Impact estimates are also robust to regressing postintervention savings *level* on treatment assignment, controlling for preintervention savings level. Appendix 2 reports these results. The statistical insignificance masks the heterogeneity in the impact of the commitment treatment relative to the marketing treatment throughout the distribution of the change in balance variable. Using measures that minimize the influence of outliers, e.g., the probability of a savings increase and the quantile regressions below, we find a significant commitment-treatment effect relative to the marketing treatment.

First, we generate two binary outcome variables: the first is

24. Change in savings was chosen as the outcome of interest in equation (2) so that coefficient estimates have the interpretation of average increase in savings due to the treatment assignment. The results are similar when postintervention savings level is used as the outcome variable, or when pre- and postintervention savings data are pooled in a differences-in-differences approach. Appendix 2 reports robustness checks of the ITT analysis. Columns (5)–(6) report ITT estimates where postintervention savings level is regressed against treatment assignment and a control for preintervention savings level. ITT estimates change little relative to estimates reported in Table VI.

TABLE VI
IMPACT ON CHANGE IN SAVINGS HELD AT BANK
OLS, PROBIT

INTENT TO TREAT EFFECT	OLS				Probit			
Length	6 months		12 months		12 months			
Dependent variable:	Change in total balance	Change in total balance	Change in total balance	Change in total balance	Binary outcome = 1 if change in balance > 0%	Binary outcome = 1 if change in balance > 0%	Binary outcome = 1 if change in balance > 20%	Binary outcome = 1 if change in balance > 20%
Sample	All (1)	Commitment & marketing only (2)	All (3)	Commitment & marketing only (4)	All (5)	Commitment & marketing only (6)	All (7)	Commitment & marketing only (8)
Commitment treatment	234.678*	49.828	411.466*	287.575	0.102***	0.056**	0.101***	0.064***
	(101.748)	(156.027)	(244.021)	(228.523)	(3.82)	(0.026)	(0.022)	(0.021)
Marketing treatment	184.851		123.891		0.048		0.041	
	(146.982)		(153.440)		(1.56)		(0.027)	
Constant	40.626	225.476*	65.183	189.074**				
	(61.676)	(133.405)	(124.215)	(90.072)				
Observations	1777	1308	1777	1308	1777	1308	1777	1308
R^2	0.00	0.00	0.00	0.00				

Robust standard errors are in parentheses. * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent. The dependent variable in the first two columns is the change in total savings held at the Green Bank after six months. Column (1) regresses change in total savings balances on indicators for assignment in the commitment- and marketing-treatment groups. The omitted group indicator in this regression corresponds to the control group. Column (2) shows the regression restricting the sample to commitment- and marketing-treatment groups. Columns (3) and (4) repeat this regression, using change in savings balances after twelve months as a dependent variable. The dependent variable in columns (5)–(8) is a binary variable equal to 1 if balances increased by x percent. One hundred and fifty-four clients had a preintervention savings balance equal to zero. Twenty-four of them had positive savings after twelve months. These individuals were coded as "one," and those that remain at zero were coded as zero for the outcome variables for columns (5) through (8). Exchange rate is 50 pesos for U.S. $1.

equal to one if savings increases, and the second is equal to one if savings increases by more than 20 percent. We then regress these indicator variables on treatment assignment dummies to estimate the impact on the probability of increasing savings, and the probability of increasing savings by at least 20 percent. This enables a substantial increase in savings by a wealthy individual to be muted in two ways: first, an outlier in the distribution of percentage savings increase would be no greater influence econometrically than a client with a savings increase slightly higher than the given cutoff level; second, the absolute magnitude of the savings increase is normalized by her initial savings level.

