



T I M E
P R E F E R E N C E S

APPLICATIONS

EE416 SEM1/2020



**EMPIRICAL
MOTIVATIONS FOR
PRESENT-BIASED
PREFERENCES**



Suppose you had a choice between getting \$50 in cash one month from today, or getting less than \$50 today. Would you take less than \$50 to get the money today?

The respondents who answered affirmatively were then asked:

What is the smallest amount of cash you would take today rather than getting the \$50 one month from today?

○ Inferences about discounting

- Typical procedure elicits indifference points of the form:

_____ *at date* ____ ~ _____ *at date* _____

- Then make inferences about discounting reflected in these indifference points

Assume $u(\cdot)$ is linear.

- Hyperbolic discount function is a better fit for $D(t)$ from experimental data than exponential discounting.



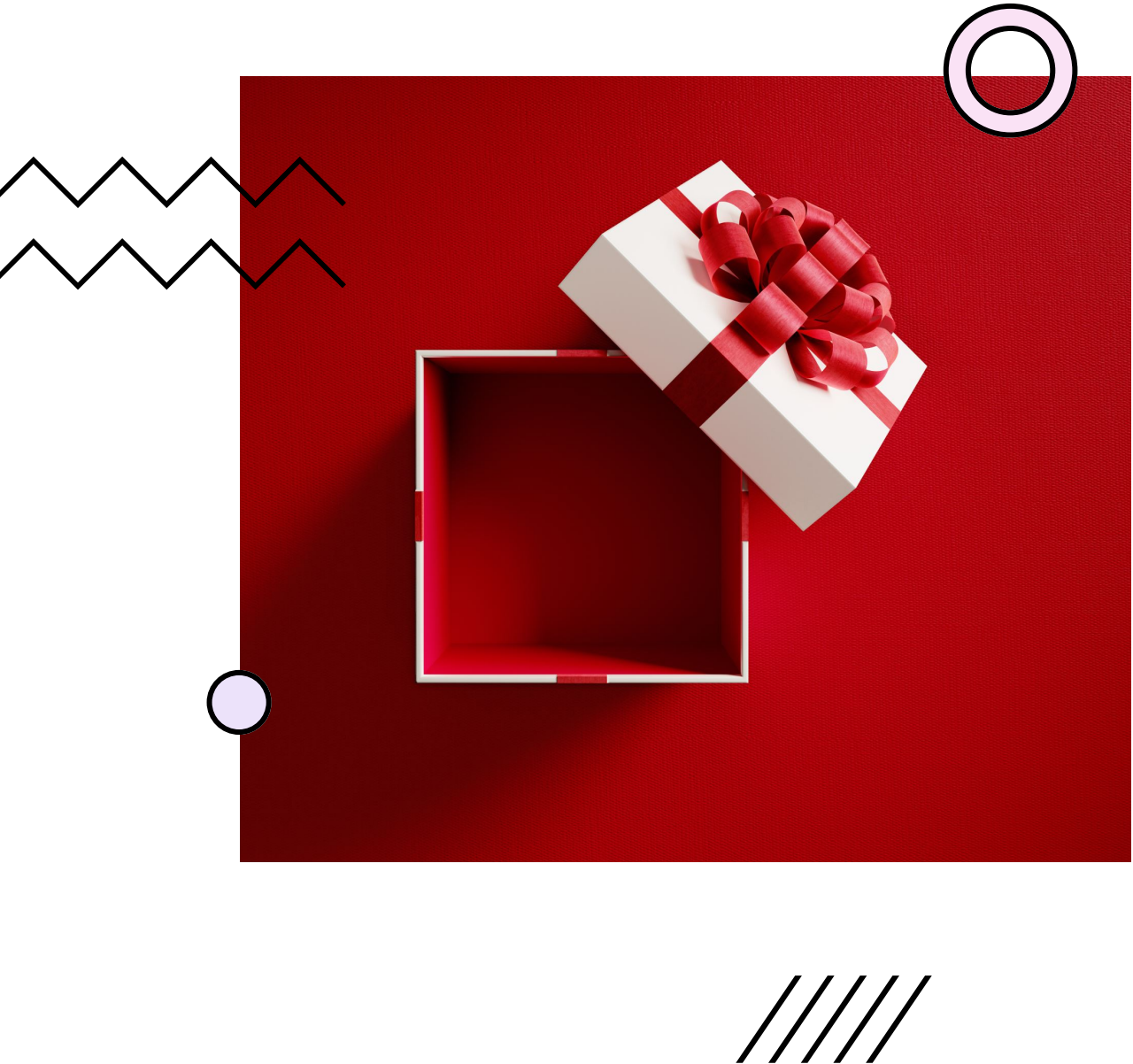
○ Short-Term vs. Long-Term Patience

Example: Suppose I have a daily discount rate of 0.999

$$\delta = 0.999, t = \text{one day}$$

- I discount tomorrow's consumption by: 0.999
- I discount consumption in a year by: $0.999^{365} = .69$
- I discount consumption in 5 year by: $0.999^{365 \times 5} = .16$
- Anything other than (almost) perfect day-to-day patience ($\delta \approx 1$) i.e., if we see a daily discount rate that is much less than one, exponential discounting is probably a bad model.





**EVIDENCES
OF
PRESENT
BIAS**



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Is there a daily discount rate? Evidence from the food stamp nutrition cycle

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Abstract

Quasi-hyperbolic discounting predicts impatience over short-run tradeoffs. I present a direct non-laboratory test of this implication using data on the nutritional intake of food stamp recipients. Caloric intake declines by 10 to 15 percent over the food stamp month, implying a significant preference for immediate consumption. These findings constitute a rejection of the permanent income hypothesis and are extremely difficult to reconcile with exponential discounting. The data support an explanation based on time preference and reject several alternative explanations, including highly elastic intertemporal substitution. I explore implications for the optimal timing of transfer payments under alternative assumptions about preferences.

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○ Shapiro (2005)

- Several government programs, such as SNAP (food stamps) issue benefits to recipients as a monthly lump sum.
