Eliciting temptation and self-control through menu choices: a lab experiment

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Introduction

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2. **Health**: diet, exercise, smoking, alcohol consumption
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3. **Professional**: job search, work productivity, academic success
   - DellaVigna and Paserman (2005), Kaur et al. (2010, 2015), Bisin and Hyndman (2014), Wong et al. (2008)

Introduction

There is the evidence and there is introspection:

1. I will wake up early tomorrow and exercise.
2. I will stop smoking next month.
3. I will eat healthier after Christmas.
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1. Models of **present-biased preferences** (Laibson 1997)
   - Time inconsistent preferences over consumption streams.

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2. Models of **menu-dependent pref.** (Gul & Pesendorfer 2001)
   - Preferences depend not only on actual consumption but also on the choice set.

$$u_{t+1}(salad, |\{salad\}) > u_{t+1}(salad, |\{salad, burger\})$$

$\Rightarrow$ Common implication: **there can be demand for commitment**.

Introduction

- Since they both generate commitment demand, discriminating between these two models can be challenging.
- One key distinction:
  - Present-biased agents will choose to restrict future choice sets only if they expect to give in to temptation.
  - Gul & Pesendorfer agents may **favor commitment even if they expect to resist temptation** = "***self-control types***"
- Goal: **propose a method to identify "self-control types".**

Introduction

Assessing the prevalence of self-control types is important from a policy perspective:

- If unchosen alternatives can affect utility, policies removing temptations could be welfare-enhancing.

- Example of smoking bans in public spaces:
  1. may benefit current smokers who want to quit.
  2. could also benefit *former* smokers by reducing self-control costs of remaining smoke-free.
     - Welfare calculations that ignore 2. will underestimate the welfare benefits of smoking bans.

Introduction

An inappropriate account of self-control costs will bias:

1. our estimate of the *effect size* of a given policy
2. our assessment of the optimal *policy tools*
   - Krusell and Smith (2010), Gul and Pesendorfer (2007)
   - (−) **Price policies** such as proportional taxes
   - (+) **Policies imposing a cap** on consumption of tempting goods, *even if optimal consumption is below the cap*.

Introduction

- However, identifying self-control types presents an empirical challenge. Requires to know:
  1. whether the DM would prefer to restrict future choice sets.
  2. what the DM would choose in the absence of commitment.
- With naturally occurring data, we rarely observe both worlds.
- Conduct a laboratory experiment to generate this data.

Elicitation Strategy (1): Generating temptation

1. Challenge of eliciting temptation in controlled settings:
   - Houser et al. (2010), Augenblick et al. (2015)
   - Cf Bryan et al. (2010) for a review
2. Generate temptation by exploiting human curiosity:
   - temptation: forfeit $ to learn a story during a boring task
   - sensational story experienced by one subject in the room

Elicitation Strategy (2): Identifying costly self-control

Rely on a two-step identification procedure ($t = 1, 2$):

1. Before task, elicit preferences $\succeq_1$ over "menus" $\{NL\}, \{L\}$ and $\{NL, L\}$ differing in access to the story:
   - Classify subjects into menu types.
   - ***Self-control type*** has ordering $\{NL\} \succ_1 \{NL, L\} \succ_1 \{L\}$.
   - Elicit beliefs about choice from $\{NL, L\}$ to interpret rankings.

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2. Use random rule to implement menu preferences during task:
   - Observe subjects who face choice but preferred commitment.
   - Actual self-control if $\{NL\} \succ_1 \{NL, L\} \succ_1 \{L\}$ and $NL \succ_2 L$.
   - Can compare task performance under flexibility vs commitment

Preview of main findings

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2. Consistent with the GP model, self-control types expect to resist the temptation to learn the story.

3. Perceived and actual self-control almost entirely coincide: self-control types indeed resist temptation.

4. Yet, facing the choice is associated with a lower productivity, suggesting the presence of self-control costs.

Related literature

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1. **Link between temptation and commitment demand**
   - *Lab studies*: Houser et al. (2010), Augenblick et al. (2015)
   - *Field experiments*: Ashraf at al. (2006), Kaur et al. (2010), John (2015), Sadoff et al. (2015), Schilbach (2015)

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   - *Flexibility*: Dean and McNeill (2015)
   - *Commitment*: Toussaert (2016)

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   - *Commitment*: Toussaert (2016)

3. **Measurement of sophistication**
   - *Unincentivized survey questions*: Ameriks et al. (2007), Wong (2008), John (2015)
   - *Incentivized mechanism*: Acland and Levy (2015), Augenblick and Rabin (2015)

Plan of the talk

1. Theory
   - Key ingredients of the Gul & Pesendorfer (2001) model
   - Restrictions on choice data
2. Experimental design
   - Description of the temptation
   - Elicitation of menu preferences
   - Measurement of beliefs
3. Results
   - Menu preferences
   - Beliefs and actual choice from flexible menu
   - Productivity under commitment vs flexibility

Theory: Set-up

- GP 2001 consider a two-period expected utility model, $t = 1, 2$.
- Primitive : a preference relation $\succeq_1$ **over a set of menus**.
- In Period 1, the DM makes choices among menus according to $\succeq_1$ (the modeled stage).
- In Period 2, the DM makes a choice from the selected menu according to $\succeq_2$ (unmodeled).
- Impose standard axioms: $\succeq_1$ is complete and transitive, satisfies continuity and independence.

  $\Rightarrow$ treated as maintained assumptions in the experiment

Theory: Key Axiom and Representation

- Key behavioral axiom called *Set Betweenness* (*SB*):

$$\text{If } A \succeq_1 B \text{ then } A \succeq_1 A \cup B \succeq_1 B$$

- GP (2001) obtain temptation and self-control representation:

$$V_{GP}(A) = \max_{x \in A} \underbrace{u(x)}_{\text{commitment utility}} + \underbrace{v(x) - \max_{y \in A} v(y)}_{\text{self-control cost}}$$

  - $u(x)$ = commitment utility: $V_{GP}(\{x\}) = u(x)$
  - $v(x)$ = temptation utility: $\{x\} \succ_1 \{x, y\} \Leftrightarrow v(y) > v(x)$

Theory: Interpretation of Set Betweenness (1)

- To interpret SB, let $X = \{a, b\}$ (for apple and brownie)
- Assume $\{a\} \succ_1 \{b\}$ or, equivalently, $u(a) > u(b)$.

Theory: Interpretation of Set Betweenness (1)

- To interpret SB, let $X = \{a, b\}$ (for apple and brownie)
- Assume $\{a\} \succ_1 \{b\}$ or, equivalently, $u(a) > u(b)$.
- Consider first a **standard** DM (STD):

$$\{a\} \sim_1 \{a, b\} \succ_1 \{b\}$$

- No conflict between u and v (i.e. $v = \alpha u + \beta$)

$$V_{STD}(A) = \max_{x \in A} u(x)$$

Interpretation of Set Betweenness (2)

Consider a DM who is **tempted** by the brownie

$$\{a\} \succ_1 \{a, b\} \text{ or, equivalently, } v(b) > v(a)$$

Two reasons for preferring commitment:

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Two reasons for preferring commitment:

1. **Avoid succumbing to temptation (*Present-biased type*)**:

$$\{a\} \succ_1 \{a, b\} \sim_1 \{b\}$$

$$V_{GP}(\{a, b\}) = u(b) + [v(b) - v(b)] = u(b)$$

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2. **Avoid costly exercise of self-control (*Self-control type*)**:

$$\{a\} \succ_1 \{a, b\} \succ_1 \{b\}$$

$$V_{GP}(\{a, b\}) = u(a) - [v(b) - v(a)] > u(b)$$

Theory: Implications for the structure of temptation

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- **Random indulgence (Stochastic dual-self models)**:

$$\{a\} \succ_1 \{a, b\} \succ_1 \{b\} \quad \text{and} \quad \mathbb{P}\{b \succ_2 a\} \in (0, 1)$$

$$V_{SDS}(A) = p \max_{x \in A} u(x) + (1 - p) \max_{y \in B_v(A)} u(y)$$

where $B_v(A) = \{y \in A \mid v(y) \geq v(y') \text{ for all } y' \in A \setminus \{y\}\}$

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  - In experiment, I elicit beliefs about choice from flexible menu.

Theory: Restrictions on choice behavior

1. GP 2001 model a sophisticated agent:

$$\underbrace{\{a,b\} \succ_1 \{b\}}_{\text{If DM expects to choose } a \text{ from } \{a,b\}} \quad \text{implies} \quad \underbrace{a \succ_2 b}_{\text{then he chooses } a \text{ from } \{a,b\}}$$

   In the experiment, I elicit Period 2 behavior:

   - *Perceived* self-control: $\{a\} \succ_1 \{a,b\} \succ_1 \{b\}$
   - *Actual* self-control: Perceived self-control and $a \succ_2 b$

2. Their model precludes:

   - Preference for Flexibility (Kreps 1979): $\{a,b\} \succ_1 \{a\},\{b\}$
   - Temptation with Guilt (Kopylov 2012): $\{a\} \succ_1 \{b\} \succ_1 \{a,b\}$

   In the experiment, allow expression of any preference ordering.

theoretical lit

Experimental design: Curiosity and task description

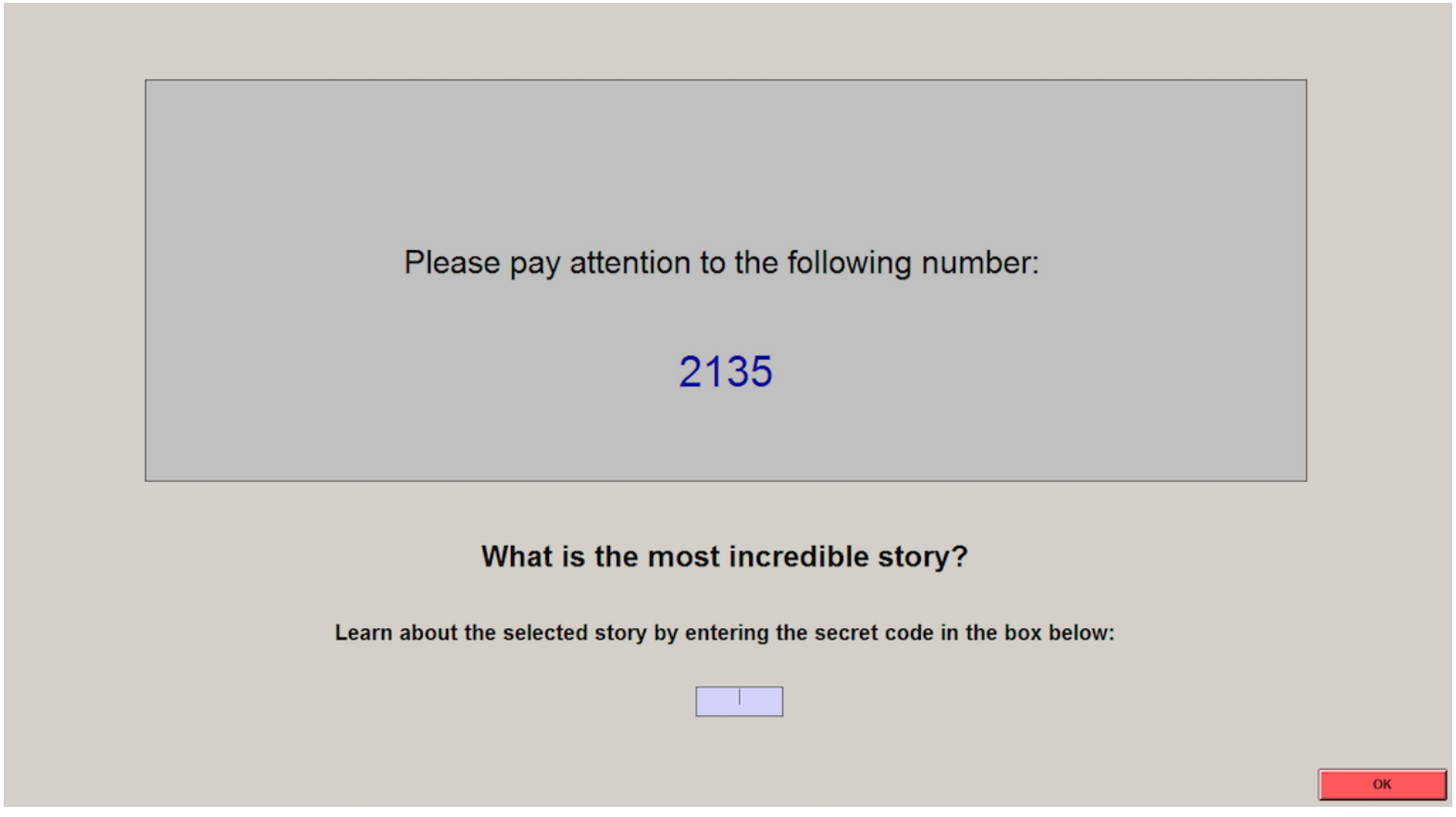
Session divided in two periods:

1. In Period 1, subjects report most incredible story ever experienced. Best story is selected. story interest

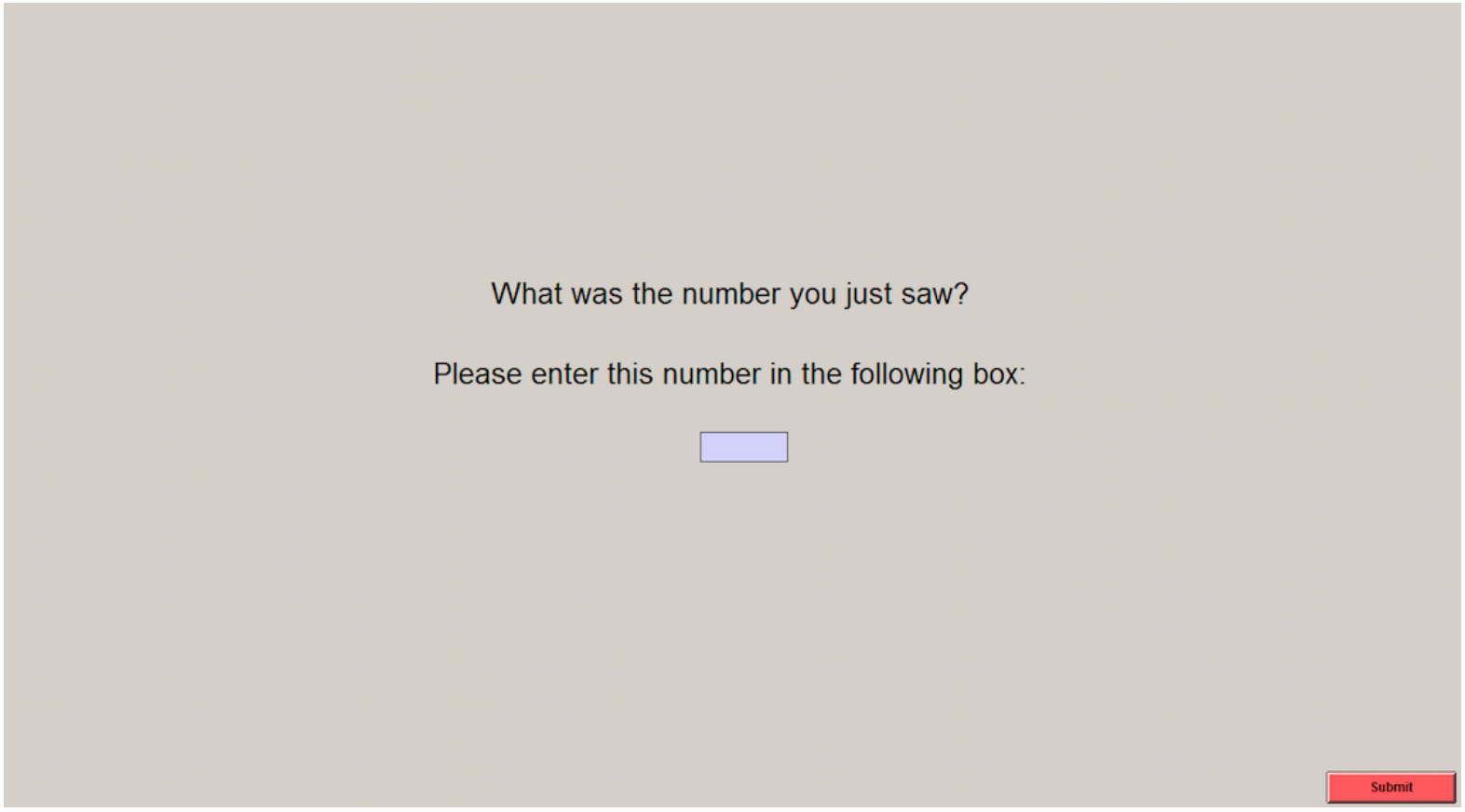
2. In Period 2, subjects perform a boring task for 45 min:
   - stare at 4-digit number updated every second
   - 5 prompts at random times to enter last number seen
   - \$2/correct answer

- Two options during the task:
  - *Learning* (L): learn the story - paid for only 4 of the 5 prompts
  - *No Learning* (NL): never learn the story - paid for all 5 prompts

Attention task (1)



Attention task (2)



Experimental design: Elicitation of menu preferences

- Task in Period 2 performed under one of 3 possible conditions:

  No Learning $\{NL\}$: Paid for 5 prompts. No access to the story.

  Learning $\{L\}$: Paid for 4 prompts. Story revealed.

  Decide in Period 2 $\{NL, L\}$: Choice to read the story or not.

- Subjects asked which condition(s) they would prefer to be in.

- Elicited weak preference ordering $\succeq_1$ over $\{\{NL\}, \{L\}, \{NL, L\}\}$.

Experimental design: Elicitation of menu preferences

- Subjects assigned a rank number to $\{NL\}$, $\{L\}$ and $\{NL, L\}$.
- Could assign the same number to 2 menus if indifferent.
- With 50% chance, ranking stochastically implemented as:

Ranking of (X,Y,Z)	% chance of being drawn $(\%_X,\%_Y,\%_Z)$
(1,2,3)	(50,30,20)
(1,1,2)	(40,40,20)
(1,2,2)	(50,25,25)
(1,1,1)	(33.3,33.3,33.3)

- With 50% chance, subjects received $\{NL, L\}$ in Period 2.
  - allows to generate the counterfactual to commitment.

Experimental design: Elicitation of *WTP*

- But so far indifferences are not strictly incentivized.
- Need cardinal measure of preferences to isolate indifferences.
- Subjects asked for *WTP* to replace:
  1. their last option with their second best option
  2. their second best option with their top option
- *WTP* in terms of money or time (between subject design).
- Elicitation using Multiple Price List mechanism.

Experimental design: Belief elicitation (1)

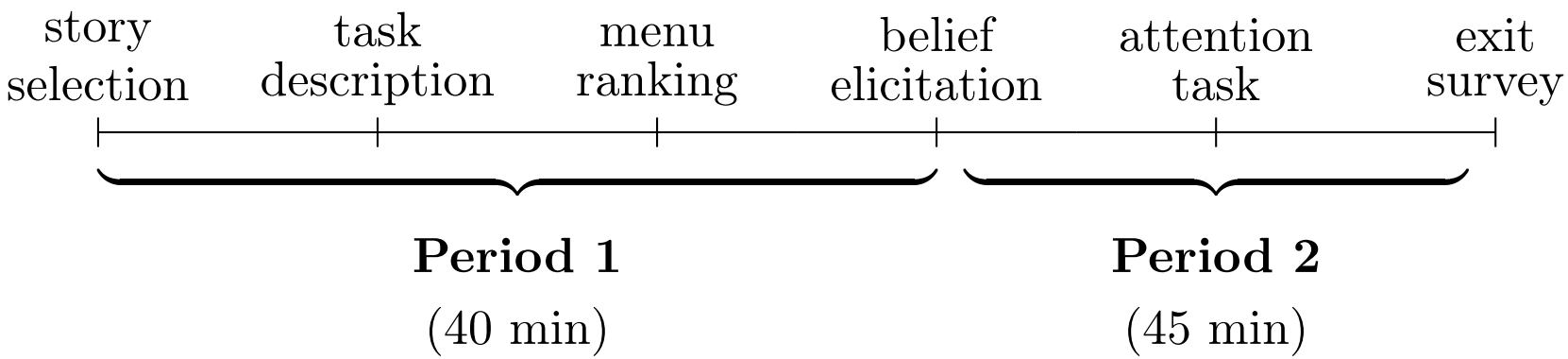
- Goal: interpret menu preferences; measure **sophistication**.
- Challenge of incentivizing beliefs without distorting behavior:
  - cf. Acland & Levy (2011), Augenblick & Rabin (2015)
  - Alternative: unincentivized survey à la Ameriks et al. (2007)
- In this paper, I **instrument beliefs about oneself with beliefs about a similar other**:
  - Uses idea of false consensus bias or self-similarity (Ross et al. 1977, Butler et al. 2013, Rubinstein & Salant 2015)

Experimental design: Belief elicitation (2)

Elicited belief about expected choice in $\{NL, L\}$ in two ways:

1. Incentivized (instrument):
   - Subjects asked to guess whether **someone with the same ranking** will choose *Learning* or *No Learning* in Period 2.
   - Received \$2 for a correct guess.
2. Unincentivized (test strength of instrument):
   - *How likely are you to choose to learn the selected story in Period 2 if given the chance?*
   - Possible answers: *very unlikely*, *somewhat unlikely*, *unsure*, *somewhat likely*, *very likely*.

Timeline of the experiment



Dataset

1. Dataset comprises 6 experimental sessions - 120 subjects total. Average earnings of \$18.70 for about 2 hours.

2. For each subject, dataset contains:

   - Initial preference ranking of $\{NL\}, \{L\}$ and $\{NL, L\}$.
   - Preference ordering after WTP
   - Beliefs about choice from $\{NL, L\}$ (incentivized and unincentivized)
   - Choice from $\{NL, L\}$ if assigned this menu (72.5% of subjects)
   - Number of prompts correctly answered (out of 5)

Experimental Results: Road Map

1. **Menu preferences**
   - Initial rank orderings and WTP decisions.
   - Link between menu preferences and beliefs.
2. **Actual self-control: Period 2 behavior**
   - Link between menu preferences and choice to learn the story.
   - Link between productivity and menu assignment.

Menu preferences: Rank orderings (1)

Subjects classified into menu types according to their rank ordering:

- *SC*: Self-Control type who is tempted to learn the story

$$\{NL\} \succ_1 \{NL, L\} \succ_1 \{L\}$$

- *STD*: Standard DM with no temptation to learn the story

$$\{NL\} \sim_1 \{NL, L\} \succ_1 \{L\}$$

- *FLEX*: DM with a preference for flexibility

$$\{NL, L\} \succ_1 \{NL\}, \{L\}$$

- *GUILT*: Guilt type afraid of making the wrong choice

$$\{NL\} \succ_1 \{L\} \succ_1 \{NL, L\}$$

Menu preferences: Rank orderings (2)

Preference ordering	menu type	% subjects	(N)	random benchmark	p-value
$\{NL\} \succ_1 \{NL, L\} \succ_1 \{L\}$	SC	**35.8%**	**(43)**	7.7%	< 0.001
$\{NL, L\} \succ_1 \{NL\}, \{L\}$	$FLEX$	**34.2%**	**(41)**	23.1%	0.006
$\{NL\} \sim_1 \{NL, L\} \succ_1 \{L\}$	STD	9.2%	(11)	7.7%	0.494
$\{NL\} \succ_1 \{L\} \succ_1 \{NL, L\}$	$GUILT$	6.7%	(8)	7.7%	0.863
other ordering		14.2%	(17)	53.8%	< 0.001
Total		100%	(120)	100%	

Notes: p-values from a two-sided binomial test that the observed frequency is equal to the benchmark frequency of selecting one of the 13 rank orderings at random.