Table VI (columns (5)–(8)) reports the outcomes of these probit specifications for cutoffs in savings changes of greater than 0 percent and greater than 20 percent.[25] The treatment effect is significant and precisely estimated in every specification, and can be interpreted as the additional probability that a client randomly assigned into the treatment group will save more than the cutoff percentage: the coefficients on commitment-treatment in columns (5) and (7) can be interpreted as the impact of treatment relative to the control clients, and those in columns (6) and (8) as the impact of treatment relative to marketing group clients. All results demonstrate positive and significant impacts. For instance, column (5) tells us that a client offered the SEED commitment product will be 10.2 percentage points more likely to increase his savings after twelve months of intervention, and 10.1 percentage points more likely to increase savings by at least 20 percent. Furthermore, the estimated coefficients on assignment into the marketing group are insignificant in every specification, compared with the control group. This is consistent with the statistically insignificant marketing effects estimated in the previous specifications, and suggests that the impact of the commitment product came from the product itself, and not from the door-to-door marketing.

Further supporting this finding, Figure I distinguishes between the twelve-month savings changes for those who were offered the product and took it up, and those who were offered but did not take it up. Clients in the latter group, labeled "non-SEED Treatment" group, appear to have increased savings in line with

25. There are 154 clients with a preintervention savings balance equal to zero. Twenty-four of them had positive savings after twelve months. These individuals were coded as "one," and those who remain at zero were coded as zero for these outcome variables. Results are virtually identical when these 154 clients are dropped from the analysis.

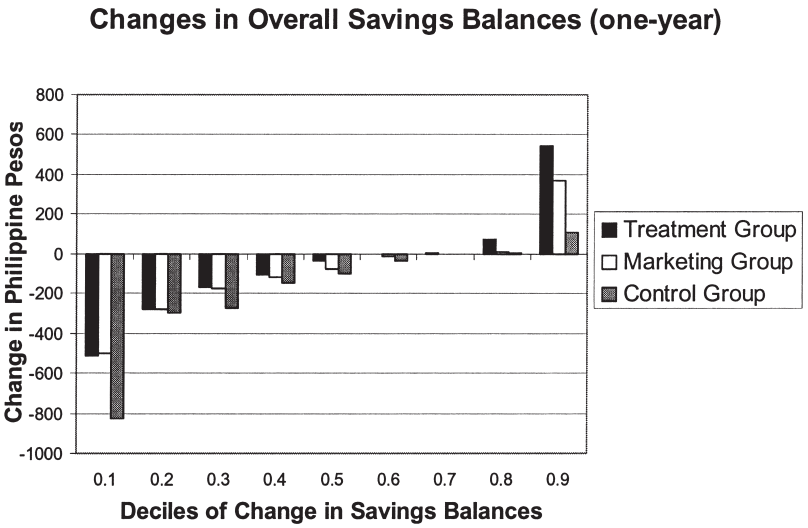

FIGURE I

clients in the control and marketing-treatment groups. In contrast, Figure II shows that the savings behavior of clients in the commitment-treatment group who took up SEED looks very different, suggesting that the effect of treatment indeed came from

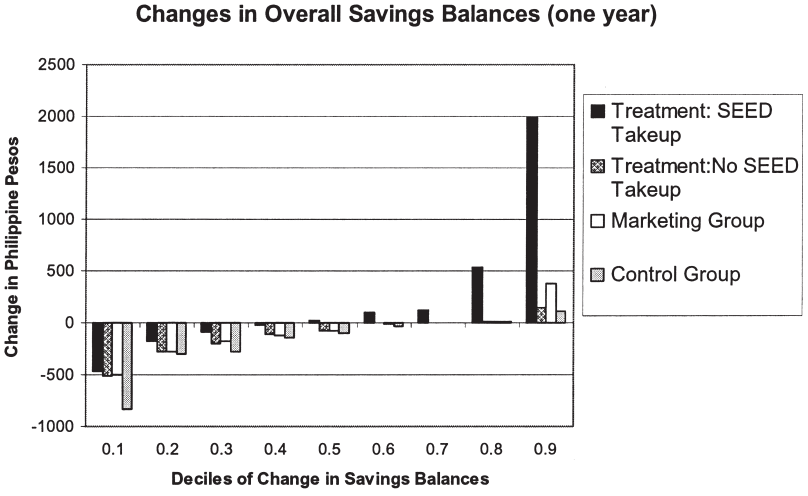

FIGURE II

the product itself, rather than from simply being offered the product. These effects support the point estimates discussed above.

