Announcement:

Office hour:

1. Friday 11am-12pm
2. Wednesday 4-5 pm

Email: Sunsiree@econ.tu.ac.th
sk2634@cornell.edu

Time Preferences:
Present-biased preferences

EE416 Sem2/2019

O'Donoghue&Rabin(AER 1999): EX3 Immediate cost &nonzero rewards

- Suppose you must write a pa- per this weekend, on Friday night, Saturday, or Sunday. You know the paper will be better if written on either Saturday or Sunday (when you have an entire day). However, it is a mid-November weekend with plenty of sports on TV-pro basketball on Friday night, college football on Saturday, and pro football on Sunday. You prefer watching pro football to college football, and prefer college football to pro basketball. Which sports event do you miss to write the paper?

- The activity to be done once is writing the paper and the costs correspond to the attractiveness of the sports event missed.

O'Donoghue&Rabin(AER 1999): EX3 Immediate cost &nonzero rewards

- Suppose costs are immediate,
- $T = 3$
- $\beta = \frac{1}{2}$ for naifs and sophisticates
- Reward schedule is $\mathrm{V} = (12,18,18)$.
- Cost schedule is $\mathrm{C} = (3,8,13)$.
- TC, with $\beta = 1$, will write report on period 4 ($\tau_{TC} = Sat$) because it maximizes utility.

	$\boldsymbol{\tau = Fri}$	$\boldsymbol{\tau = Sat}$	$\boldsymbol{\tau = Sun}$
$U(\tau)$	12-3=9	18-8=10	18-13=5

O'Donoghue&Rabin(AER 1999): EX3 Immediate cost &nonzero rewards

- Suppose costs are immediate,
- $T = 3$
- $\beta = \frac{1}{2}$ for naifs and sophisticates
- Reward is $\mathrm{V} = (12,18,18)$.
- Cost schedule is $\mathrm{C} = (3,8,13)$.
- $\beta = \frac{1}{2}$

	$\tau = Fri$	$\tau = Sat$	$\tau = Sun$
At t = 1: $U^{Fri}(\tau)$	0.5(12)-3=3	0.5(18)-0.5(8)=5	0.5(18)-0.5(13)=2.5
At t = 2: $U^{Sat}(\tau)$	n/a	0.5(18)-8=1	0.5(18)-0.5(13)=2.5
At t = 3: $U^{Sun}(\tau)$	n/a	n/a	(0.5)18-13 = -4

O'Donoghue&Rabin(AER 1999): EX3 Immediate cost&non-zero rewards

- Naif:

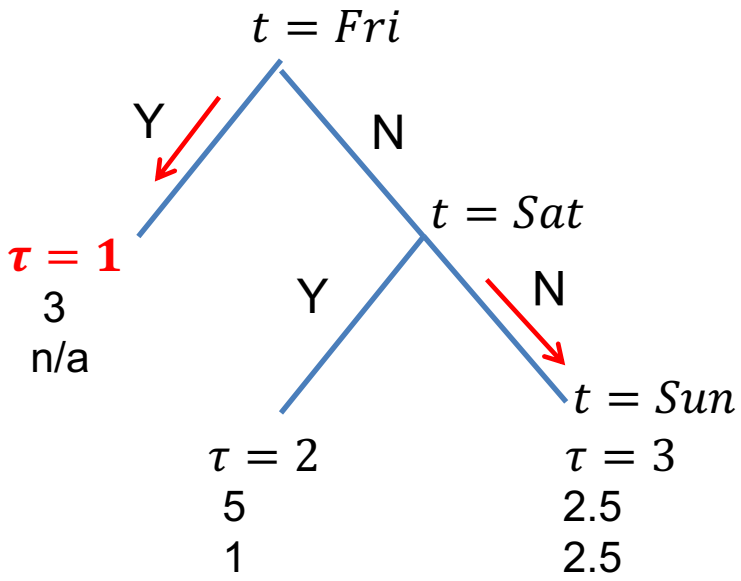
	$\tau = Fri$	$\tau = Sat$	$\tau = Sun$
At t = 1: $U^{Fri}(\tau)$	0.5(12)-3=3	0.5(18)-0.5(8)=5	0.5(18)-0.5(13)=2.5
At t = 2: $U^{Sat}(\tau)$	n/a	0.5(18)-8=1	0.5(18)-0.5(13)=2.5
At t = 3: $U^{Sun}(\tau)$	n/a	n/a	(0.5)18-13 = -4