Menu preferences: Rank orderings (3)

- Frequency of SC types over 4x higher than what would be observed in a sample of random choices.
- Only 4.2% of subjects with $\{L\} \succ_1 \{NL, L\} \succ_1 \{NL\}$: subjects are tempted by reading the story, as intuition would predict.
- Only 2.5% of subjects with $\{NL\} \succ_1 \{NL, L\} \sim_1 \{L\}$, capturing temptation with no self-control.

Menu preferences: *WTP*

- Subjects asked for WTP (in \$ or min) to replace:
  1. their last option with their second best option
  2. their second best option with their top option

- No differences in distribution of WTP for time vs money

▸ WTP dist.

- High degree of consistency between initial ordering and WTP i.e. $(\succ_1, WTP > 0)$ or $(\sim_1, WTP = 0)$.

- Alternative classification accounting for WTP by replacing:
  - $\succ_1$ with $\sim_1$ whenever $WTP = 0$
  - $\sim_1$ with $\succ_1$ whenever $WTP > 0$

Alternative classification accounting for *WTP* choices (1)

Preference ordering	menu type	% subjects	(N)	random benchmark	p-value
$\{NL\} \succ_1 \{NL, L\} \succ_1 \{L\}$	SC	**23.3%**	**(28)**	7.7%	< 0.001
$\{NL, L\} \succ_1 \{NL\}, \{L\}$	$FLEX$	18.3%	(22)	23.1%	0.235
$\{NL\} \sim_1 \{NL, L\} \succ_1 \{L\}$	STD	**30.0%**	**(36)**	7.7%	< 0.001
$\{NL\} \succ_1 \{L\} \succ_1 \{NL, L\}$	$GUILT$	8.3%	(10)	7.7%	0.732
other ordering		20.0%	(24)	53.8%	< 0.001
Total		100%	(120)		

Notes: p-values from two-sided binomial test that the observed frequency is equal to the benchmark frequency of selecting one of the 13 rank orderings at random.

Alternative classification accounting for WTP choices (2)

- Self-control types $\approx 1/4$; 3x higher than under random choice.
- Previous preference for flexibility not robust to WTP analysis.
- Findings robust to alternative classifications that exclude subjects with inconsistencies between $\succeq_1$ and WTP. ▸ alternative classifications
- In the following, I will present results with both classifications.

Beliefs (1)

1. Incentivized and unincentivized belief measures highly agree.
   beliefs
   - Guesses about others highly correlated with own subjective likelihood of learning.
   - $\approx 90\%$ agreement when excluding subjects who are *unsure*.
2. In the subsequent analysis, unincentivized belief:
   - $= 1$ (0) if *somewhat* or *highly likely* (*unlikely*) lo learn the story.
   - Answer to incentivized question used as tie-breaker if *unsure*.

Beliefs (2)

- Both measures compared to Period 2 choice inferred from menu preferences under two conditions.

- Let λ_x be the DM's propensity to choose x from $\{NL, L\}$:

  Sophistication (S):

  $\{x, y\} \succ_1 \{y\}$ implies $\lambda_x > 0$ ($=1$ in a deterministic world)

  No preference reversal (NPR):

  $\{x\} \succ_1 \{y\}$ implies $\lambda_x > \lambda_y$ ($x \succ_2 y$ in deterministic world)

Beliefs (3)

Table: Relationship between initial preference ordering and beliefs

Pref. ordering $\succeq_1$ on $\mathcal{M}$	menu type	dist. of Period 2 choice under S and NPR	% (N) who predict Learning *Incentivized*	% (N) who predict Learning *Unincentivized*
$\{NL\} \succ_1 \{NL, L\} \succ_1 \{L\}$	SC	$\lambda_{NL} > \lambda_L \geq 0$	**2.3% (1/43)**	**2.3% (1/43)**
$\{NL, L\} \succ_1 \{NL\} \succ_1 \{L\}$		$\lambda_{NL} > \lambda_L > 0$	12.0% (3/25)	12.0% (3/25)
$\{NL, L\} \succ_1 \{L\} \succ_1 \{NL\}$	$FLEX$	$\lambda_L > \lambda_{NL} > 0$	66.7% (6/9)	77.8% (7/9)
$\{NL, L\} \succ_1 \{L\} \sim_1 \{NL\}$		$\lambda_{NL}, \lambda_L > 0$	71.4% (5/7)	71.4% (5/7)
$\{NL\} \sim_1 \{NL, L\} \succ_1 \{L\}$	STD	$\lambda_L = 0$	0.0% (0/11)	0.0% (0/11)
$\{NL\} \succ_1 \{L\} \succ_1 \{NL, L\}$	$GUILT$	$\lambda_{NL} > \lambda_L \geq 0$	12.5% (1/8)	25.0% (2/8)

Beliefs (4)

Beliefs overall consistent with S and NPR:

- Almost all SC subjects expected No Learning.
- For all $FLEX$ types, the fraction of subjects who expected No Learning is strictly positive and different from one.
- All subjects with standard preferences and no temptation to learn, STD, expected to choose No Learning.
- Same findings with alternative classification based on WTP.

see Table

Actual self-control: Overall Learning

- Out of 120 subjects, 87 assigned $\{NL, L\}$, 29 assigned $\{NL\}$ and 4 assigned $\{L\}$.
- 18.4% (16/87) chose to learn the story.
- Some heterogeneity in the timing of learning.
- Differences in the propensity to learn across menu types.

Beliefs versus actual behavior by menu type

Notes: Learning prediction corresponds to the incentivized guess about a similar other.

Effect of flexible menu on productivity (1)

- Although self-control types do not succumb, the GP model suggests that resisting temptation involves psychic costs.
- One way to indirectly test for the presence of these psychic costs is to measure their impact on productivity.
- If subjects are challenged in their self-control then productivity should be higher when the temptation is removed.

Effect of flexible menu on productivity (2)

Effect of flexible menu on productivity (3)

- But this finding has to be interpreted with caution.
- Assignment to $\{NL\}$ or $\{NL, L\}$ is fully random only conditional on the initial rank ordering and WTP, which affects the odds of receiving each menu.
- Confounding factor if those with a higher WTP for replacing $\{NL, L\}$ with $\{NL\}$ are also more productive. This is the case.

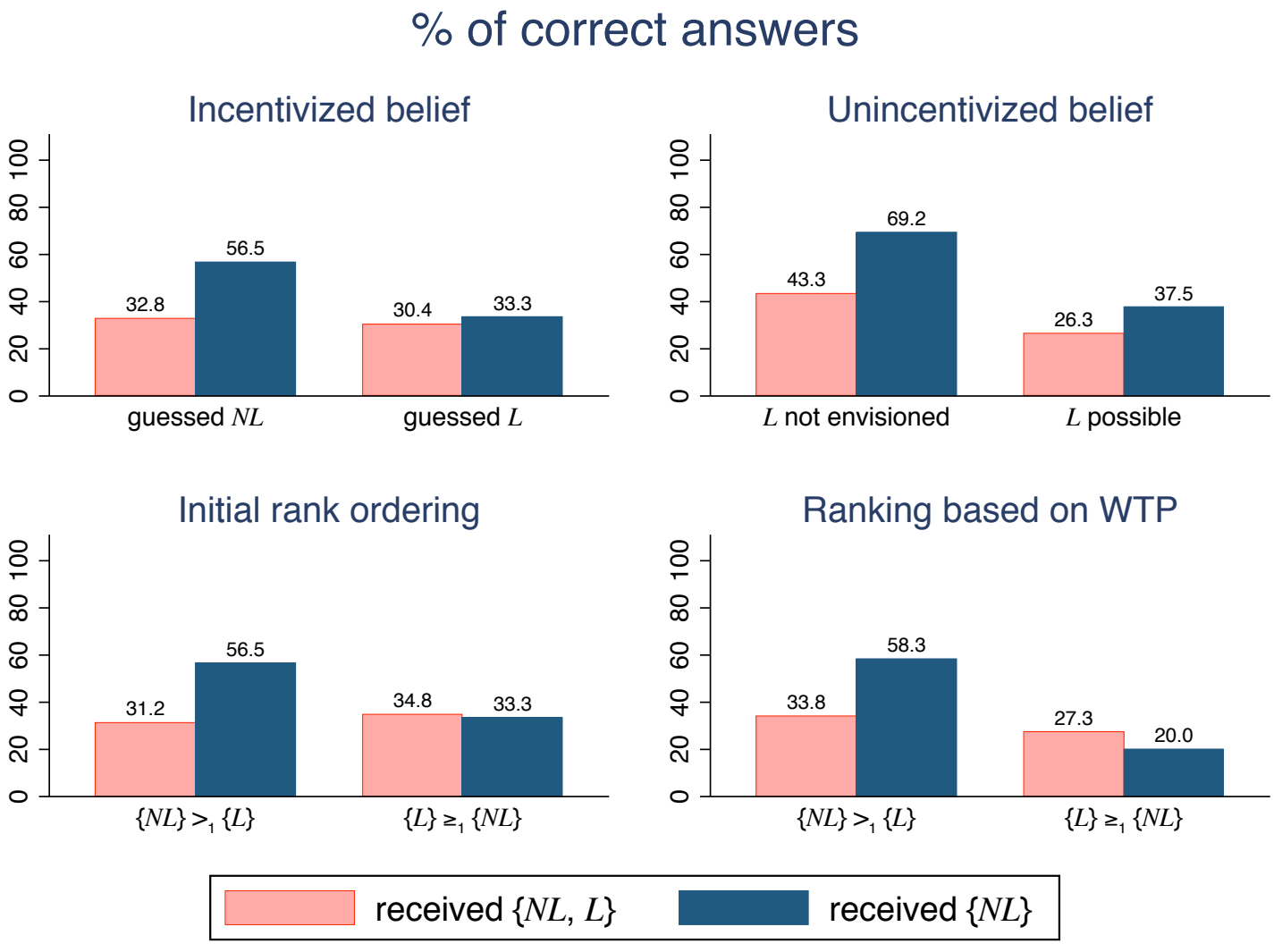
Effect of flexible menu on productivity (4)

attention levels

	Received perfect score		Number of correct answers	
	(1)	(2)	(3)	(4)
assigned $\{NL,L\}$	-0.22**	-0.19*	-0.43*	-0.39*
	(0.10)	(0.11)	(0.23)	(0.23)
assigned $\{L\}$	-0.34	-0.26	-0.70	-0.54
	(0.26)	(0.26)	(0.57)	(0.57)
$\mathbb{P}_{\{NL\}}$		1.30**		2.09*
		(0.55)		(1.20)
$\mathbb{P}_{\{NL,L\}}$		1.06*		2.12
		(0.61)		(1.34)
Observations	120	120	120	120
Mean dependent variable	0.37	0.37	3.93	3.93

Notes: (1)-(2) are linear probability models of the propensity to answer all 5 prompts correctly. Session FE in all regressions. * $p < 0.1$ and ** $p < 0.05$.