In order to calculate the Treatment on the Treated (TOT) effect—the savings increase for those who opened a SEED account relative to clients in the control group who would have taken up the product if it had been offered to them—both the assignment must be correlated to take-up of the SEED product, and the treatment assignment must satisfy the exclusion restriction; that is, offering the commitment product cannot have an effect on savings except through take-up of the product. By experimental design (and internal bank operating controls enforcing the experimental design), no marketing or control individuals were permitted to open the SEED product. The ITT regressions support that the exclusion restriction holds, but are not definitive.[26] We estimate the TOT to be 1715 pesos, roughly four times larger than the ITT effect.[27]

VI.C. Quantile Treatment Effects

Estimating quantile treatment effects allows us to see the distribution of impacts, and also avoids drawing misleading conclusions from outliers. Figure I shows graphically the impact at

26. The impact of the marketing treatment arguably reflects the impact of being offered the savings product, since encouragement to take up a savings product with a commitment mechanism should not prompt savings directly any more than the encouragement to take up a regular savings product. The insignificant estimate of the marketing-treatment coefficient suggests that SEED affected savings through take-up of the SEED product alone, not the marketing of SEED. Based on this estimate alone we cannot argue that the exclusion restriction holds for certain. First, although the marketing treatment is not statistically significantly different than the control group, the SEED treatment group is not statistically different from the marketing-treatment group except in nonlinear specifications (Table VI, columns (6) and (8)). Furthermore, the encouragement to save is not identical to the SEED marketing, and it may be that the coefficient on the encouragement treatment indicator does not provide a perfect measure of the independent effect of SEED marketing. The TOT estimates are therefore interpreted as approximations of the isolated impact of voluntary SEED take-up.

27. We calculate the TOT by using assignment to treatment as an instrument for take-up. Since preintervention savings levels for all clients who would have taken up the account if it had been offered to them is unknown, we cannot report a percentage point increase in savings balance for the TOT. If preintervention savings balance for SEED account holders ("treated compliers") is used as an estimate for preintervention savings levels for all clients who would have taken up the account had it been offered to them, then the TOT estimate represents a 318 percentage point increase in savings level. Another way to interpret the TOT is by comparing with the control complier mean (CCM)—the savings change for would-be SEED compliers not offered the product, as done in Katz, Kling, and Liebman [2001]. We calculate the CCM to be a *decrease* in savings level by 674 pesos. Therefore, the change in savings for SEED "compliers" is dramatically larger than the savings outcome in absence of the treatment.

each of the deciles in the distribution of change in twelve-month savings for the three groups: treatment, marketing, and control.

Table VII shows regressions for deciles of the distribution, both after six months and after twelve months. The estimated treatment effect at the tenth percentile may be interpreted as the difference in balance changes between two clients—one in the treatment group, the other in the control group—both positioned at the tenth percentile of the distribution of balance changes within her group. Column (1) of Table VII shows the quantile treatment effects at every decile breakpoint, and compares commitment- and marketing-treatment savings behavior to the control group after six months of the intervention. Column (2) restricts the sample to only those clients in the commitment- and marketing-treatment groups so that the savings changes of clients in the commitment-treatment group can be directly compared against those in the marketing-treatment group. Columns (3) and (4) show the quantile treatment effects for the full one-year period.

Comparing the treatment group to the control group, the largest treatment effects—in both the six-month and one-year periods—are for the very bottom of the distribution, the lowest decile, and for the top, at the eightieth and ninetieth percentiles. After one year the bottom decile has a treatment effect of 317 pesos, and the ninetieth percentile has a treatment effect of 437 pesos, both significant at the 5 percent level. The marketing does not appear to have any independent effect.

As done in the previous OLS analysis, we isolate the effect of the commitment treatment from the effect of the marketing treatment by restricting the analysis to these two groups alone. The results are reported in columns (2) and (4). The impact is positive and significant throughout the distribution after six months and is significant for the upper half of the distribution after twelve months.