- Receive a voucher (~\$130) once a month that can only be redeemed for food
- Recipients can choose to consume these benefits_____.

_____.

- For certain goods (e.g., food), consumers are likely better off with, at least a somewhat_____consumption path.





Table 1
Monthly patterns in food intake

Dependent variable	(1) log(caloric intake)	(2) log(caloric intake)	(3) caloric intake
Days since receipt of food stamps	- 0.0045 (0.0021)	- 0.0040 (0.0019)	- 7.9439 (3.1772)
Demographics?	No	Yes	No
Dataset	CSFII	CSFII	CSFII
Number of observations	6652	6652	6652
R^2	0.0796	0.1895	0.0966



○ Shapiro (2005): Results

- For each day after benefit receipt, caloric intake decreases by .4 percent holding demographic characteristics constant.
- The last day of the benefit month, you eat about ~12% fewer calories than on the day you received food stamps.



○ Does the Exponential Model Match the Data?

- If I decrease consumption each day by .4 percent (0.004), this corresponds to a daily discount factor of .996

- If $\delta = 0.996$, $t = \text{one day}$

- I discount tomorrow's consumption by: 0.996

- I discount consumption in a year by: $0.996^{365} = .23$
(note: $0.999^{365} = .69$)

- I discount consumption in 5 year by: $0.996^{365 \times 5} = .0007$
(note: $0.999^{365 \times 5} = .16$)

- Implausible level of long term patience!



○ Take-away

- Provides evidence that food stamp recipients consume more calories at the beginning of the benefit period than at the end
→ important for policy
- This daily discount rate suggests implausible long-term discount rates using an exponential discounting model
→ important for theory



The First of the Month Effect: Consumer Behavior and Store Responses[†]

By JUSTINE HASTINGS AND EBONYA WASHINGTON*

Previous research has demonstrated that benefit recipients decrease expenditures on, and consumption of, food throughout the benefit month. Using detailed grocery store scanner data, we ask two questions: whether cycling is due to a desire for variety that leads to within-month substitution across product quality, and whether cycling is driven by countercyclical retail pricing. We find that the decrease in food expenditures is largely driven by reductions in quantity, not quality, and that prices for foods purchased by benefit households vary pro-cyclically with demand, implying that households could save money by delaying their food purchases until later in the month. (JEL D12, I38)