Effect of flexible menu on productivity: heterogeneity (1)



Effect of flexible menu on productivity: heterogeneity (2)

Table: Effect of $\{NL, L\}$ on the proba of obtaining a perfect score

No Conflict variable	$\{L\} \succeq_1^{rank} \{NL\}$	$\{L\} \succeq_1^{WTP} \{NL\}$	*L possible*	*guessed L*
	(1)	(2)	(3)	(4)
No Conflict	0.642	1.128*	-1.142**	-0.991
	(0.511)	(0.588)	(0.531)	(0.616)
Assigned $\{NL, L\}$	-0.216*	-0.273**	-0.391**	-0.177
	(0.124)	(0.115)	(0.185)	(0.126)
No Conflict $\times$ *Assigned* $\{NL, L\}$	0.097	0.076	0.280	0.053
	(0.262)	(0.272)	(0.229)	(0.264)
Test $\beta_2 + \beta_3 = 0$				
F-stat	0.26	0.64	0.68	0.28
p-value	0.608	0.426	0.413	0.595
Observations	116	116	116	116
Mean dependent variable	0.37	0.37	0.37	0.37

Notes: All regressions include controls ($\mathbb{P}_{\{NL\}}, \mathbb{P}_{\{L\}}$ and session FE) and their interaction with the *No Conflict* variable. * and ** refer to $p < 0.1$ and < 0.05.

Summary

1. Propose an experimental method to identify self-control types and implement it in the lab.

2. Find 23%-36% of subjects with self-control preferences:

   - High degree of consistency between Period 1 menu preferences and beliefs and Period 2 behavior.

3. Although beliefs were correct and subjects resisted temptation, there is suggestive evidence that their productivity was harmed.

Is it self-control or uncertainty? (1)

- With data on menu preferences, beliefs and ex post choice, I can compare different temptation models.
- Look at 54 tempted subjects for whom:

$$\{NL\} \succ_1 \{L\} \text{ and } \{NL\} \succ_1 \{NL, L\}$$

- Predictions under sophistication contrasted with findings.

Is it self-control or uncertainty? (2)

Temptation model	menu preferences	expected propensity to learn λ_L	actual propensity to learn ρ_L
Dynamic Inconsistency (Strotz preferences)	$\{NL\} \succ_1 \{NL, L\} \sim_1 \{L\}$	$\lambda_L = 1$	$\rho_L = 1$
Costly Self-Control (GP 2001)	$\{NL\} \succ_1 \{NL, L\} \succ_1 \{L\}$	$\lambda_L = 0$	$\rho_L = 0$
Random Indulgence (Stochastic Dual-Self models)	$\{NL\} \succ_1 \{NL, L\} \succ_1 \{L\}$	$\lambda_L \in (0, 1)$	$\rho_L \in (0, 1)$
Temptation with Guilt (Kopylov 2012)	$\{NL\} \succ_1 \{L\} \succ_1 \{NL, L\}$	$\lambda_L \in \{0, 1\}$	$\rho_L \in \{0, 1\}$
Observed	$\{NL\} \succ_1 \{NL, L\} \succ_1 \{L\}$ for 79.6% (43/54)	$\lambda_L = 0.023$ (1/43)	$\rho_L = 0.037$ (1/28)
	other temptation ranking for 20.4% (11/54)	$\lambda_L = 0.091$ (1/11)	$\rho_L = 0.25$ (2/8)

Notes: Predictions and findings for the set of 54 subjects for whom $\{NL\} \succ_1 \{L\}$ and $\{NL\} \succ_1 \{NL, L\}$.

Is it self-control or uncertainty? (3)

Go back

In my dataset, uncertainty is unlikely to have played an important role:

- Period 1 & 2 choices happened within the same session.
- There is little preference for flexibility.
- Subjects have fairly accurate beliefs on average. Belief dist.
  - Some types overestimate their likelihood of learning the story but not self-control types.

Is it self-control or uncertainty? (4)

- Another way to think about the distinction is to look at subjects' WTP for commitment to $\{NL\}$.
- Under random indulgence, expected loss $E(L)$ from exposure to $\{NL, L\}$ corresponds to foregone opportunity of earning \$2 if one reads the story.

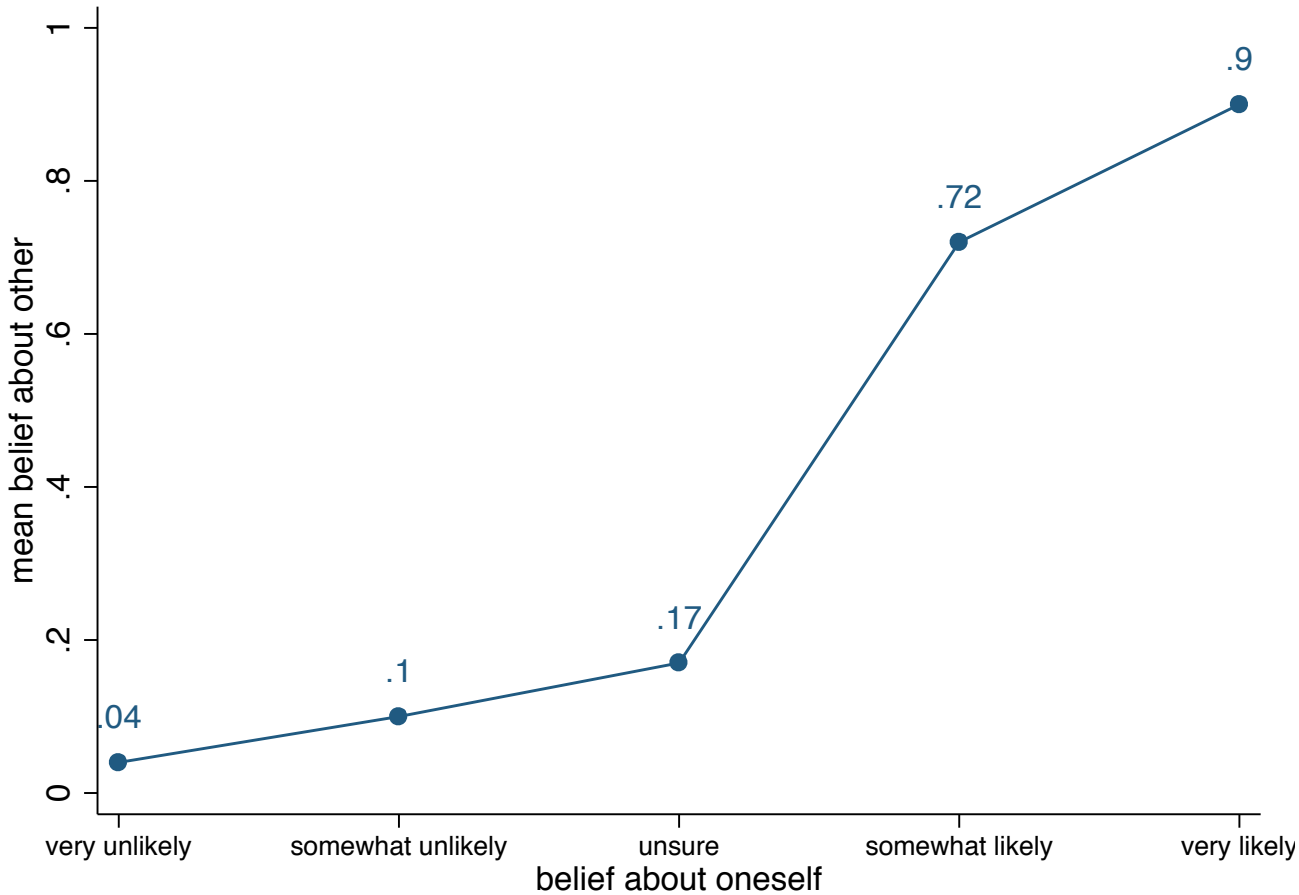
$$WTP_{\{NL\}} \approx E(L) = 2\lambda_L \pi$$

where $\lambda_1 = \mathbb{P}\{L \succ_2 NL\}$ and π =proba of answering prompt correctly.

- To estimate π for each subject i, I use the proportion of prompts correctly answered by i during the task, $\hat{\pi}_i$.
- To estimate λ_L for each i, use both incentivized and unincentivized belief measures.

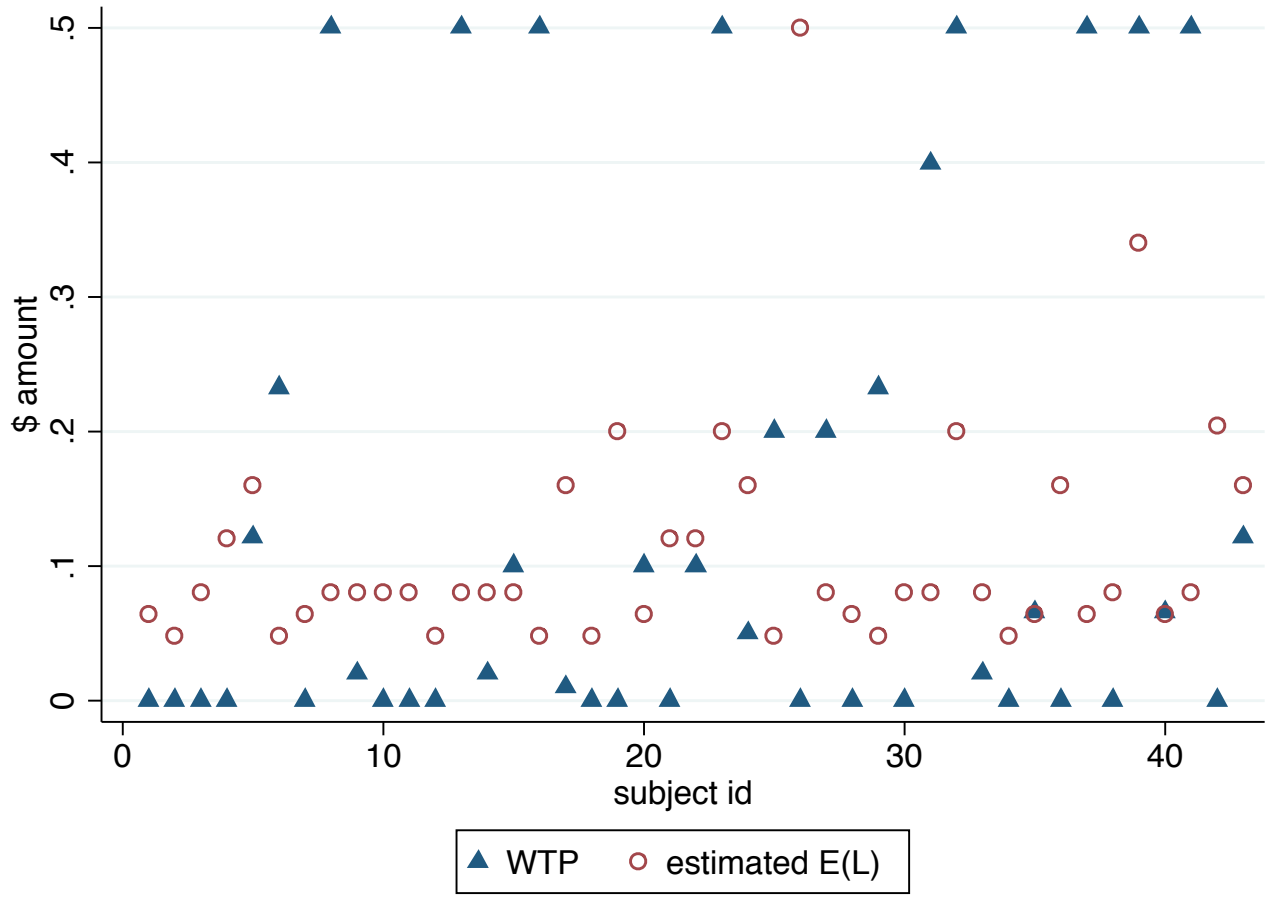
Is it self-control or uncertainty? (5)

- Use unincentivized question: "*How likely are you to choose to learn the selected story in Period 2 if given the chance?*"
- Answers: very/somewhat unlikely, unsure, somewhat/very likely.
- Use mean guess about similar other to interpret answer, e.g. $\hat{\lambda}_i = 0.04$ if answered "very unlikely".



