Sin Taxes and Bans

Hunt Allcott

July 14, 2025

Agenda

1. Motivating questions
2. Optimal sin tax model
3. Applications

Motivating questions

Should we regulate energy efficiency?

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In short, the problem is that consumers appear not to purchase products that are in their economic self-interest. There are strong theoretical reasons why this might be so:

- *Consumers might be myopic...*
- *Consumers might lack information ...*
- *... the benefits of energy-efficient vehicles may not be sufficiently salient ...*

–2010 Corporate Average Fuel Economy Standard Final Rule

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- *Consumers might lack information ...*
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Call it what it is. You prevent people from making things that consumers want.

–Rand Paul, U.S. Senator

Should we tax sugary drinks?

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Public health advocates often view the growing prevalence of obesity as proof that many individuals pursue behaviors that are out of sync with their own best interests.

... policies are too easily justified on the assumption that government officials are better informed than the individuals they seek to guide.

–Michael Marlow and Sherzod Abdukadirov, from a Mercatus Center book

Should we restrict payday lending?

POLITICS

Payday Loans — And Endless Cycles Of Debt — Targeted By Federal Watchdog

March 26, 2015 · 7:58 AM ET
Heard on All Things Considered

SCOTT HORSLEY

Should we restrict payday lending?

The CFPB's new rule puts a stop to the payday debt traps that have plagued communities across the country. Too often, borrowers who need quick cash end up trapped in loans they can't afford.

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[The CFPB rule] will significantly reduce consumers' access to credit at the exact moments they need it most.

–Thaya Brook Knight, Cato Institute

Common theme

- Assertion: taxes, subsidies, bans, or other regulations needed to protect consumers from their own decisions
- Question: what is the optimal policy (if any)?

Optimal sin tax model

Model setup

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Setup:

- Consumer types θ
- Choose "sin good" and numeraire consumption, quasilinear utility
- Sin good demand $x_\theta(p)$
- Social marginal welfare weights g_θ
  - Social value of θ's marginal numeraire consumption, in units of public funds
  - No income effects $\implies \mathbb{E}[g_\theta] = 1$ by construction

Inconsistent choice

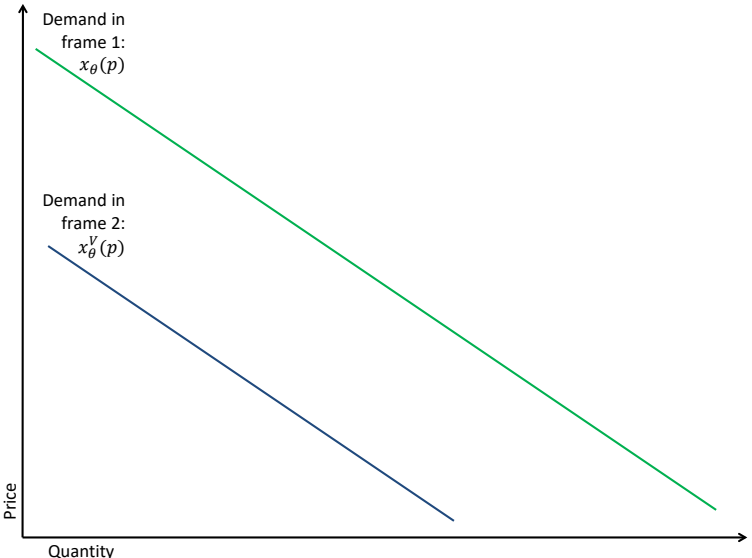

Figure: type θ's demand functions

How to do welfare analysis?

1. Respect both frames, compute bounds
2. Expand scope of concerns
   - "Frame" $\Longrightarrow$ preference
3. Designate one frame as welfare-relevant
   - Establish characterization failure
   - Assume long-run criterion

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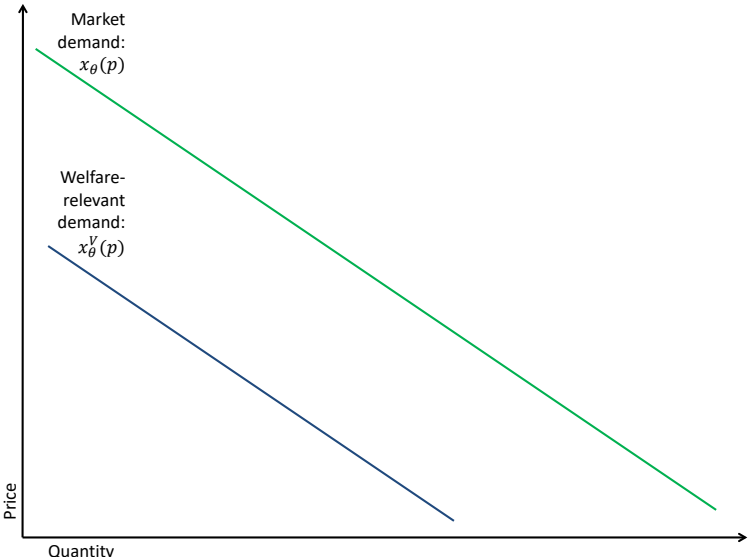

