Are subscription plan prices transparent?
Estimating concentration bias in intertemporal choice

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Columbia University - Industrial Organization Colloquium

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Concentration bias in intertemporal choice

"Most people can save a few dollars a day or even $10 a day. That's doable. But if you say: Can you save $300 a month or a couple of thousand dollars a year? people will say: Whoa."

Liz Davidson (financial consultant) - NYT interview - March 2016

Concentration bias: overweight "large, concentrated amounts" relative to smaller, distributed ones

- Getting now a $1200 tax refund sounds better than $100/month
- Saving $1200/year sounds more demanding than $100/month

Deviations from "rational" behavior in **intertemporal choice**

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Competing biases in intertemporal choice

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- **Saving $1200/year** sounds more demanding than $100/month

Present bias: overweight "today amounts" relative to future ones

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Competing models of intertemporal choice

- **Exponential discounting model** (ED)
  - Introduce a constant discount factor $\delta < 1$ to express intertemporal elasticity
  - \$1 today $\sim$ \$$\delta^{-1}$ one year from now $\sim \delta^{-t}$ t years from now

- **Hyperbolic discounting model** Present Bias (PB)
  - Laibson 1997: future is discounted more than the present
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- **Focusing model** Concentration Bias (CB)
  - Koszegi & Szeidl 2012: "concentrated, large amounts" is weighted more relative to "distributed, small amounts"
  - Multiply values by a coeff. increasing in V, more details later

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Why should we care? Policy relevant implications

- How should a policy that protects "boundedly rational consumers" look like? Which are the right incentives?
- **Different advisors could give you different suggestions...**
- Why are mobile plan prices not transparent?
  - PB: welcome offers are too tempting - try 2 months for free
  - CB: prices are fragmented - activate + monthly plan + cancel
- How can we promote careful filing of tax deductions?
  - PB: fight procrastination by discouraging last-minute filing
  - CB: introduce more standard tax deduction, less itemized ones

Why should we care? Policy relevant implications

- How should a policy that protects "boundedly rational consumers" look like? Which are the right incentives?
- **...or even opposite responses!**
- How to design a program to promote credit card repayment?
  - PB: on Dec 1 set a unique automatic payment for Dec 31
  - CB: on Dec 1 set small daily automatic payments for the month
- How should firms pay overtime work during seasonal peak?
  - PB: pay the overtime hours right away
  - CB: show the bonus for working an extra 1 hour x 10 days

This project

- Both PB and CB can explain *some* well-known behavioral patterns (e.g. undersaving, procrastination, credit card)
- So far the empirical literature focused on present bias: Laibson, Repetto and Tobacman 2007, Paserman 2008, Martinez, Meier and Sprenger 2016, Laibson et al 2017 (observational)
- Little work on focusing - Dertwinkel-Kalt et al. 2017 (lab only)
- But the two models have different predictions in *other* cases

- **Estimate and compare the performance of both the models outside the laboratory**
- A field experiment may allow us to answer this question

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Today's (rest of the) presentation

- Motivating examples
- Research question
- Focusing model and concentration bias
  - Koszegi and Szeidl 2012
- Laboratory experiment
  - Dertwinkel-Kalt et al. 2017
- **Field experiment**
  - **Design, hypothesis, implications**

Motivating Examples

The 28-day billing saga - Italy 2015-18

Agcom imposes €1.16 million fine on TIM, Vodafone, Wind Tre and FastWeb

22 December 2017 | Natalie Bannerman

Agcom, the Italian telecoms regulator, has said it will fine operators TIM (Telecom Italia), Vodafone, Wind Tre and FastWeb the maximum sanction of €1.16 million each, over 28-day bills.

The decision comes as Italy's ruling democratic party banned the use of 28-day bills, as the calculation of fixed line invoices on the basis of a 28-day period, overcharges customers and effectively results in a 13th monthly bill every year.

Weekly/monthly installments

- Weekly or monthly installments are commonly used to advertise items (even inexpensive ones)
- There are **rational** reasons to promote them!
  - Consumption smoothing
  - Credit constraints
  - Direct access to credit market without searching
- But also **behavioral** motivations.
  - **Present bias** - Future payment are discounted much more
  - **Concentration bias** - Large benefit, many small payments

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Advertisement A - Monthly installments

Advertisement B - Daily installments

RM 9 ($\sim$ \$2)/day $\leftrightarrow$ RM 270 ($\sim$ \$60)/month $\leftrightarrow$ RM 3240 ($\sim$ \$750)/year

Research question

Are intertemporal choices affected by concentration bias?