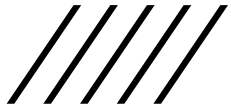


I. Data

Previous investigations of the monthly food expenditure/consumption cycle have relied on household survey data. Such data have been extremely valuable in allowing researchers to carefully document cycling amongst benefit-receiving populations. However, because household survey data do not provide the full menu of products from which households are able to choose, nor the monthly variation in price of products chosen or unchosen, survey data do not allow for the investigation of two possible causes of such cycling. These two possible causes are: a desire to consume a variety of food products across the month, and a response to variation in food prices across the month. We are fortunate to have access to grocery store scanner data that will allow us to investigate both of these possibilities.

Our scanner data cover transactions at three focal stores in a national grocery chain over the 26-month period from January 2006 to February 2008. The data include an observation for each item purchased, detailing the quantity, price, and any discounts applied. While our supermarket chain carries food and nonfood items, such as those found in a drug store, in keeping with previous literature, we analyze only food purchases. Our dataset includes an observation for each food item scanned at the register during our 26-month period. Each item is uniquely identified by its Universal Product Code (UPC), an identifier specific to the product and size of container where applicable (e.g., extra large red delicious apples, or General Mills Cheerios Cereal 18 oz. box). There are thousands of UPCs for food items.

For each scanned item, the data also record the form of payment, which can include cash, credit, debit and, most importantly for our purposes, currency from the social programs, food stamps, cash welfare, and The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC). Finally, each record includes a household loyalty card identifier. We use the loyalty card number and payment information to identify benefit recipients. In particular, we categorize a loyalty card number as belonging to a welfare recipient if that loyalty card was associated with any purchases settled with currency from social programs over the 26-month period. We



○ Hastings & Washington (2010)

Same basic research question as Shapiro (2005): Do we see a “first-of-the-month effect”?

Uses detailed scanner data from three stores in Nevada, where all recipients receive their food stamps on the 1st of the month

- Compare first week to later weeks
- Food stamp recipients vs. others
- Data on exact products and prices



○ Regression Analysis of Expenditures

- $Y_{its} = ben_i \times week_t \beta' + week_t \delta' + h_i \lambda' + s_s \eta' + \epsilon_{its}$
- Y_{its} is the log of total expenditures for household i in week t at store s
- ben_i is an indicator for whether household i is classified as a benefit household.
- $week_t$ is a row vector of dummies for each seven day period beginning at the first of each month.
- h_i is a row vector of household fixed effects;
- s_s is a row vector of store fixed effect.



○ Hastings & Washington (2010)

- Hastings & Washington (2010) replicates findings from Shapiro:
 - higher expenditure at the beginning of the month
 - This is driven by changes in quantity, not quality.



○ Hastings & Washington (2010)

- Also addresses a new question: Is the cyclical in consumption driven by cyclical in prices?
- Finding: prices are slightly higher at the beginning of the month.
- Standard model would suggest _____
_____.