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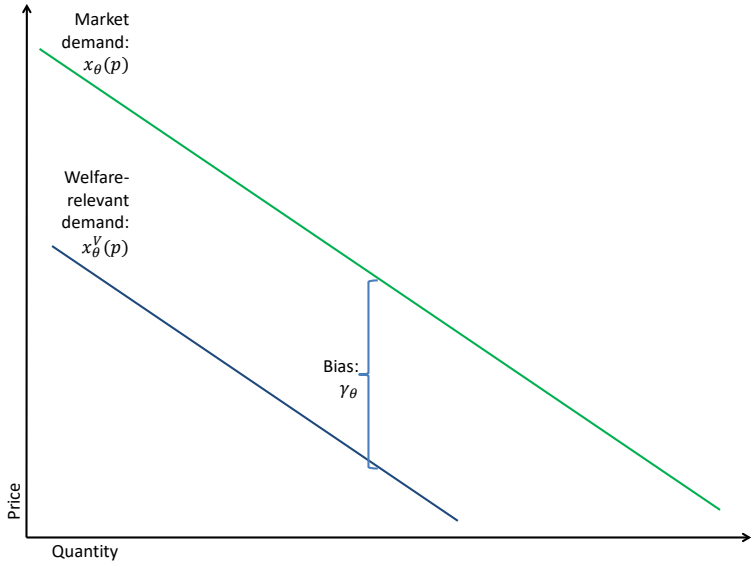
Bias and analogy to externalities



Example structural models of bias

- Bias γ_θ is a sufficient statistic for optimal tax, regardless of the underlying model of bias

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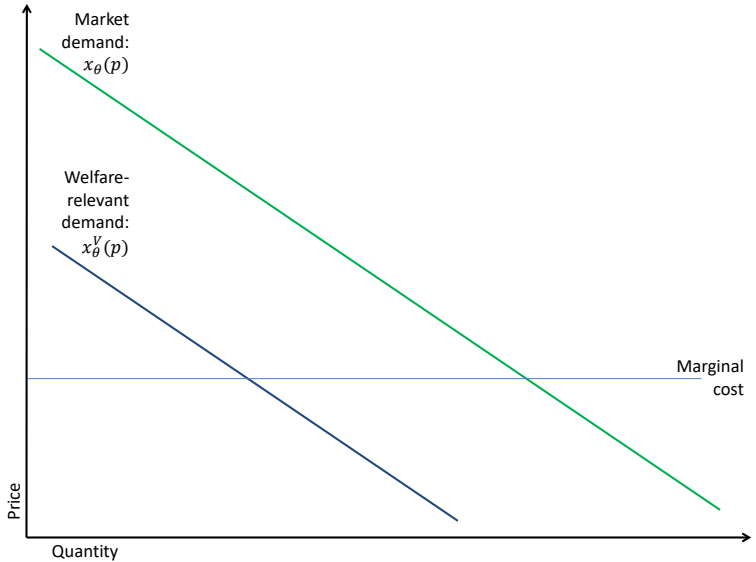
- Bias γ_θ is a sufficient statistic for optimal tax, regardless of the underlying model of bias
- Example (O'Donoghue and Rabin 2006): downweight marginal health cost h of unhealthy food by present focus β_θ , planner uses long-run criterion