Do we need a field experiment?

- Probably yes
- Lack of observational data with the desired set of treatments
- Removes self-selection issues, allows stratified randomization
- Allows to collect data for counterfactual treatments
- and compare performance of competing models out of sample

Research question

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Focusing Model

Focusing model: Koszegi and Szeidl 2012

- Choose a T-dimensional consumption vector $c = (c_1, \ldots c_T)$
- Standard outcome-based utility $U(c) = \sum u_t(c_t)$
  (true measure of welfare)
- Focus-weighted utility $\widetilde{U}(c, C) = \sum g_t \cdot u_t(c_t)$
- where $u_t(c_t)$ is the utility in period t
- and g_t is the focus weight on attribute/time t

Focusing model: Koszegi and Szeidl 2012

- Two crucial assumptions about the weights $g_t = g(\Delta_t(C))$
- $\Delta_t = max\ u_t(c'_t) - min\ u_t(c'_t)$ is the range of possible values
- the function $g(\Delta)$ is strictly increasing in the range

Standard parametrization of the model

- $\widetilde{U}(c, C) = \sum g_t \cdot u_t(c_t)$

$u_t(c_t) = \delta^t \cdot u_0(c_t)$ $\quad$ δ = discount factor

$u_0(c_t) = \frac{1}{\alpha} c_t^{\alpha}$ $\quad$ α = RRA coefficient

$g_t = \Delta_t^{\gamma}$ $\quad$ γ = concentration bias

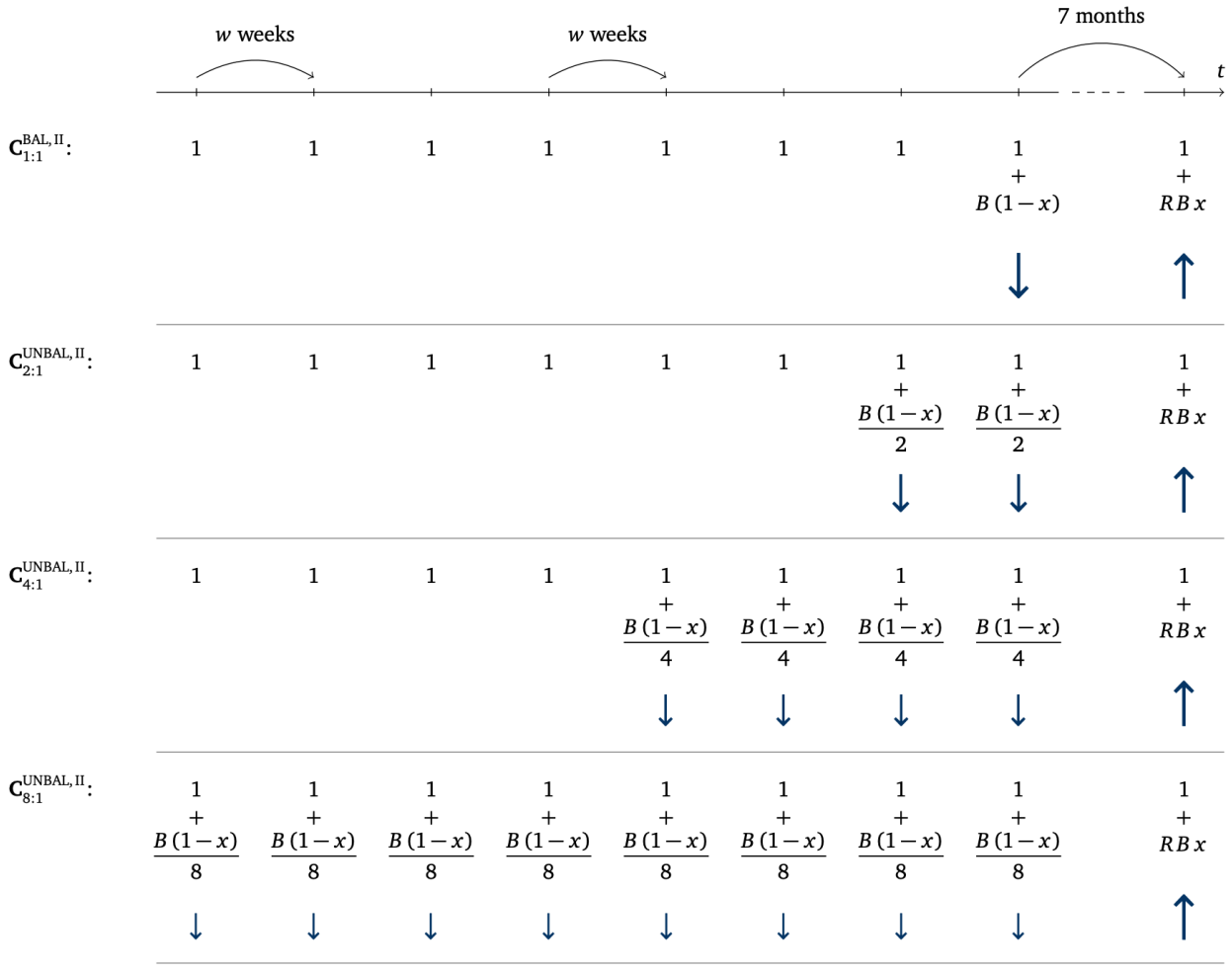
Laboratory Experiment

Laboratory experiment: Dertwinkel-Kalt et al. 2017

- Laboratory experiment of intertemporal choice
- Specifically designed to estimate concentration bias
- First study testing the **causal effect of payoff dispersion** in an intertemporal choice framework

- "Convex time budget" allocation task similar to Andreoni and Sprenger 2012: participants decide how to allocate the endowment between two periods
- Treatments: manipulate payoff dispersion

Dertwinkel-Kalt et al. 2017: Design



Design: choose $x \in [0, 1]$ and allocate the budget B across time.
Trials (rows) differ in the dispersion of early payments.
Arrows indicate in which directions payment change if x is increased.

Dertwinkel-Kalt et al. 2017: Main results

- Participants allocate larger share of the budget in the period (present or future) where rewards are more concentrated
- Concentration bias is significant and its magnitude is increasing in the number of payments of the dispersed option
- Analysis: structural estimation of the primitives of the model (discount $\delta = 0.9994$, RRA $\alpha = 0.452$, concentration $\gamma = 0.562$)[1]
- Subjects' choices can be explained by focus weighting in combination with concave per-period utility over money

[1] Associated SE are 0.0002, 0.139, 0.173. n=185 participants, 24 trials each.

Field Experiment

Field experiment