VI.D. Heterogeneous Treatment Effects

Next we examine differential impacts along several demographic and behavioral characteristics. In Table VIII we repeat the regressions from Table VI, but interact the treatment indicator variable with one demographic or behavioral variable at a time. The variables include the following: gender, has attended some postsecondary education, shows present-biased (hyperbolic)

TABLE VII
IMPACT ON FINANCIAL SAVINGS
DECILE REGRESSIONS
DEPENDENT VARIABLE: CHANGE IN TOTAL SAVINGS HELD AT BANK

	Length:	6 months		12 months	
	Sample:	All (1)	Commitment & marketing groups only (2)	All (3)	Commitment & marketing groups only (4)
10th Percentile	Commitment	146.450	118.040	317.490**	−9.660
	treatment	(124.015)	(3.926)	(19.913)	(64.895)
	Marketing	28.410		327.150**	
	treatment	(158.193)		(274.125)	
20th Percentile	Commitment	0.000	0.000	20.000	0.000
	treatment	(8.086)	(9.740)	(12.109)	(2.260)
	Marketing	0.000		20.000	
	treatment	(0.846)		(18.560)	
30th Percentile	Commitment	59.820***	50.300***	107.030***	6.130
	treatment	(18.966)	(109.491)	(26.784)	(21.318)
	Marketing	9.520		100.900***	
	treatment	(18.027)		(19.150)	
40th Percentile	Commitment	60.000***	56.330***	42.510**	12.900
	treatment	(17.393)	(135.428)	(2.272)	(17.971)
	Marketing	3.670		29.610	
	treatment	(19.628)		(54.917)	
50th Percentile	Commitment	0.000	0.000	62.000***	40.420**
	treatment	(8.511)	(1.069)	(141.573)	(16.031)
	Marketing	0.000		21.580	
	treatment	(10.103)		(8.512)	
60th Percentile	Commitment	4.140***	4.140***	37.620***	15.030*
	treatment	(0.688)	(0.686)	(129.382)	(4.896)
	Marketing	−0.000		22.590	
	treatment	(0.657)		(135.321)	
70th Percentile	Commitment	8.690***	8.740***	6.550***	6.550***
	treatment	(0.840)	(9.395)	(54.939)	(7.744)
	Marketing	−0.050		0.000	
	treatment	(0.931)		(0.965)	
80th Percentile	Commitment	87.770***	87.510***	65.790***	61.770***
	treatment	(19.653)	(17.035)	(20.996)	(251.610)
	Marketing	0.260		4.020	
	treatment	(2.065)		(30.463)	
90th Percentile	Commitment	403.730***	367.210***	437.230***	172.170
	treatment	(152.666)	(14.578)	(19.252)	(8.994)
	Marketing	36.520		265.060	
	treatment	(93.627)		(18.646)	
Observations	1777	1308	1777	1308	

Robust standard errors are in parentheses. * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent. Column (1) reports the quantile regression (deciles) of change in total savings balances on indicators for treatment group assignment. The omitted indicator in the regression corresponds to the control group. Column (2) repeats the regression in column (1), but excludes the control group and thus compares the commitment-treatment group to the marketing group. That is, the control group is dropped from the sample in this regression. The columns (3) and (4) report the results of the same regressions using full-year data.

TABLE VIII
INTENT TO TREAT EFFECT OF SUBGROUPS (TWELVE MONTHS)
DEPENDENT VARIABLE: CHANGE IN TOTAL SAVINGS HELD AT BANK AFTER TWELVE MONTHS
OLS