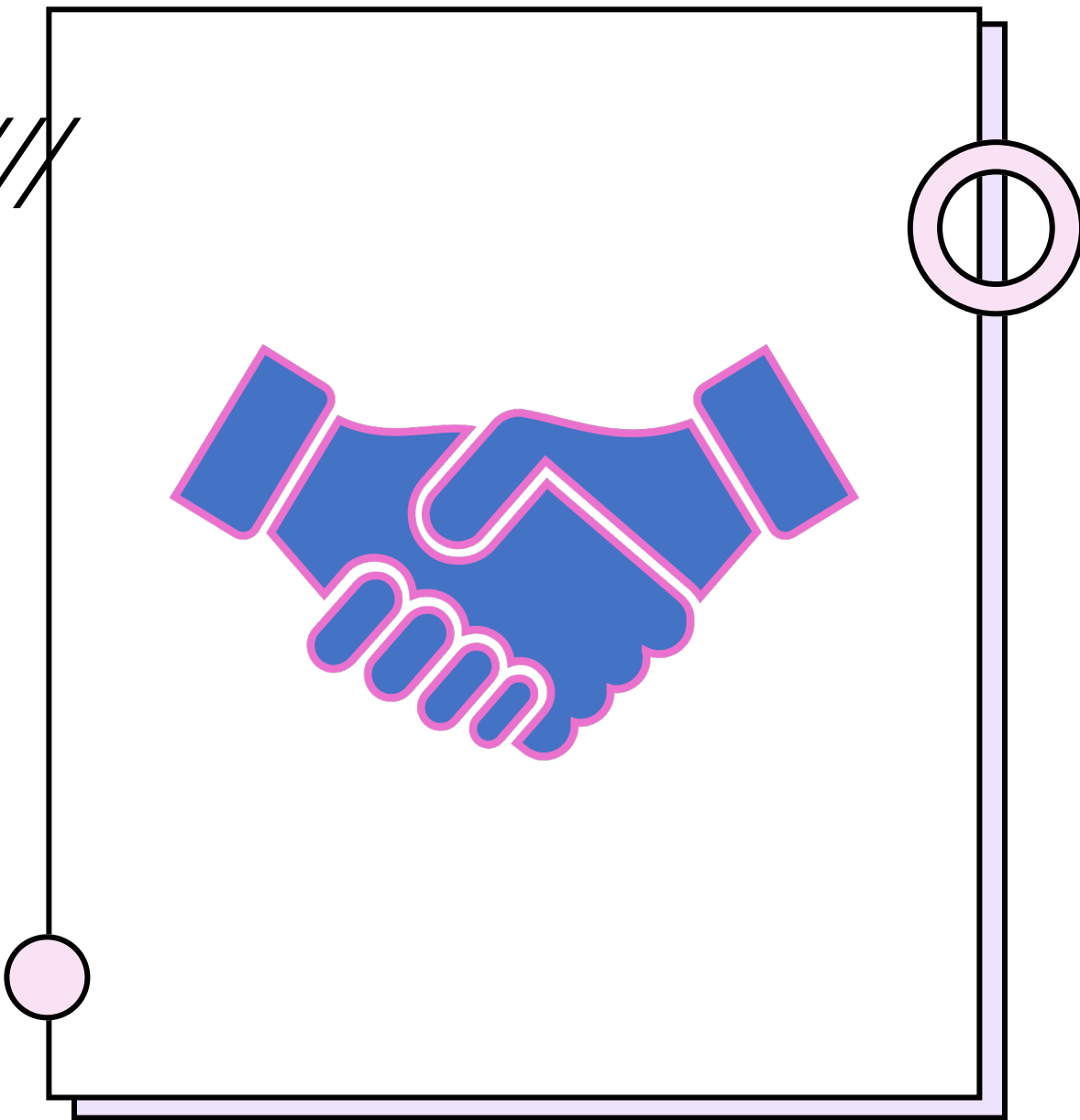


○ Hastings & Washington (2010): Policy implication

- Suggests giving people benefits_____.



**P R E F E R E N C E
F O R
C O M M I T M E N T**





Paying Not to Go to the Gym

By STEFANO DELLA VIGNA AND ULRIKE MALMENDIER*

How do consumers choose from a menu of contracts? We analyze a novel dataset from three U.S. health clubs with information on both the contractual choice and the day-to-day attendance decisions of 7,752 members over three years. The observed consumer behavior is difficult to reconcile with standard preferences and beliefs. First, members who choose a contract with a flat monthly fee of over \$70 attend on average 4.3 times per month. They pay a price per expected visit of more than \$17, even though they could pay \$10 per visit using a 10-visit pass. On average, these users forgo savings of \$600 during their membership. Second, consumers who choose a monthly contract are 17 percent more likely to stay enrolled beyond one year than users committing for a year. This is surprising because monthly members pay higher fees for the option to cancel each month. We also document cancellation delays and attendance expectations, among other findings. Leading explanations for our findings are overconfidence about future self-control or about future efficiency. Overconfident agents overestimate attendance as well as the cancellation probability of automatically renewed contracts. Our results suggest that making inferences from observed contract choice under the rational expectation hypothesis can lead to biases in the estimation of consumer preferences. (JEL D00, D12, D91)