WTP versus E(L)

- mean of $\widehat{E(L)}$ is very close to the mean WTP (0.13 vs 0.14, $p = 0.85$ for a two-sided t-test).
- But correlation is close to 0.



Is it self-control or uncertainty? (5)

- Agents who suffer from random indulgence will only pay if they expect to succumb with positive probability ($\lambda_L > 0$).
- Furthermore, their WTP will be increasing in λ_L :

$$u(NL) - WTP_{RU} = \lambda_L u(L) + (1 - \lambda_L) u(NL)$$

$$\Leftrightarrow WTP_{RU} = \lambda_L [u(NL) - u(L)]$$

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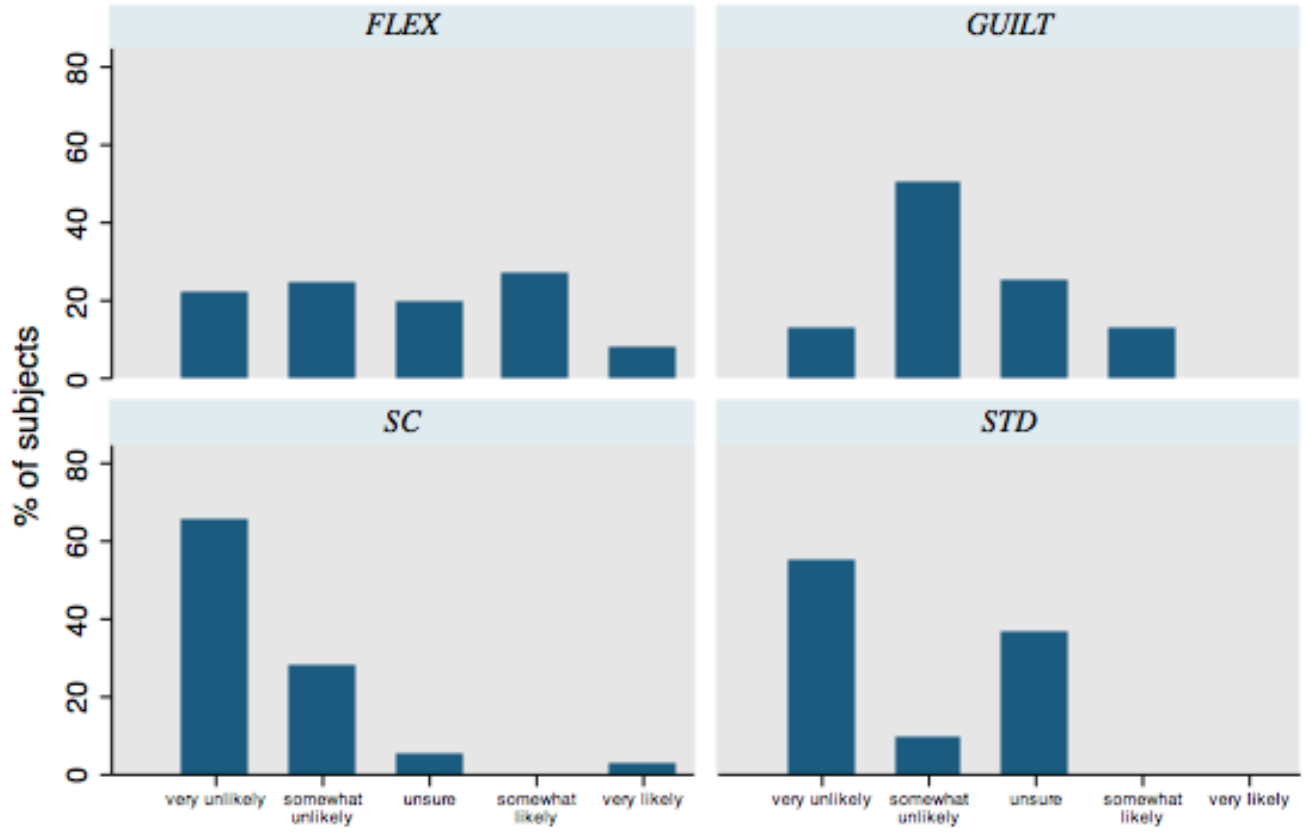
$$\Leftrightarrow WTP_{RU} = \lambda_L [u(NL) - u(L)]$$

- Use answers to unincentivized question: "*How likely are you to choose to learn the selected story in Period 2 if given the chance?*"
- Possible answers: very unlikely (1), somewhat unlikely (2), unsure (3), somewhat likely (4), very likely (5).

Is it self-control or uncertainty? (6)

Figure: Dist. of subjective beliefs about likelihood of reading the story



- As measure of λ_L, use *May choose* $L = 1$ $(= 0)$ if answered 2-5 (1); *Confidence that will choose* $L =$ response 1-5.

Is it self-control or uncertainty? (7)

- On the other hand, the WTP of self-control types should be increasing in how tempting they find the story:

$$V_{GP}(\{NL\}) - WTP = V_{GP}(\{NL, L\})$$

$$\Leftrightarrow \; u(NL) - WTP_{GP} = u(NL) - [v(L) - v(NL)]$$

$$\Leftrightarrow \; WTP_{GP} = v(L) - v(NL)$$

Is it self-control or uncertainty? (8)

Measured level of interest for the story among subjects:

1. *How interested are you in learning whether the selected story was yours?*
2. *How interested are you in learning the most incredible story among the other participants in this room?*

Possible answers: completely indifferent (1), somewhat indifferent (2), somewhat interested (3), very interested (4), dying to learn (5).

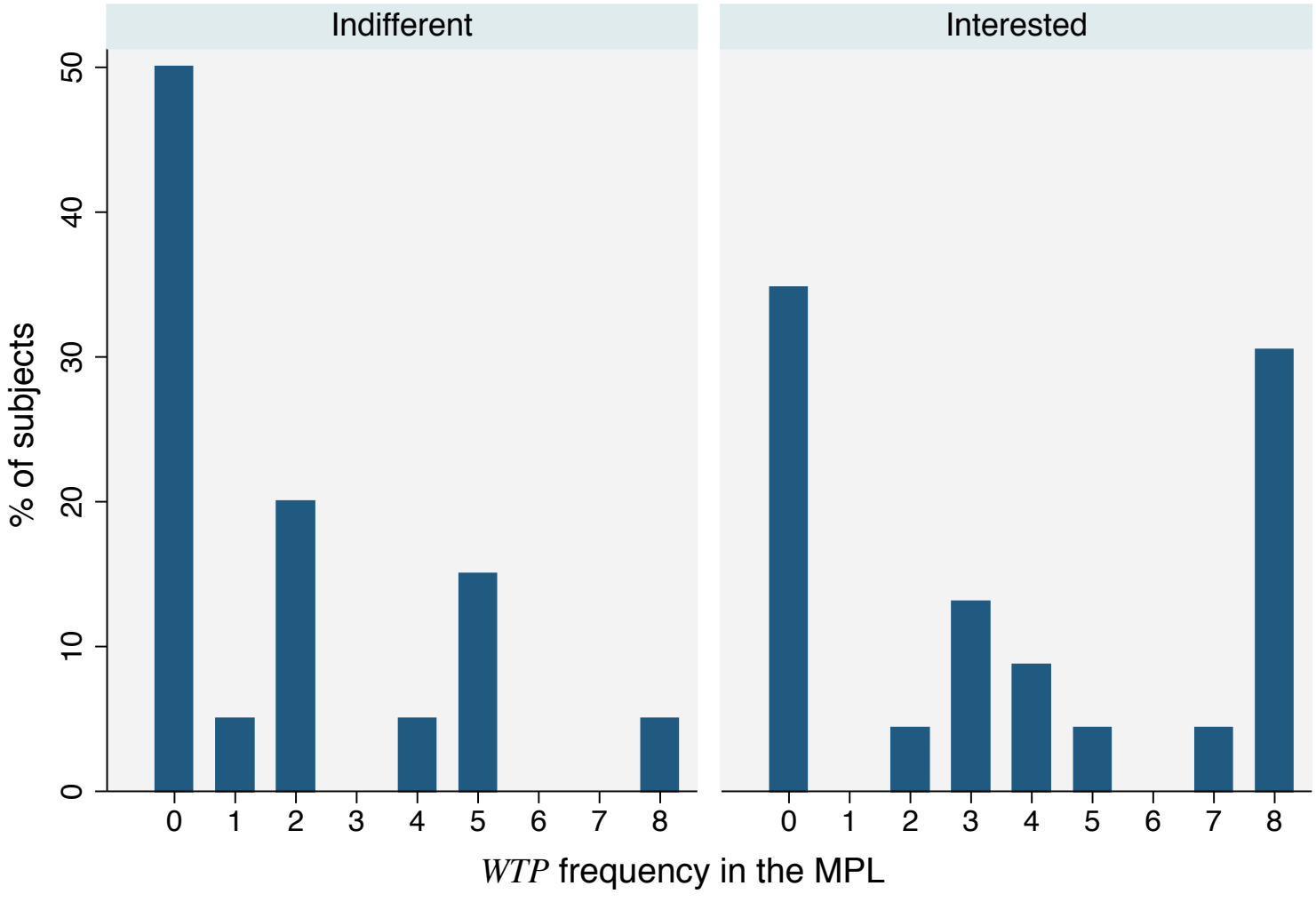
Variables:

Interested = 1 if at least somewhat interested in either 1 or 2 (53.5% of self-control types)

Interest level = mean answer to 1 & 2.

WTP for commitment and interest for the story

Consistent with temptation, SC types interested in learning the story have a higher WTP for commitment to $\{NL\}$.



Is it self-control or uncertainty? (8)

Table: Determinants of normalized WTP for replacing $\{NL, L\}$ with $\{NL\}$

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Interested	0.371**				0.459***		0.461***	
	(0.136)				(0.141)		(0.144)	
Interest Level		0.133*				0.188**		0.197**
		(0.073)				(0.079)		(0.082)
May choose L			-0.102				-0.269*	-0.276*
			(0.144)				(0.136)	(0.156)
Confidence that will choose L				-0.107	-0.208*	-0.202*		
				(0.10)	(0.103)	(0.116)		
time WTP	0.177	0.141	0.101	0.09	0.173	0.143	0.196	0.165
	(0.129)	(0.133)	(0.135)	(0.135)	(0.120)	(0.127)	(0.122)	(0.128)
Session FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	43	43	43	43	43	43	43	43
Mean dependent variable	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14

Conclusion

- More research is needed to identify the robustness of these results to more complex environments.
- For instance, sophistication and self-control may break down in environments with high uncertainty.

  ▸ Uncertainty vs self-control

- Obviously, fairly artificial environment. Relevance in the field?
- Can we think of "self-control type" as a stable individual trait?
  - I have another paper that tries to provide some answers to these questions.

    ▸ field paper

Thank you for your curiosity!

Temptation in the field

- Typical experiment on temptation looks at demand for a specific commitment device: Go back
  - 2 options a and b, where b construed as the temptation.
  - DM asked to choose between $\{a\}$ and $\{a, b\}$.
  - DM demands commitment if chooses $\{a\}$.
- Little evidence of commitment demand driven by temptation:
  - Low take-up rates in range 10-35%.
  - Not obvious how to interpret choice of $\{a\}$.
- This paper revisits the link between commitment demand and temptation in a richer choice environment.

What I do

- Conduct a field experiment with participants in a weight loss challenge to study their demand for commitment.
- Study temptation to eat unhealthy by eliciting preferences over lunch reimbursement options differing in their food coverage.
- Using data on the entire ordering, develop menu preference measures of temptation and validate them with survey data.
- Test whether these measures can predict self-control problems in other domains such as exercise.