Sample	All (1)	All (2)	All (3)	All (4)	All (5)	All (6)
Commitment-treatment	680.289	676.348**	247.78	464.261*	344.633	516.794**
	(420.260)	(327.540)	(362.050)	(271.070)	(290.470)	(261.952)
Marketing-treatment	137.204	122.411	122.868	131.982	126.032	127.571
	(150.091)	(152.380)	(154.136)	(150.283)	(153.490)	(151.951)
Female	192.963					
	(135.096)					
Female * commitment-treatment	−443.422					
	(483.559)					
Active		637.862***				
		(204.620)				
Active * commitment-treatment		−738.195*				
		(393.833)				
Some college			−145.03			
			(166.616)			
Some college * commitment-treatment			279.77			
			(448.278)			
High household income				193.509		
				(153.943)		
High household income * commitment-treatment				−106.621		
				(444.092)		
Time inconsistent					−28.407	
					(132.336)	
Time inconsistent * commitment-treatment					243.866	
					(470.796)	
Patient now & impatient in future						284.833
						(353.421)
Patient now & impatient in future * commitment-treatment						−633.581
						(448.519)
Constant	−53.722	−164.665**	148.057	−32.603	72.633	15.99
	(93.641)	(81.526)	(200.428)	(84.767)	(142.170)	(80.693)
Observations	1777	1777	1777	1777	1774	1774
R^2	0.00	0.00	0.00	0.00	0.00	0.00

Robust standard errors are in parentheses. * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent. Exchange rate is 50 pesos for U.S. $1.

preferences when asked hypothetical time preference questions, and household income. These are the demographic variables that have, to some extent, been shown to be correlated with take-up of the commitment product. We are also interested in the impact of previously being an active client on changes in balances. We define "active" as a binary variable for transacting on a non-SEED deposit account in the six months prior to the study.

The coefficient on the interaction term is insignificant for all variables except "active." This suggests that, within the treatment group, the average effect of the treatment assignment is working fairly uniformly across these other characteristics. However, the clients who were active clients prior to the intervention have a much higher change in savings balances *without* SEED (the coefficient on the "active" variable is P638), but those who took-up SEED did not save more. Active savings clients were also less likely to open a SEED account (intuitively, this follows from the fact that if they are active savers and hence are perhaps not in need of a commitment savings product). After a one-year period the coefficient on being active has increased to P637, and the coefficient on the interaction between active and treatment is negative P738, significant at the 10 percent level. This suggests that the SEED treatment worked on getting inactive savers to save, but did not work for clients who were already active savers.

The positive but insignificant interaction of time-inconsistent preferences and treatment deserves some mention here. Theoretically, the prediction is not clear whether hyperbolic clients would be more or less likely to increase their savings. If hyperbolic clients are sophisticated about their time inconsistency, we expect them to demand commitment devices more than nonhyperbolic clients would [Laibson 1997] and to increase their savings more than hyperbolic clients who did not receive the treatment would. However, if we think of sophistication as more continuous (rather than 0–1), we can imagine a client who is sophisticated enough to realize a commitment device would help them, but not sophisticated enough to actually use the commitment device. These "partially naïve," or "partially sophisticated," clients, would sign up for the product but have even more problems contributing to it than a time-consistent client would. Recall that the product requires action beyond the initial sign-up commitment: the design focused on restricting withdrawals from the deposits made, but those deposits needed to be made. In order to increase deposits in the first place—and not just increase the

probability that they will not make impulse withdrawals—time-inconsistent clients would need to sign up for automatic transfer, a feature that was not taken up by most clients (few clients have direct deposit of income, and hence did not want automated withdrawals). We might, therefore, see great variance in account balances among those clients that we labeled as time-inconsistent and who took up the product: some who were sophisticated enough to take up the product but not enough to keep using it once they had made their initial deposit, and others who were sophisticated enough to keep using the product throughout the year. Indeed, although we do not have a good measure of sophistication, we do find greater variance in balances in the SEED client among hyperbolic SEED clients than nonhyperbolic ones.

VI.E. Crowd-out: Shifting Assets versus Generating New Savings

To test whether the SEED account balances represent new savings, or whether they represent shifting of assets between accounts held at the institution, we define a new outcome variable: change in balance in all non-SEED savings accounts. This is the change in savings in their normal savings account over the six months, and over the twelve-month period, since the experiment began. We regress non-SEED change in balance on the indicator variables for the treatment groups and the binary variable for active client status. We then compare the coefficient estimates against the ITT coefficient estimates. Perfect crowd-out (shifting) of SEED savings would be indicated if the coefficient on the commitment treatment indicator in the non-SEED regression were the negative of the coefficient in the primary ITT analysis. If all SEED savings lead to new institutional savings, then the coefficient in this regression will be zero. In general, the sum of the commitment treatment coefficient estimate in the non-SEED change in balance equation and the commitment ITT estimate yields the gross effect of the SEED account.