“Saturday 31 December. New Year’s Resolutions. I WILL [...] go to the gym three times a week not merely to buy sandwich.”
Bridget Jones’s Diary: A Novel

“Monday 28 April. [...] Gym visits 0, no. of gym visits so far this year 1, cost of gym membership per year £370; cost of single gym visit £123 (v. bad economy).”
Bridget Jones: The Edge of Reason

Many firms offer consumers a menu of contracts. Cellular phone users choose combina-

tions of monthly airtime minutes and prices. Credit card users choose between teaser rate offers and contracts with a constant interest rate. A large literature in industrial organization analyzes the profit-maximizing contract design (Jean Tirole, 1988). A standard assumption in this literature is that consumers have rational expectations about their future consumption frequency and choose the utility-maximizing contract.

In this paper, we provide evidence that this may not always be the case. We present a novel dataset from three U.S. health clubs that allows



○ DellaVigna and Malmendier (2006)

- Exercise as _____
- _____ cost, _____ benefit
- Present-Bias: _____ to exercise



○ DellaVigna and Malmendier (2006)

- DellaVigna and Malmendier (2006) look at different gym membership contracts
- (i) Pay-as-you-go: \$10 per visit
- (ii) Monthly membership: \$70/month

- Standard model says buy membership if you plan to go more than _____ times per month.

- Finding: the average member only goes 4 times!



○ Dellavigna&Malmendier(2006)

- Choice of flat-rate vs. per-visit contract
- Per visit fee p
- Lump-sum periodic fee L

- Menu of contracts
 - Flat-rate contract: $L > 0, p = 0$
 - Pay-per-visit contract: $L = 0, p > 0$



○ Dellavigna&Malmendier(2006)

- Choice of flat-rate vs. per-visit contract
- Per visit fee p
- Lump-sum periodic fee L

- Health club attendance
 - Immediate cost c_t
 - Delayed health benefit $h > 0$

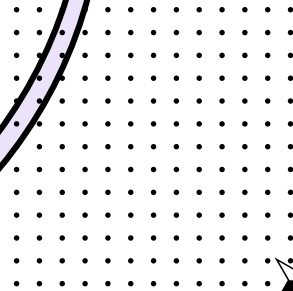


○ RECAP

- An exponential agent has time-consistent preferences _____ and is aware of it _____.
- A sophisticated agent has time-inconsistent preferences _____ and is aware of it _____.
- A fully naive agent has time-inconsistent preferences _____, but is completely unaware of it _____. She believes that she will behave like a time-consistent agent in the future.
- A partial naïve agent has time-inconsistent preferences _____, and underestimate their present bias _____. _____ reflects the overconfidence about future self-control.



Attendance decision



- Long-run plans at time 0:
 - Attend at t iff _____ \leftrightarrow

- Actual attendance decision at $t \geq 1$:
 - Attend at t iff _____ \leftrightarrow

- Forecast at $t = 0$ of attendance at $t \geq 1$:
 - Attend at t iff _____ \leftrightarrow

- This shows _____.

○ Attendance decision

- Let the effort cost at day t vary according to a cumulative distribution function G
- $c_t \sim G, c_t \text{ i. i. d. } \forall t$

○ Attendance decision

➤ Long-run plans at time 0: Attend at t iff $c_t < \delta h - p$

Attend at t with probability _____

➤ Actual attendance decision at $t \geq 1$: Attend at t iff $c_t < \beta \delta h - p$

Attend at t with probability _____

The _____ is β , the _____ is the difference between benchmark and actual attendance probability _____ and the more serious is the time inconsistency.

➤ Forecast at $t = 0$ of attendance at $t \geq 1$: Attend at t iff _____

Attend at t with probability _____

○ Attendance decision

➤ At time 0, a partial naive overestimates the probability with which she will attend in future periods.

➤ She expects to attend with probability $G(\hat{\beta}\delta h - p)$

• The _____ is the difference _____, the large is the overestimation of the future attendance probability

_____.

○ Attendance decision

- Time-consistent $\hat{\beta} = \beta = 1$ and sophisticated agents $\hat{\beta} = \beta < 1$ have rational expectations about their future time preferences and therefore do not overestimate future attendance.