The subject pool

- 113 participants in a weight loss challenge conducted at NYU.
- Data concerns the 2014 edition; 8-week challenge.
- Only faculty and staff members eligible to participate.
- 35 y.o. and 79% female.
- Large majority overweight:
  - Mean weight of 204 lbs (male) and 172 (female)
  - US ref: 196 lbs (male) and 166 lbs (female)
- Average weight loss goal of 14.4 lbs.

Description of the reimbursement program (1)

- I elicit participants' temptation to eat unhealthy by studying their preferred coverage in a lunch reimbursement program.
- Lunch reimbursement program over one month ($300 value):
  - 10% of participants drawn at random.
  - Had to bring their receipts to be reimbursed.
  - Winners announced at the end of the challenge.
- Reimbursement could cover 1, 2 or 3 lunch categories.

Table: Lunch Categories

Green Category "G"	- salads (including regular, kale, quinoa) - soups (including veggie and noodle soups) - natural fruits and low-fat yogurt - water (spring or sparkling)
Orange Category "O"	- sandwiches (including bagels, wraps, baguette, club and hot sandwiches) - cereal bars, fruit bars or trail mix - fruit juice
Red Category "R"	- burgers, pizzas or fried foods (including French fries, chicken wings and barbecue) - pastries (including cookies, cakes, muffins, donuts, croissants) - soda

Description of the reimbursement program (2)

- Participants asked to rank 7 reimbursements options:

$$\mathcal{M} := \{G, O, R, GO, GR, OR, GOR\}$$

- Elicitation of weak order $\succeq$ over $\mathcal{M}$:
  - Participants assigned a rank number 1-7 to each option.
  - Could assign the same rank to multiple options to allow for indifferences.

- Incentive compatible elicitation procedure:
  - Probabilistic implementation with higher odds of receiving an option ranked higher.
  - Indifferences made easier to report.

Temptation in the reimbursement program (1)

- A standard DM should weakly prefer GOR.
- In contrast, a DM who is tempted by a food category may prefer to eliminate it from the coverage.

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- A standard DM should weakly prefer GOR.
- In contrast, a DM who is tempted by a food category may prefer to eliminate it from the coverage.

Test for the presence of temptation by looking at:

- The top choice: preference for a restricted coverage?
- Pairwise comparisons between 2 options:
  - *Global Temptation index* for G, O and R

$$GT_{-R} = \sum_{\mathcal{M}_R} \mathbb{1}_{\{M \setminus \{R\} \succ M\}} \quad \text{where} \quad \mathcal{M}_R \in \{GR, OR, GOR\}$$

  - R is *globally tempting* if $GT_{-R} = 3$.

Temptation in the reimbursement program (2)

What do I find?

- Over 82.3% of strict orderings.
- Only 39% of participants assigned rank 1 to GOR.
- GO (G) ranked as unique top by 33% (15%) of participants.
- GO is by far the most popular option (mean rank: 2.0), followed by GOR (2.6) and G (3.0).
- R is the least popular (5.9), followed by OR (4.8).

Temptation in the reimbursement program (3)

Table: Distribution of top choices

Top option(s)	Actual sample % (N)	*B1* %	p-value	*B2* %	p-value
Option G	15.0 (17)	9.9	0.081	13.4	0.581
Option GO	32.7 (37)	9.9	< 0.001	13.4	< 0.001
Option GOR	31.9 (36)	9.9	< 0.001	13.4	< 0.001
Other option	6.2 (7)	39.5	< 0.001	53.6	< 0.001
No unique top	14.2 (16)	30.7	< 0.001	6.1	0.002
Total	100 (113)	100.0		100.0	

Notes: "No unique top" refers to participants who assigned rank 1 to several options. Reported p-values are the result of a binomial test that the observed frequency is equal to the frequency of benchmark $B1$ ($B2$).

Temptation in the reimbursement program (4)

Figure: Distribution of the Global Temptation Index for G, O and R

Temptation in the reimbursement program (5)

Previous slides speak to the *source* and the *strength* of temptation.

How about the *structure* of temptation?

GP-Self-Control (*GP-NSC*): $M \succ M^{'}$ implies $M \succ M \cup M' \succ M'$

GP-No Self-Control (*GP-SC*): $M \succ M^{'}$ implies $M \succ M \cup M' \sim M'$

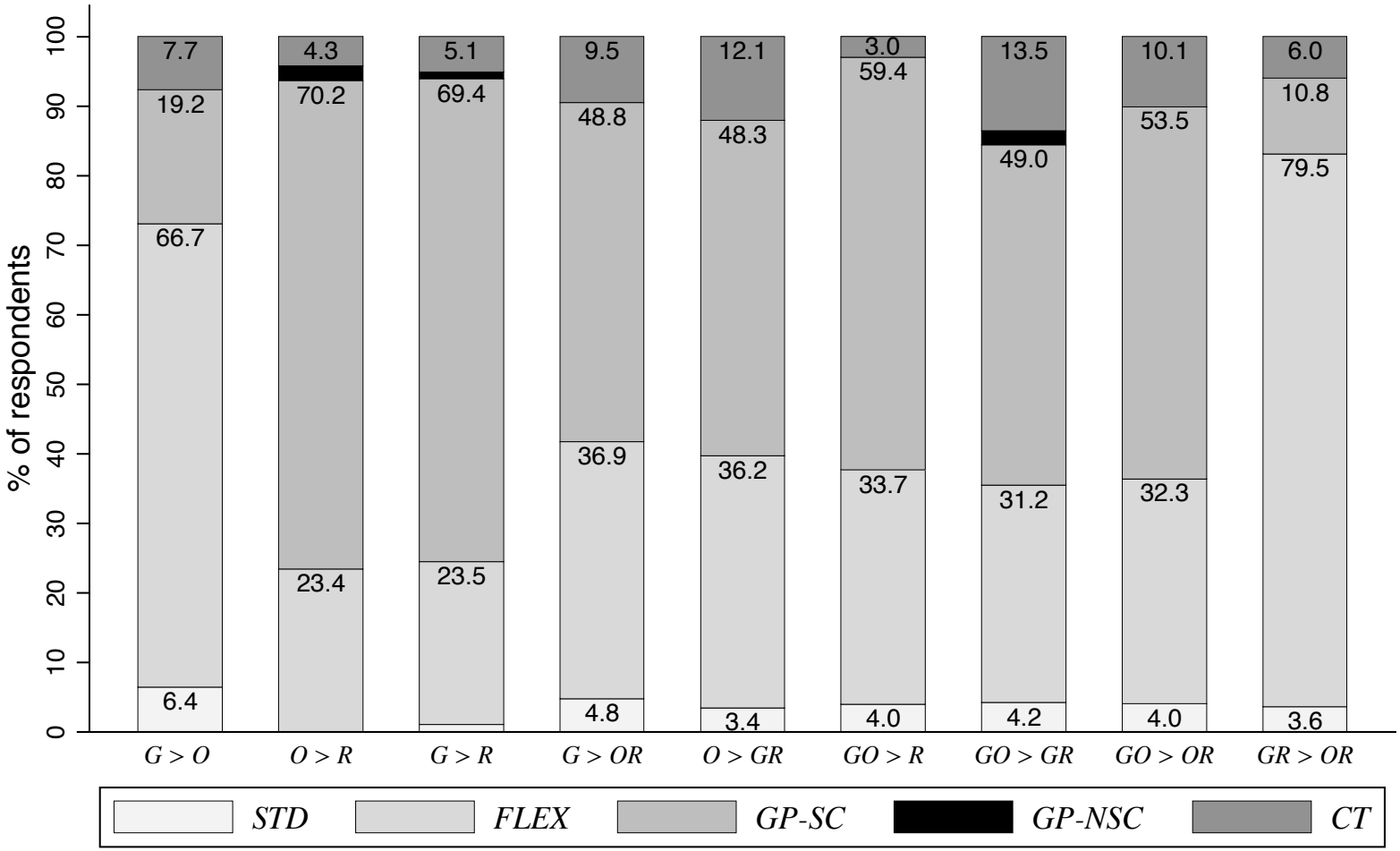
Cumulative Temptation (*CT*): $M \succ M^{'}$ implies $M \succ M' \succ M \cup M'$

Standard (*STD*): $M \succ M^{'}$ implies $M \sim M \cup M' \succ M'$

Flexibility-loving (*FLEX*): $M \succ M^{'}$ implies $M \cup M' \succ M \succ M'$

Temptation in the reimbursement program (6)

Figure: Distribution of menu preferences in bilaterial comparisons



Temptation in the reimbursement program (7)

- *Strict Set Betweenness index* for G, O and R

$$SSB_{-R} = \sum_{(M,M') \in \mathcal{P}_R} \mathbb{1}_{\{M \succ M \cup M' \succ M'\}}$$

where

$\mathcal{P}_R = \{(G,R),(O,R),(G,OR),(GO,R),(O,GR),(GO,GR),(GO,OR)\}$

- Full consistency with Strict Set Betweenness when $SSB_{-R} = 7$.

External validation of menu preference measures (1)

Are these revealed preference measures of temptation consistent with subjective perceptions?

1. Yes, consistent w/ health and temptation rating of G, O and R:
   - R rated as less healthy and more tempting than G or O.
   - O rated as less healthy than G but not more tempting.

External validation of menu preference measures (1)

Are these revealed preference measures of temptation consistent with subjective perceptions?

1. Yes, consistent w/ health and temptation rating of G, O and R:
   - R rated as less healthy and more tempting than G or O.
   - O rated as less healthy than G but not more tempting.

2. Also consistent with participants' ideal versus actual consumption of each food category:
   - On average, participants want to increase (decrease) their consumption share of G (R) by 12 ppts (8 ppts).
   - Those who would prefer to exclude R from the coverage include R in their diet.

External validation of menu preference measures (2)

Do these menu preference measures predict self-control problems in other domains?

- Study the demand for another commitment device during the challenge: commitment to self-set attendance goals.
- Participants could commit to goals in 1, 2 or 3 categories:
  - Gym visits (over a month)
  - Follow-up weigh-ins (out of 3)
  - Wellness events (out of 4)
- Lost their study payment ($20) for not achieving them.

External validation of menu preference measures (3)

What do I find?

1. Over 65% of participants committed to at least one goal.
2. Non trivial goals:
   - 30% (33%) committed to attending all weigh-ins (going to the gym ≥ 5 times).
   - Goals achieved only 43% of the time.

External validation of menu preference measures (3)

What do I find?

1. Over 65% of participants committed to at least one goal.
2. Non trivial goals:
   - 30% (33%) committed to attending all weigh-ins (going to the gym ≥ 5 times).
   - Goals achieved only 43% of the time.
3. Those revealed to be tempted by R were *more* likely to set goals and *less* likely to achieve them.
   - e.g. those for whom R revealed globally tempting were 29.8^{***} ppts (19.6^{*} ppts) more (less) likely to set (reach) a goal.

External validation of menu preference measures (4)

Table: Linear probability models of the propensity to set goals

	(1)	(2)	(3)	(4)	(5)
G first	-0.124				
	(0.128)				
GO first		0.231**			
		(0.091)			
GOR first			-0.154		
			(0.097)		
GT_{-G}				0.051	
				(0.072)	
GT_{-O}				-0.056	
				(0.070)	
GT_{-R}				0.106***	
				(0.039)	
SSB_{-G}					-0.032
					(0.041)
SSB_{-O}					-0.083*
					(0.044)
SSB_{-R}					0.055***
					(0.019)
N	113	113	113	113	113
Mean dependent variable	0.655	0.655	0.655	0.655	0.655

Notes: Control variables include *gender*, *marital status*, *age*, *educ*, *past participation*, *initial weight*, *weight loss goal*, *confidence in success*, $(confidence\ in\ success)^2$, *diets attempted*.