Table IX reports the results of this regression. Column (1) reports the regression of non-SEED change in balance on treatment indicators for the full one-year postintervention period. The estimated coefficient on both treatment indicators is positive but insignificant. Column (2) repeats the primary ITT regression for comparison. Thus, the improvement in savings is a result of new savings, not crowd-out of other financial savings at the Green Bank. If anything, the positive but insignificant treatment effect on non-SEED savings suggests potential

TABLE IX
TESTS FOR NEW SAVINGS
OLS

FULL SAMPLE OF CLIENTS	12 months	
Dependent variable	Change in Non-SEED balance (1)	Change in total balances (2)
Commitment-treatment	220.776	411.466*
	(227.501)	(244.021)
Marketing-treatment	120.705	123.891
	(153.437)	(153.440)
Constant	63.690	65.183
	(124.234)	(124.215)
Observations	1777	1777
R^2	0.00	0.00

Robust standard errors are in parentheses. * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent. The dependent variable in the regressions in column (1) is the change in savings in all non-SEED savings accounts held at the institution. Exchange rate is 50 pesos for U.S. $1.

positive externalities on other savings behavior from opening the SEED account.

VII. CONCLUSION

Savings requires a delay of immediate rewards for greater future rewards and is thus considered particularly difficult for individuals who have hyperbolic preferences or self-control problems. Individuals with such preferences, theoretically, should have a preference for commitment. However, identifying hyperbolic preferences and observing a preference for commitment is difficult. Using hypothetical survey questions, we identify individuals who exhibit impatience over near-term trade-offs but patience over future trade-offs. Although we find this reversal uncorrelated with most demographic and economic characteristics, we do find that this reversal predicts take-up of a commitment savings product, particularly for women. We put forth the idea that this is due to the Philippine tradition of women being responsible for household finances, and hence more in need of finding solutions to temptation or savings problems.

Using a randomized control methodology, we evaluate the effectiveness of a commitment savings account on financial savings. Individuals were assigned randomly to one of three groups, a commitment-treatment group that was offered the special prod-

uct, a second treatment group that received a special marketing visit to promote savings but no special product, and a control group. Of those in the commitment-treatment group, 28 percent opened the SEED account. We find the SEED product generates a strong positive impact on savings: after six months, average bank account savings increased by 234 pesos (a 47 percent increase in savings stock) in the commitment-treatment group relative to the control group (ITT). After twelve months, average bank account savings increased 82 percent (411 pesos = U.S. $8.2) for the ITT. Furthermore, commitment-treatment group participants have a 10.1 percentage point higher probability of increasing their savings by more than 20 percent after twelve months, relative to the control group participants, and a 6.4 percentage point higher probability relative to the marketing group participants. The increase in savings over the twelve months suggests that the savings response to the commitment treatment is a lasting change, not merely a short-term response to the new product. Although the nominal amounts are small, as a percentage of prior formal bank savings the product impact is significant. The average amounts saved are also economically significant: a doctor's visit in this area of the Philippines costs about U.S. $3, public school fees are $3/year plus $4/month for special projects, and a one-month supply of rice for a family of five costs $20.

The welfare implications of this project are ambiguous. Merely demonstrating a positive increase in savings does not necessarily imply a welfare-enhancing intervention. The loss of liquidity of the funds may (despite the "emergency" access for medical needs) cause harm to the individuals. Further research should shed insight into this important question.

Whereas these results are economically and statistically significant, they suggest that further research is warranted to understand several issues. For instance, will the effect of the product diminish over longer time periods without constant reminders? Which product features exactly generate the outcomes we observed (i.e., is it the locked box, the withdrawal restrictions, or a mental accounting effect from labeling the account that matters most)? From an institutional perspective, what are the costs involved in implementing this product, and do the benefits in terms of savings mobilization warrant such efforts? Last, does this represent substitution from other forms of savings in nonfinancial assets or in financial assets in other institutions?