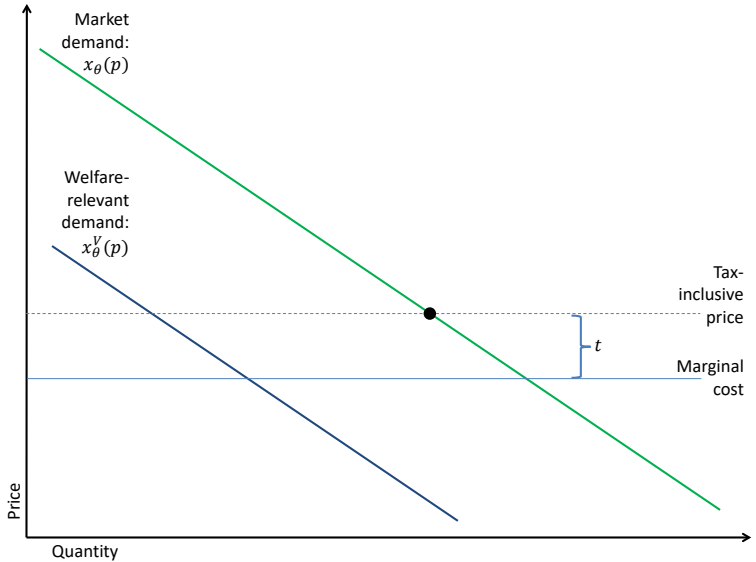
$$\gamma_\theta = h(1 - \beta_\theta)$$

Effects of taxes

Effects of marginal tax increase



Effects of marginal tax increase



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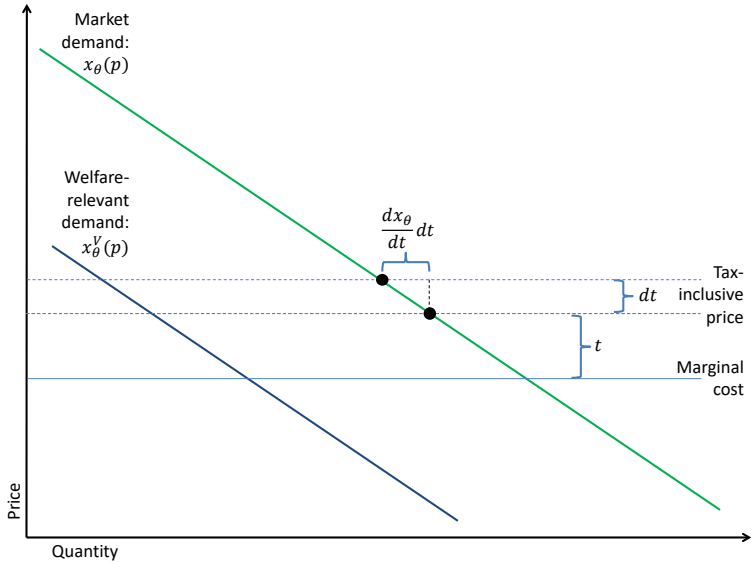

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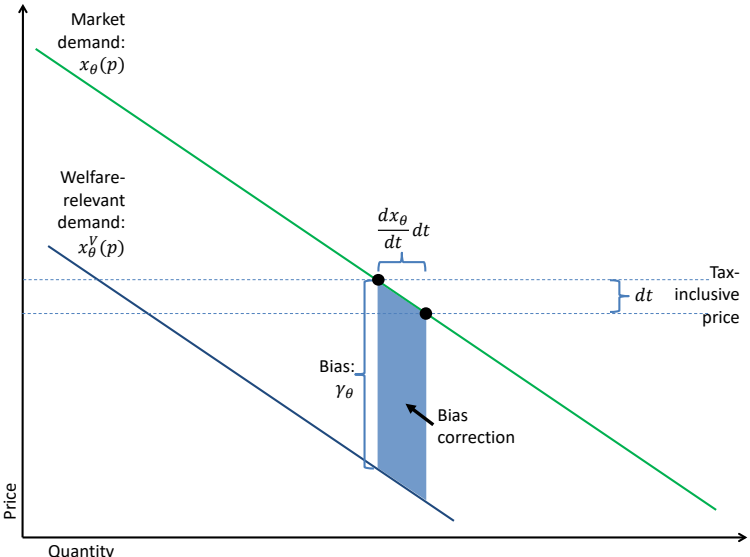

$$\underbrace{-g_\theta \gamma_\theta \frac{dx_\theta}{dt} dt}_{\text{Bias correction}}$$

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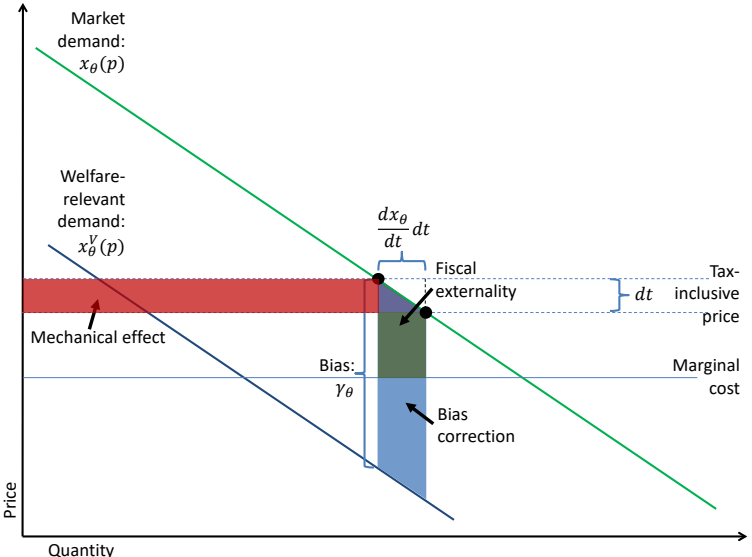