External validation of menu preference measures (5)

Table: Linear probability models of the propensity to achieve a goal

	(1)	(2)	(3)	(4)	(5)
G first	-0.213*				
	(0.115)				
GO first		-0.152			
		(0.111)			
GOR first			0.231**		
			(0.110)		
GT_{-G}				-0.004	
				(0.088)	
GT_{-0}				0.027	
				(0.089)	
GT_{-R}				-0.110**	
				(0.049)	
SSB_{-G}					0.036
					(0.047)
SSB_{-0}					0.139*
					(0.073)
SSB_{-R}					-0.065***
					(0.021)
N	148	148	148	148	148
Mean dependent variable	0.432	0.432	0.432	0.432	0.432

Notes: Control variables include *gender*, *marital status*, *age*, *educ*, *past participation*, *initial weight*, *weight loss goal*, *confidence in success*, $(\textit{confidence in success})^2$, *diets attempted*, *selected goal*, *goal category*. Standard errors clustered at subject level.

Conclusion

- Find strong evidence of commitment demand driven by temptation as measured through menu preferences.
- Revealed preference approach, structural, more agnostic and comprehensive than in previous studies.
- Menu preference measures of temptation may offer promising venue for measuring self-control problems.

The next steps

1. Field experiment focuses on commitment demand: link to ex post choice?
   - new setting: online grocery shopping and food delivery
   - can restrict access to specific categories of foods
   - measure impact on diet choices

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1. Field experiment focuses on commitment demand: link to ex post choice?
   - new setting: online grocery shopping and food delivery
   - can restrict access to specific categories of foods
   - measure impact on diet choices
2. Lab experiment proposed new belief elicitation method: how does it perform relative to other methods?
   - consider 3 methods: (beliefs about self, no incentives), (beliefs about self, incentives), (beliefs about similar other, incentives)
   - compare distribution of beliefs and outcomes under 3 procedures

Appendix

Related literature (2): Theory

Go back

1. **Models of dynamic inconsistency**:
   - Strotz (1956), Laibson (1997), O'Donoghue & Rabin (1999)
2. **Models of menu choice**:
   - *Temptation and self-control*: Gul & Pesendorfer (2001, 2004), Dekel, Lipman & Rustichini (2009), Chatterjee & Krishna (2009), Stovall (2010), Dekel & Lipman (2012), Lipman & Pesendorfer (2013), Masatlioglu et al. (2014)
   - *Preference for flexibility*: Kreps (1979), Dekel, Lipman & Rustichini (2001)
   - *Guilt/perfectionism*: Kopylov (2012)
3. **Applications that use 1. and/or 2.**
   - *Optimal taxation*: Krusell and Smith (2010)
   - *Optimal contracting*: DellaVigna & Malmendier (2004), Eliaz & Spiegler (2006), Esteban et al. (2003), Amador et al. (2004)

Story example

Go back

"One of the weirdest things that ever happened to me: I got into a cab here in New York. The cab driver looks at me through the review mirror and says, "you've been in my cab before". He then proceeded to describe to me exactly what I had worn the last time I was in his cab, which was 8 months prior. He was right, it was definitely me. I got out of the cab immediately!"

Interest for the story

Go back

WTP for time versus money

Go back

Figure: Distribution of WTP by condition and comparison of ranks

WTP by rank ordering

$$X_{\$} = \{0.01, 0.02, 0.05, 0.10, 0.20, 0.30, 0.40, 0.50\}$$

$$N_{min} = \{1, 2, 3, 4, 5, 6, 8, 10\}$$

Table: Converted WTP by rank ordering

	top choice versus second choice		**second choice versus last choice**	
Preference ordering	average WTP (all)	% with $WTP > 0$ (freq.)	average WTP (all)	% with $WTP > 0$ (freq.)
$\{NL\} \succ_1 \{NL, L\} \succ_1 \{L\}$	**\$0.14**	**58.1% (25/43)**	\$0.31	88.4% (38/43)
$\{NL, L\} \succ_1 \{NL\}, \{L\}$	\$0.11	53.7% (22/41)	\$0.24	92.7% (38/41)
$\{NL\} \sim_1 \{NL, L\} \succ_1 \{L\}$	\$0.06	27.3% (3/11)	\$0.37	81.8% (9/11)
$\{NL\} \succ_1 \{L\} \succ_1 \{NL, L\}$	\$0.25	100.0% (8/8)	\$0.20	62.5% (5/8)
Strict ranking	\$0.15	62.4% (63/101)	\$0.28	87.0% (94/108)
Indifference	\$0.05	31.6% (6/19)	\$0.17	83.3% (10/12)

WTP of self-control types

Go back

Alternative classification (1)

Go back

Table: Classification excluding ($\sim_1$, $WTP > 0$) and ($\succ_1$, $WTP = 0$)

Preference ordering	menu type	% subjects	(N)	random benchmark	p-value
$\{NL\} \succ_1 \{NL, L\} \succ_1 \{L\}$	SC	**41.7%**	**(25)**	7.7%	<0.001
$\{NL, L\} \succ_1 \{NL\}, \{L\}$	$FLEX$	**26.7%**	**(16)**	23.1%	0.540
$\{NL\} \sim_1 \{NL, L\} \succ_1 \{L\}$	STD	10.0%	(6)	7.7%	0.464
$\{NL\} \succ_1 \{L\} \succ_1 \{NL, L\}$	$GUILT$	8.3%	(5)	7.7%	0.807
other ordering		13.3%	(8)	53.8%	<0.001
Total		100%	(60)	100%	

Notes: p-values from a two-sided binomial test that the observed frequency is equal to the benchmark frequency of selecting one of the 13 rank orderings at random.

Alternative classification (2)

Table: Classification excluding ($\sim_1$, $WTP > 0$)

Preference ordering	menu type	% subjects	(N)	random benchmark	p-value
$\{NL\} \succ_1 \{NL, L\} \succ_1 \{L\}$	SC	**24.0%**	**(25)**	7.7%	<0.001
$\{NL, L\} \succ_1 \{NL\}, \{L\}$	$FLEX$	17.3%	(18)	23.1%	0.200
$\{NL\} \sim_1 \{NL, L\} \succ_1 \{L\}$	STD	32.7%	(34)	7.7%	<0.001
$\{NL\} \succ_1 \{L\} \succ_1 \{NL, L\}$	$GUILT$	4.8%	(5)	7.7%	0.356
$\{NL\} \sim_1 \{L\} \sim_1 \{NL, L\}$	IND	10.6%	(11)	7.7%	0.267
other ordering		10.6%	(11)	46.1%	<0.001
Total		100%	(104)	100%	

Notes: p-values from a two-sided binomial test that the observed frequency is equal to the benchmark frequency of selecting one of the 13 rank orderings at random.

Beliefs about oneself and others (1)

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Beliefs about oneself and others (2)

Table: Relationship between belief about other and belief about oneself

	said unlikely to learn	said likely to learn	Total
	[Oneself]		
	69	6	75
expected No Learning	**92.0%**	8.0%	100%
	93.2%	21.4%	73.5%
[Other]			
	5	22	27
expected Learning	18.5%	**81.5%**	100%
	6.8%	**78.6%**	26.5%
	74	28	102
Total	72.6%	27.4%	100%
	100.0%	100.0%	100.0%

Notes: "said unlikely (likely) to learn" refers to subjects who reported being somewhat or very unlikely (likely) to learn; subjects reporting being unsure are excluded.

Consistency of beliefs with menu preferences

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Table: Relationship btw preference ordering through WTP and beliefs

Preference ordering $\succeq_1$ on $\mathcal{M}$	menu type	dist. of Period 2 choice under S and NPR	% (N) w/ belief 1 $\in c(\{NL, L\}, \succeq_2)$ incentivized	unincentivized
$\{NL\} \succ_1 \{NL, L\} \succ_1 \{L\}$	SC	$\lambda_{NL} > \lambda_L \geq 0$	0.0% (0/28)	0.0% (0/28)
$\{NL, L\} \succ_1 \{NL\} \succ_1 \{L\}$	$FLEX_{-NL}$	$\lambda_{NL} > \lambda_L > 0$	38.5% (5/13)	30.8% (4/13)
$\{NL, L\} \succ_1 \{L\} \succ_1 \{NL\}$	$FLEX_{-L}$	$\lambda_L > \lambda_{NL} > 0$	57.1% (4/7)	71.4% (5/7)
$\{NL\} \sim_1 \{NL, L\} \succ_1 \{L\}$	STD	$\lambda_L = 0$	8.3% (3/36)	5.6% (2/36)
$\{NL\} \succ_1 \{L\} \succ_1 \{NL, L\}$	$GUILT$	$\lambda_{NL} > \lambda_L \geq 0$	30.0% (3/10)	20.0% (2/10)
$\{NL\} \sim_1 \{L\} \sim_1 \{NL, L\}$	IND	$\lambda_{NL}, \lambda_L \geq 0$	36.4% (4/11)	45.5% (5/11)

Learning belief versus actual learning by menu type

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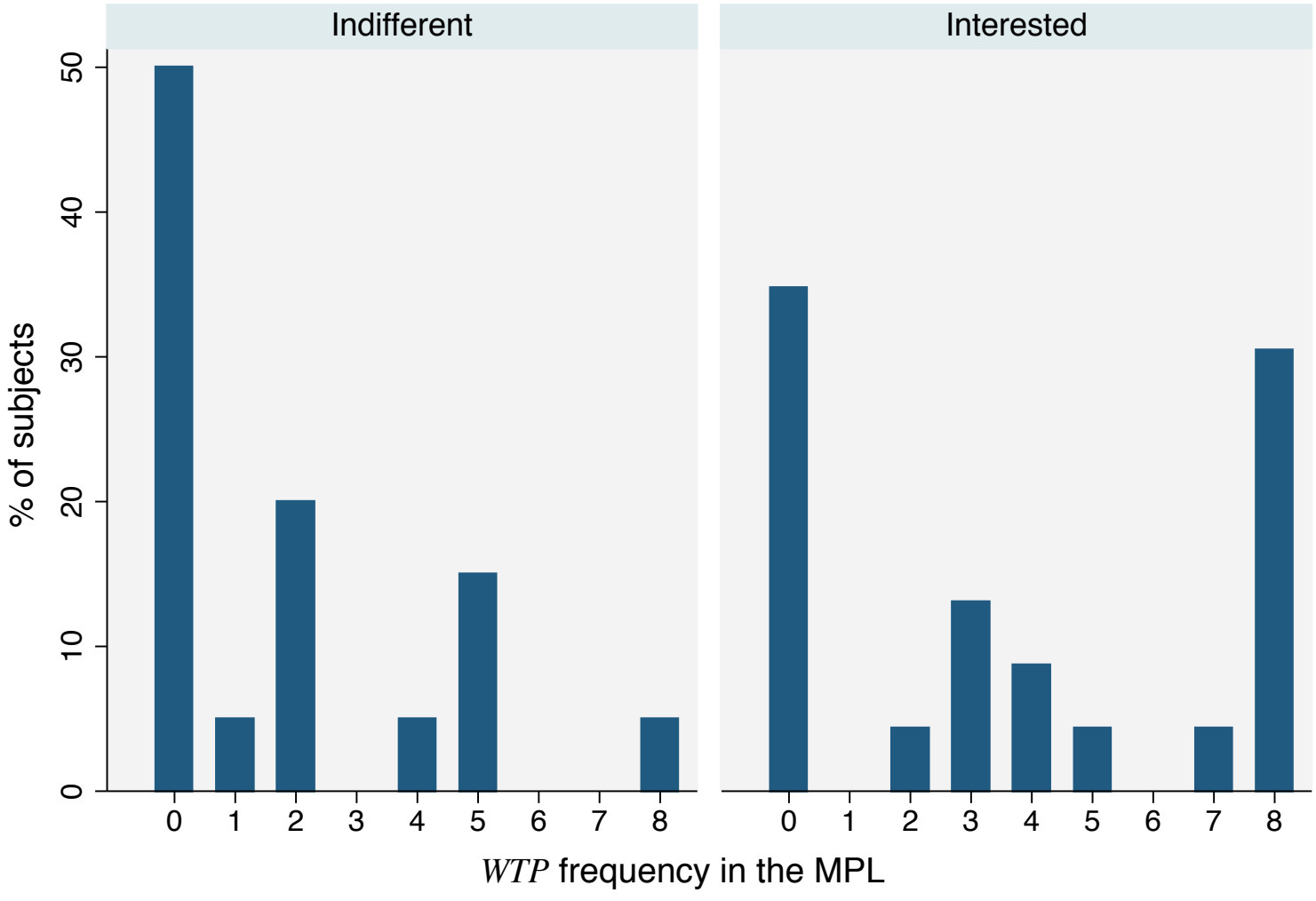
Notes: Expectations measured using the unincentivized belief measure.