- At t = 1: $U^1(Sat) > U^1(Fri) > U^1(Sun)$. ➔ Wait on Fri, Write report Sat.
- At t = 2: $U^2(Sun) > U^2(Sat)$ ➔ Wait on Sat, Write report Sun.
- Write report on Sunday $\tau_{naif} = Sunday$

O'Donoghue&Rabin(AER 1999): EX3 Immediate reward & nonzero rewards

- Sophisticates:

	$\tau = Fri$	$\tau = Sat$	$\tau = Sun$
At t = 1: $U^{Fri}(\tau)$	0.5(12)-3=3	0.5(18)-0.5(8)=5	0.5(18)-0.5(13)=2.5
At t = 2: $U^{Sat}(\tau)$	n/a	0.5(18)-8=1	0.5(18)-0.5(13)=2.5
At t = 3: $U^{Sun}(\tau)$	n/a	n/a	(0.5)18-13 = -4



- $\tau_{sophisticate} = Fri$
- Preproperation: Doing things too soon

O'Donoghue&Rabin(AER 1999): EX3 Immediate reward & nonzero rewards

- On Friday, sophisticates correctly predict that they will end up writing the paper on Sunday if they do not do it now. Hence, although sophisticates would prefer to write the paper on Saturday, they do it on Friday to prevent themselves from procrastinating until Sunday.
- Because sophisticates are influenced by the sophistication effect in addition to the present-bias effect, the qualitative behavior of sophisticates relative to TCs is complicated. In particular, it can be that sophisticates do not even exhibit the basic present-bias intuition

Proposition 1

- If costs are immediate, then $\tau_{Naif} \geq \tau_{TC}$.
- If rewards are immediate, then $\tau_{Naif} \leq \tau_{TC}$.

  - "Naifs believe they will behave like TCs in the future but are more impatient now. Hence, the qualitative behavior of naifs relative to TCs intuitively and solely reflects the present-bias effect."
  - General lesson: The timing of rewards and costs is crucial for a person with present-biased preferences.

Proposition 2

- For all cases, $\tau_{sophisticate} \leq \tau_{naif}$

- General lesson: Sophistication about future present bias can mitigate or exacerbate misbehavior.

Welfare

- To compare “welfare” is to compare “long-run utility comparisons”.
- Long-run utility is

$$U^0(c_1, \dots, c_T) = \sum_{\tau=1}^{T} \delta^\tau u(c_\tau).$$

- Welfare loss for Naifs is

$$U^0\left(\tau_{TC}\right) - U^0\left(\tau_{Naif}\right)$$

- Welfare loss for Sophisticates is

$$U^0\left(\tau_{TC}\right) - U^0\left(\tau_{Sophisticate}\right)$$

Proposition 3&4

- For immediate costs, a small present bias can cause severe welfare losses if and only if you are naive.

- For immediate rewards, a small present bias can cause severe welfare losses if and only if you are sophisticated.

- General lesson: Even “small” present bias can cause severe welfare losses.

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?

Empirical Motivations for Present-Biased Preferences

- Experimental evidence on discounting.
- Typical procedure elicits indifference points of the form:

$$A\ at\ date\ x \sim B\ at\ date\ x + y$$

- Then make inferences about discounting reflected in these indifference points

$$\frac{D(x+y)}{D(x)} = \frac{A}{B}$$

  - Assume $u(.)$ is linear.