APPENDIX 1: COMPARISON OF SURVEYED VERSUS NONSURVEYED CLIENTS

	Not found for survey (1)	Surveyed (2)	*T*-stat *P*-value (3)
A. VARIABLES USED IN RANDOMIZATION			
Distance to branch	20.850	22.620	0.009
	(0.510)	(0.450)	
Savings balance (hundreds)	4.306	5.091	0.000
	(0.130)	(0.120)	
Active account	0.288	0.356	0.000
	(0.012)	(0.011)	
Penetration	0.023	0.022	0.000
	(0.000)	(0.000)	
Mean balances (hundreds)	4.740	4.756	0.561
	(0.019)	(0.019)	
Standard deviation of balances (hundreds)	4.891	4.887	0.853
	(0.019)	(0.017)	
Population (thousands)	6.984	5.757	0.000
	(0.135)	(0.106)	
B. TREATMENT GROUP ASSIGNMENT			
Assigned to treatment group	42%	58%	
Assigned to marketing group	40%	60%	
Assigned to control group	46%	54%	
C. OUTCOME VARIABLE: CHANGE IN SAVINGS BALANCE			
Assigned to treatment group	45.33	476.65	0.062
	(50.31)	(209.99)	
Assigned to marketing group	93.44	189.07	0.500
	(108.65)	(90.10)	
Assigned to control group	13.77	65.18	0.750
	(77.73)	(124.24)	
Full sample	48.37	292.64	0.055
	(40.87)	(107.44)	
Sample size	1376	1777	

This appendix demonstrates the observable sample selection bias of those surveyed versus those not surveyed. The sample frame was taken from existing clients in the Green Bank database. Column (1) shows summary statistics of those chosen for the survey but where the individual was not found or not willing to complete the survey. Column (2) shows the summary statistics of those with a completed survey. Standard errors are listed in parentheses below the estimates of the means. Exchange rate is 50 pesos for U.S. $1.

APPENDIX 2: ROBUSTNESS CHECKS FOR IMPACT ANALYSIS OLS

INTENT TO TREAT EFFECT						
Length	12 months		12 months		12 months	
Dependent variable:	Table VI, col (3) Change in total balance	Table VI, col (4) Change in total balance	Change in total balance	Change in total balance	Postintervention balance	Postintervention balance
Sample	All (1)	Commitment & marketing only (2)	All (3)	Commitment & marketing only (4)	All (5)	Commitment & marketing only (6)
Commitment treatment	411.466*	287.575	369.059*	273.712	404.319*	287.847
	(244.021)	(228.523)	(220.213)	(222.418)	(246.310)	(228.195)
Marketing treatment	123.891		89.993		115.880	
	(153.440)		(155.612)		153.847	
Preintervention balance					0.747***	0.908***
					0.162	0.211
Constant	65.183	189.074**	−601.346	−835.927	199.189	234.582
	(124.215)	(90.072)	(501.920)	(681.476)	(162.943)	(134.691)
Covariates	No	No	Yes	Yes	No	No
Observations	1777	1308	1777	1308	1777	1308
R^2	0.00	0.00	0.01	0.01	0.01	0.01

Robust standard errors are in parentheses. * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent. In columns (1)–(4) the dependent variable is the change in total savings held at the Green Bank after twelve months. Column (1) regresses total savings balances on indicators for assignment in the commitment- and marketing-treatment groups. The omitted group indicator in this regression is the control group. Column (2) shows the regression restricting the sample to commitment- and marketing-treatment groups. Columns (3) and (4) report the results when controls are included in the specification for marital status, education, number of household members, employment status, household income, and squared household income. These are the same covariates used in the take-up analysis. In columns (5)–(6) the dependent variable is the total twelve-month postintervention savings level held at the Green Bank. The level of preintervention savings are included as a covariate in these columns. Exchange rate is 50 pesos for U.S. $1.

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