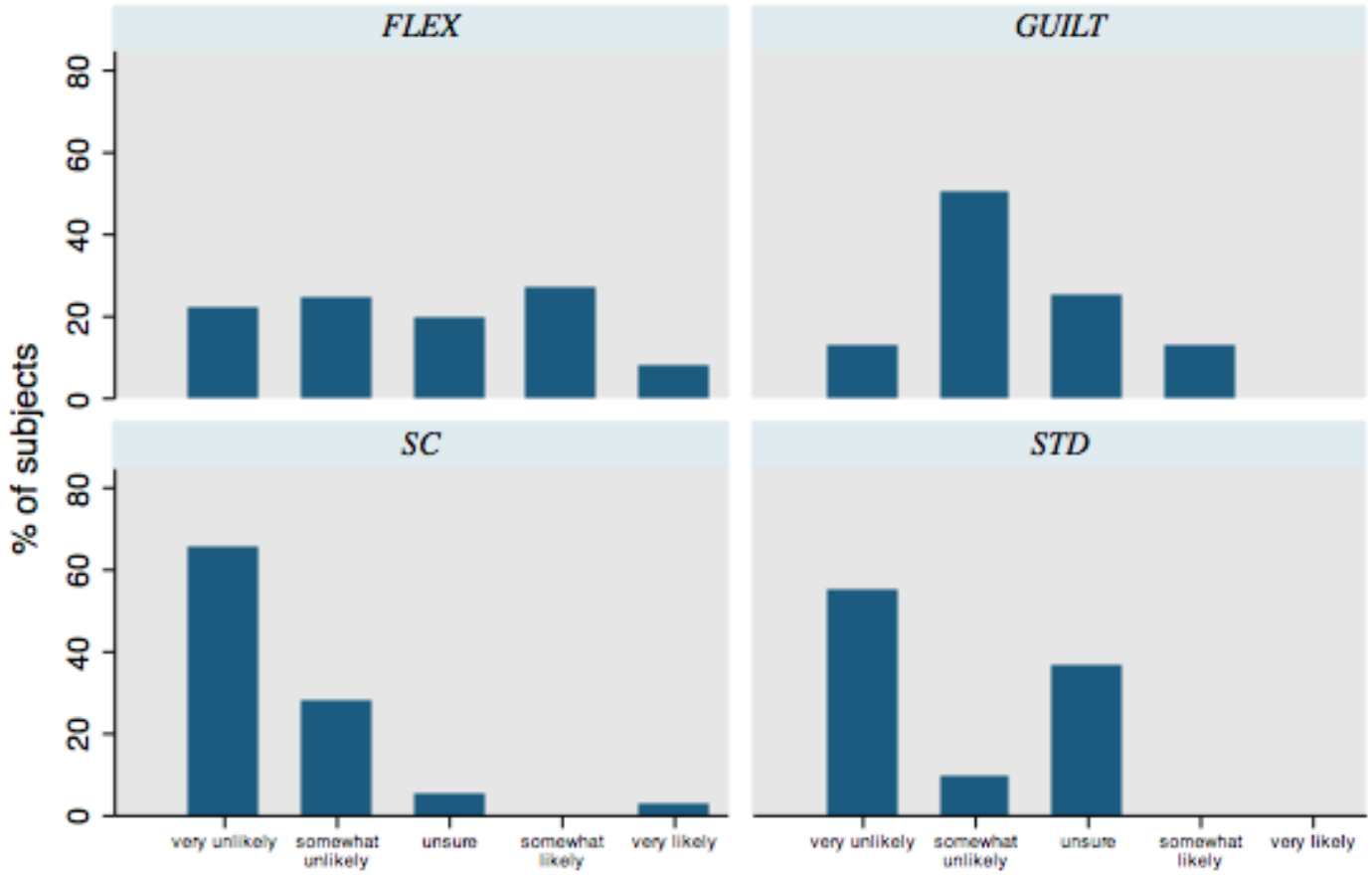
WTP for commitment and interest for the story

Consistent with temptation, SC types interested in learning the story have a higher WTP for commitment.



Belief distribution by menu type - initial classification

Figure: Dist. of subjective beliefs about likelihood of learning by type



Belief distribution by menu type - *WTP*

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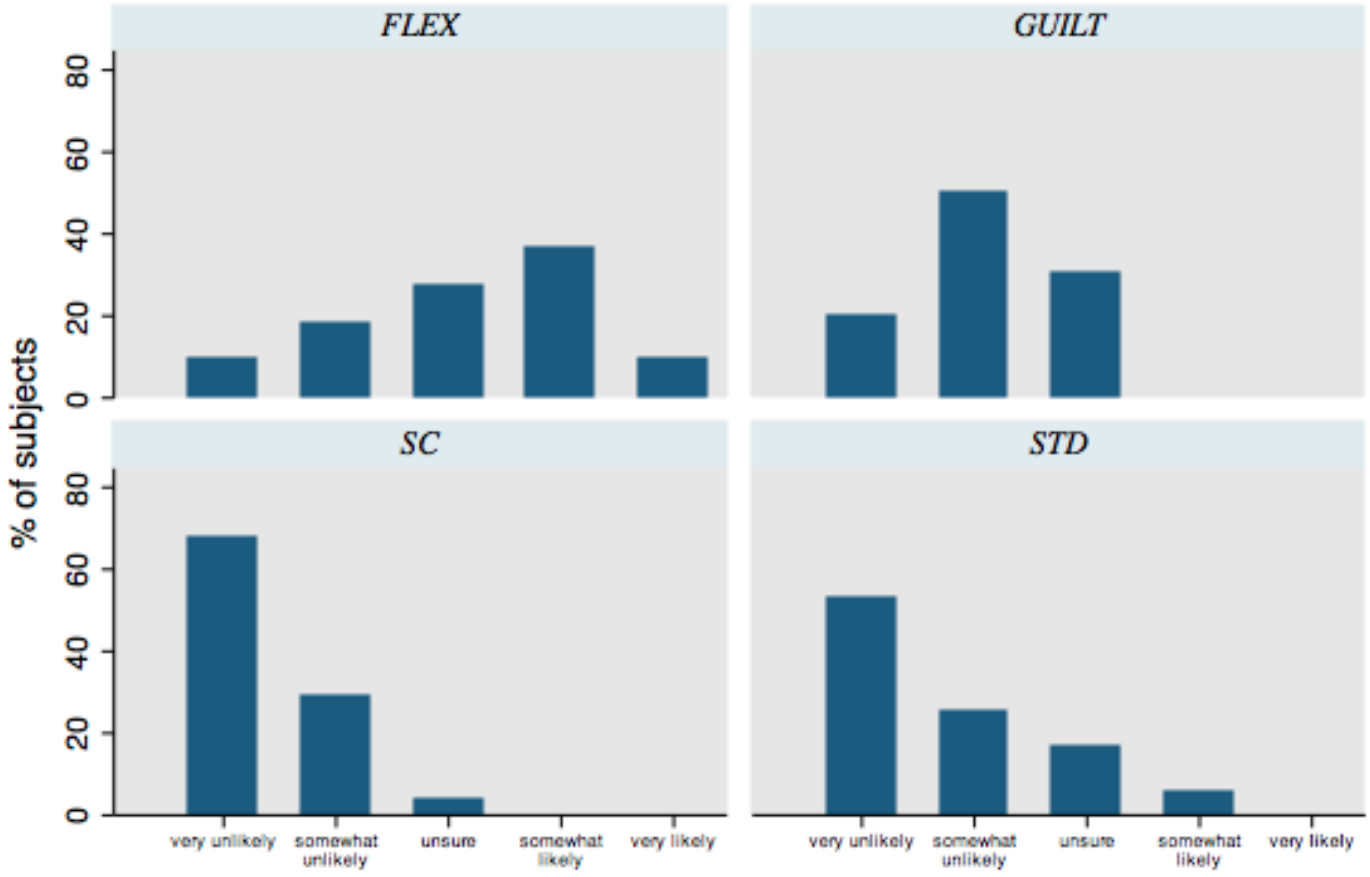
Figure: Dist. of subjective beliefs about likelihood of learning by type



Effect of flexible menu on level of attention during the task

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	thought about the story				*level of attention to the story*			
	OLS		Probit		OLS		Ordered Probit	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	SC	Other	*SC*	Other	*SC*	Other	*SC*	Other
assigned $\{NL, L\}$	**0.280**	-0.0168	**0.329***	-0.015	**0.700***	-0.0212	**0.887****	-0.0553
	(0.182)	(0.151)	(0.189)	(0.158)	(0.412)	(0.344)	(0.451)	(0.329)
assigned $\{L\}$	0.594	-0.356	0.702	-0.397	1.703	-0.780	2.088**	-0.826
	(0.456)	(0.399)	(0.437)	(0.406)	(1.030)	(0.911)	(1.031)	(0.831)
odds of $\{NL\}$	4.265	-1.318*	5.361*	-1.421	7.873	-2.834*	9.735	-2.862*
	(2.613)	(0.697)	(2.927)	(0.741)	(5.900)	(1.591)	(6.325)	(1.514)
odds of $\{NL, L\}$	2.833	-1.300*	3.805	-1.419	4.542	-2.193	5.743	-2.160
	(2.681)	(0.682)	(2.946)	(0.725)	(6.052)	(1.555)	(6.392)	(1.485)
Observations	43	77	43	77	43	77	43	77
Mean dependent variable	0.35	0.53	0.35	0.53	2.00	2.51	2.00	2.51

Productivity of *SC* types vs Others

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	Perfect score = 1			*Number of correct answers*		
	(1)	(2)	(3)	(4)	(5)	(6)
	All	*SC*	Other	*All*	*SC*	Other
assigned $\{NL, L\}$	-0.19*	-0.18	-0.20	-0.39*	-0.23	-0.49
	(0.11)	(0.17)	(0.14)	(0.23)	(0.31)	(0.34)
assigned $\{L\}$	-0.26	-0.08	-0.61	-0.54	-0.11	-1.42
	(0.26)	(0.44)	(0.37)	(0.57)	(0.78)	(0.89)
odds of $\{NL\}$	1.30**	2.73	1.35*	2.09*	0.36	2.02
	(0.55)	(2.50)	(0.64)	(1.20)	(4.49)	(1.56)
odds of $\{NL, L\}$	1.06*	0.07	1.14*	2.12	-5.38	2.59*
	(0.61)	(2.57)	(0.63)	(1.34)	(4.60)	(1.53)
Observations	120	43	77	120	43	77
Mean dependent variable	0.37	0.40	0.35	3.93	4.07	3.84

Notes: (1)-(3) are linear probability models of the propensity to answer all 5 prompts correctly. Session FE in all regressions. * $p < 0.1$ and ** $p < 0.05$.