Empirical Motivations for Present-Biased Preferences

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

Empirical Motivations for Present-Biased Preferences

- Average discount rates are lower for longer delays
- Average discount factor are lower for shorter delays
- More impatient over short delays than over long delays.
- People were indifferent between:

$(\$15\ now) \sim (\$30\ in\ 3\ months)$ ➔ 277% yearly discounting

$(\$15\ now) \sim (\$60\ in\ 1\ year)$ ➔ 139% yearly discounting

$(\$15\ now) \sim (\$100\ in\ 3\ year)$ ➔ 63% yearly discounting

Short-Term vs. Long-Term Patience

Example: Suppose I have a daily discount rate of 0.999

$$\delta = 0.999, t = one\ day$$

- 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: $0.999^{365\times5} = .16$

- 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.

ELSEVIER

Journal of Public Economics 89 (2005) 303–325

JOURNAL OF PUBLIC ECONOMICS

www.elsevier.com/locate/econbase

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

Jesse M. Shapiro*

Harvard University, NBER, 1050 Massachusetts Avenue, Cambridge, MA 02138, USA

Received 30 November 2003; received in revised form 23 April 2004; accepted 6 May 2004
Available online 20 July 2004

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.

Evidences of Present bias: Shapiro (2005)

- Shapiro (2005): Is There a Daily Discount Rate? Evidence from the Food Stamp Nutrition Cycle

- 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

Evidences of Present bias: Shapiro (2005)

- Shapiro (2005): Is There a Daily Discount Rate? Evidence from the Food Stamp Nutrition Cycle

- Recipients can choose to consume these benefits all at once or consume them steadily throughout the month.
- For certain goods (e.g., food), consumers are likely better off with, at least a somewhat smooth consumption path.

Results

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

Interpretation

- 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?

- What do results imply for discounting?

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

Does the Exponential Model Match the Data?

- If $\delta = 0.996, t = one\ day$
  - I discount tomorrow's consumption by: 0.996
  - I discount consumption in a year by: $0.996^{365} = .23$ $(\text{note: } 0.999^{365} = .69)$
  - I discount consumption in 5 year by: $0.996^{365\times5} = .0007$ $(\text{note: } 0.999^{365\times5} = .16)$

- Implausible level of long term patience!

Evidences of Present bias

- Shapiro (2005): Is There a Daily Discount Rate? Evidence from the Food Stamp Nutrition Cycle
- 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

American Economic Journal: Economic Policy 2 (May 2010): 142–162
http://www.aeaweb.org/articles.php?doi=10.1257/pol.2.2.142

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

- $Y_{its} = ben_i \times week_t \beta' + week_t \delta' + \mathrm{h_i} \lambda' + s_s \eta' + \epsilon_{its}$

- 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.
- $\mathrm{h_i}$ 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:

- i.e., 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 cyclicality in consumption driven by cyclicality in prices?

- If prices are low at the beginning of the month, then standard model would predict I consume more calories at the start of the month.
- Finding: prices are slightly higher at the beginning of the month.

- Standard model would suggest lower consumption at start of the month.

Hastings & Washington (2010)

- Policy implication: Suggests giving people benefits in more frequent installments.

Paying Not to Go to the Gym

By Stefano DellaVigna 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 combinations 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 an investment good
- Immediate cost, future benefit
- Present-Bias: Temptation not 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 7 times per month.

- Finding: the average member only goes 4 times!

DellaVigna and Malmendier (2006)

- Finding: the average member only goes 4 times!
- Commitment device (sophisticated): maybe without a contract they would have gone even less

DellaVigna and Malmendier (2006)

- Finding: the average member only goes 4 times!
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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 attendence
  - Immediate cost c_t
  - Delayed health benefit $h > 0$

Dellavigna&Malmendier(2006)

- Attendance decision:
  - Long-run plans at time 0:
    - Attend at t iff
    - $\beta\delta^t(-p - c_t + \delta h) > 0 \leftrightarrow c_t < \delta h - p$
  - Actual attendance decision at $t \geq 1$:
    - Attend at t iff
    - $-p - c_t + \beta\delta h > 0 \leftrightarrow c_t < \beta\delta h - p$
  - This shows time inconsistency.