Contract choice



GYM MEMBERSHIP
WORTH THE COST



A contract (L, p, T) gives customers the right to exercise

for a fee p , for T days, once the flat fee L is paid.

The choice at enrollment between:

>> flat-fee contract (e.g. monthly, annual contract)

$$(L > 0, p = 0, T)$$

>> pay-per-visit contract

$$(L = 0, p > 0, T)$$

Let $E[v]$ is the expected number of visits over T days.

○ Contract choice

- For agents who choose a flat-rate contract,

$$\frac{L}{E[v]} \leq p$$

,i.e.

$$L \leq pE[v]$$

- Payment per expected visit under the flat-rate contract should be smaller than the per-visit-fee p .

○ Contract choice

- If an agent chooses the at-rate contract over the pay-per-visit contract and if $T < 30$, then

$$L \leq \begin{aligned} & pTG(\beta\delta h) \\ & + (1 - \hat{\beta})\delta hT[G(\hat{\beta}\delta h) - G(\hat{\beta}\delta h - p)] \\ & + pT[G(\hat{\beta}\delta h) - G(\beta\delta h)] \end{aligned}$$

○ Contract choice

- For time-consistent agent $\hat{\beta} = \beta = 1$



- The time-consistent agent chooses the flat-fee contract at $t = 0$ only if the fee L is smaller than p times the expected number of attendances.
- In other words, a time-consistent agent is willing to pay per expected attendance _____ p .

○ Contract choice

- A time-inconsistent agent may instead pay _____ p for two distinct reasons.

The first reason:

- To the extent that she is sophisticated _____ she values the flat-rate contract as a _____ to overcome her short-run impatience.
- $(1 - \hat{\beta})\delta hT [G(\hat{\beta}\delta h) - G(\hat{\beta}\delta h - p)]$ is the price that the consumer is willing to pay for this commitment.

○ Contract choice

- $(1 - \hat{\beta})\delta h$ is the additional utility of each extra attendance on top of the utility for the future impatient self.
- $T[G(\hat{\beta}\delta h) - G(\hat{\beta}\delta h - p)]$ is the _____

○ Contract choice

- A time-inconsistent agent may instead pay more than p for two distinct reasons.

The second reason:

- To the extent that the agent is _____ about the future time preferences _____, she believes that she will attend _____ than she actually does. That is, _____.
- Therefore, her additional willingness to pay (relative to a time-consistent agent) equals the _____
_____ times the willingness to pay for an attendance, p .

○ Result

TABLE 3—PRICE PER AVERAGE ATTENDANCE AT ENROLLMENT

Sample: No subsidy, all clubs			
	Average price per month (1)	Average attendance per month (2)	Average price per average attendance (3)
Users initially enrolled with a monthly contract			
Month 1	55.23 (0.80) <i>N</i> = 829	3.45 (0.13) <i>N</i> = 829	16.01 (0.66) <i>N</i> = 829
Month 2	80.65 (0.45) <i>N</i> = 758	5.46 (0.19) <i>N</i> = 758	14.76 (0.52) <i>N</i> = 758
Month 3	70.18 (1.05) <i>N</i> = 753	4.89 (0.18) <i>N</i> = 753	14.34 (0.58) <i>N</i> = 753
Month 4	81.79 (0.26) <i>N</i> = 728	4.57 (0.19) <i>N</i> = 728	17.89 (0.75) <i>N</i> = 728
Month 5	81.93 (0.25) <i>N</i> = 701	4.42 (0.19) <i>N</i> = 701	18.53 (0.80) <i>N</i> = 701
Month 6	81.94 (0.29) <i>N</i> = 607	4.32 (0.19) <i>N</i> = 607	18.95 (0.84) <i>N</i> = 607
Months 1 to 6	75.26 (0.27) <i>N</i> = 866	4.36 (0.14) <i>N</i> = 866	17.27 (0.54) <i>N</i> = 866
Users initially enrolled with an annual contract, who joined at least 14 months before the end of sample period			
Year 1	66.32 (0.37) <i>N</i> = 145	4.36 (0.36) <i>N</i> = 145	15.22 (1.25) <i>N</i> = 145



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

NAVA ASHRAF
DEAN KARLAN
WESLEY YIN

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.