- The **lab experiment** provides a simplified setting that tests the focusing model in a fully controlled environment
- A **field experiment** should be simple and imitate the design as closely as possible
- Tradeoff between current and future benefits (or current costs and future benefits)
- Random assignment of treatments (concentrated/dispersed)
- What are the costs/benefits? It depends on the "partner" that is willing to provide the data: here two (extreme) examples

Field experiment - Design - Example 1 (Blue Apron)

- Suppose I partner with Blue Apron (ingredient meal kit service)
- Special deal: add $5 of almonds for 4 weeks, get a $10 discount

- **Cost**: purchase for C weeks a $ N add-on (e.g. extra recipe/fruit)
- **Benefit**: enjoy for B weeks a $ M discount on the weekly subscription
- **Random treatment**: assign and offer a deal with a combination of dispersed costs and benefits
- Variable of interest: probability of accepting the deal

Field experiment - Design - Example 2 (YouTube)

- Suppose I partner with YouTube (video-sharing platform)
- Special deal: complete 4 short surveys and enjoy 30min w/o ads

- **Cost**: fill C surveys with N questions each
- **Benefit**: enjoy B periods of time ad-free for M minutes each
- **Random treatment**: assign and offer a deal with a combination of dispersed costs and benefits
- Variable of interest: probability of accepting the deal

Field experiment - Hypothesis

- Present bias predicts (effect on prob accept)
  - Large/small benefit now > large/small benefit later (+)
  - Large/small cost now > large/small cost later (-)
  - No effect of distribution of costs/benefits in the future (=)
- Concentration bias predicts
  - Concentrated benefit > dispersed benefit (+)
  - Concentrated costs > dispersed costs (-)
  - No effect of timing now/later (=)
- There are other potential candidate models, e.g. relative thinking model (opposite of focusing)

Field experiment - Implications

- The decision of AGCom (Italian regulator) is coherent with the suggestions of both the competing models (PB and CB)
- But this is not the case for many other cases
- Promote repayment of credit card debt:
  dispersed or concentrated payments?
- Encourage overtime work
- Transparent pricing
- Promote careful filing tax deductions

Summary

- Repeated payments and subscriptions (such as phone billing) offer a relevant framework for intertemporal choice
- Promote transparency in the pricing of regular service
- Quasi-hyperbolic discounting model (and present bias) represent the benchmark
- Focusing model (and concentration bias) have different predictions...
- ...and different implications about what is a transparent price
- Use a field experiment to estimate and compare the models

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