○ It can be difficult to save. Why?

- Three broad classes of reasons:
 1. Pressure from others
 2. Pressure from yourself
 3. Lack of secure ways to save
- If savings is useful for *ex ante* consumption smoothing (among other things), then devices that help overcome 1, 2 or 3 may increase welfare by facilitating smoothing
- Of course, informal financial institutions do exist and for some savers they are likely to be sufficient.





Program and design

Commitment savings product offered by a local bank

“SEED: Save, Earn, Enjoy Deposits”

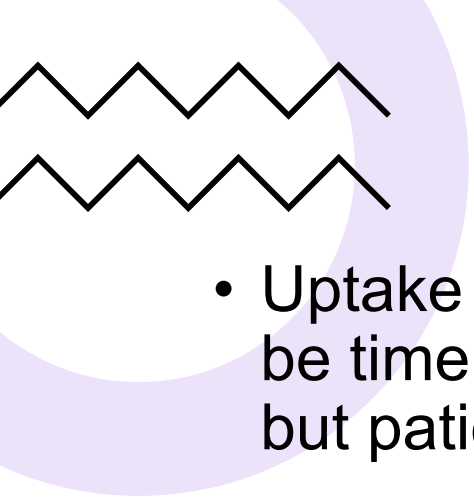
- Two ways to set goals: specify amount, or date
- Participants also wrote down a “savings goal” indicating desired use of savings
- Lockbox provided upon request



○ Program and design

- Lockbox provided upon request
 - Physical 'piggy bank' to keep at home
 - Bank holds the key
 - Allowed for frequent small deposits without traveling to bank
 - Breakable if necessary
- Automatic transfers available but not used
- Interest rate same as on normal savings accounts: 4%
- This account was _____ that restricted access to deposits as per the client's instructions upon opening the account, but _____ the client for this restriction





- Uptake is higher for those found to be time inconsistent (impatient now, but patient for future trade-offs)
- Effect is only present for women
- Effects of education and income are statistically significant
- Female effect is driven by single women, so likely not a spousal control story

TABLE V
DETERMINANTS OF SEED TAKE-UP
PROBIT

	(1) All	(2) All	(3) Female	(4) Male
Time inconsistent	0.125* (0.067)	0.005 (0.080)	0.158* (0.085)	0.046 (0.098)
Impatient, now versus 1 month	-0.030 (0.050)	-0.039 (0.050)	-0.036 (0.062)	-0.041 (0.075)
Patient, now versus 1 month	0.076 (0.072)	0.070 (0.072)	0.035 (0.089)	0.119 (0.110)
Impatient, 6 months versus 7 months	0.097 (0.065)	0.108* (0.065)	0.124 (0.087)	0.078 (0.091)
Patient, 6 months versus 7 months	0.015 (0.064)	0.022 (0.064)	0.057 (0.081)	-0.021 (0.093)
Female	0.099 (0.137)	0.070 (0.138)		
Female X time inconsistent		0.191** (0.090)		
Married X female	-0.113 (0.091)	-0.117 (0.090)		
Married	0.049 (0.077)	0.050 (0.076)	-0.080 (0.051)	0.054 (0.068)
Some college	0.083** (0.038)	0.081** (0.038)	0.081 (0.050)	0.079 (0.055)
Number of household members	0.000 (0.008)	-0.000 (0.008)	0.003 (0.010)	-0.006 (0.011)
Unemployed	0.040 (0.109)	0.033 (0.108)	0.039 (0.115)	0.059 (0.290)
Age	-0.002 (0.001)	-0.002 (0.001)	-0.001 (0.002)	-0.003 (0.002)
Lending client from bank	-0.014 (0.036)	-0.014 (0.036)	-0.059 (0.046)	0.036 (0.053)
Lending client with default	-0.032 (0.072)	-0.036 (0.071)	-0.019 (0.088)	-0.057 (0.103)
Total household income	0.049 (0.031)	0.050 (0.031)	0.136*** (0.045)	-0.026 (0.043)
Total household monthly income—squared	-0.008* (0.004)	-0.008* (0.004)	-0.024*** (0.008)	0.001 (0.004)