Welfare effect of marginal tax increase:

$$dW_\theta = \underbrace{-g_\theta \gamma_\theta \frac{dx_\theta}{dt} dt}_{\text{Bias correction}} + \underbrace{t \frac{dx_\theta}{dt} dt}_{\text{Fiscal externality}} + \underbrace{x_\theta (1 - g_\theta) dt}_{\text{Mechanical effect}}$$

Optimal tax

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Optimal tax sets $\mathbb{E}\frac{dW_\theta}{dt} = 0$:

$$t^* = \underbrace{\frac{1}{\frac{d\bar{x}}{dt}}\mathbb{E}\left[g_\theta \gamma_\theta \frac{dx_\theta}{dt}\right]}_{\text{Corrective motive}} - \underbrace{\frac{1}{\frac{d\bar{x}}{dt}}\mathbb{E}\left[x_\theta(1-g_\theta)\right]}_{\text{Redistributive motive}}$$

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Special case with no redistributive concerns ($g_\theta = 1$):

$$t^* = \bar{\gamma} := \underbrace{\frac{1}{\frac{d\bar{x}}{dt}} \mathbb{E}\left[\gamma_\theta \frac{dx_\theta}{dt} \right]}_{\text{Average marginal bias}}$$

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Special case with homogeneous consumers:

$$t^* = \gamma$$

Optimal tax: discussion

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- γ_θ: externality imposed by θ
- g_θ: welfare weight on people harmed by θ

Optimal tax: connections to early work

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Bernheim and Rangel (2004):

- Hot state: inelastic demand, overconsume. Cold state: elastic demand, consume optimally
  - $\mathbb{E}\left[\gamma_\theta \frac{dx_\theta}{dt}\right] = 0$
- Pr(hot state) $\uparrow \implies$ higher marginal utility of money
  - $Cov(x_\theta, g_\theta) > 0$, so $\mathbb{E}[x_\theta(1 - g_\theta)] < 0$

Applications

Applications

Next: three applications

Recipe for each application:

1. Hypothesize and measure bias
2. Welfare analysis

Application: energy efficiency

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- But in 2010, CFLs had only a 28% “socket share”

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  - Implementation delayed by Obama and partially rolled back by Trump

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Economic questions

- Did bias reduce CFL demand?
- If so: what was the optimal CFL subsidy? Should we ban incandescents?

Hypothesize and measure bias

Measuring bias

Hypothesized biases

- Imperfect information / biased beliefs about energy costs
- Inattention to energy costs

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Bias measurement approach

- Exogenous frame variation: energy cost information provision RCT

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Welfare-relevant domain: choices by information treatment group

Assumptions:

- Information fully eliminates bias
  - $\Longrightarrow$ ensure comprehension
- Information doesn't affect preferences
  - $\Longrightarrow$ provide only hard info, do not persuade, minimize demand effects
- No biases other than imperfect info and inattention

Experimental design

- Goal: estimate average marginal bias

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- 1533 participants using Time-Sharing Experiments for the Social Sciences (TESS)
- Given $10 shopping budget, incentivized choices between CFLs and incandescents

Within-subject design:

1. Baseline choices
2. Randomized information treatment
3. Endline choices

Choice set

Choice A
Philips 60-Watt-Equivalent Compact Fluorescent Light Bulb, 1-Pack

Choice B
Philips 60-Watt Incandescent Light Bulbs, 4-Pack

Click for detailed product information

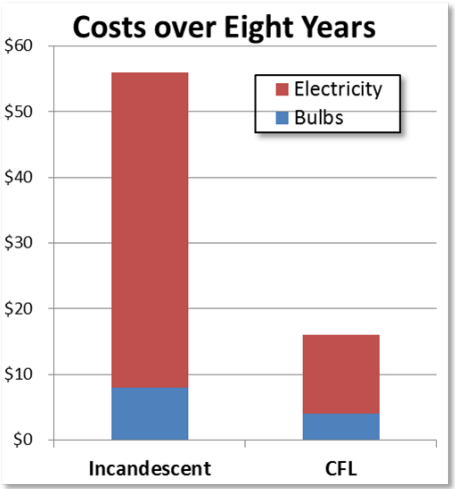
Baseline multiple price list

Now please make your decisions for each of the 15 choices below.

Decision Number	Choice A 60-Watt-Equivalent Compact Fluorescent Light Bulb, 1-Pack	Choice B 60-Watt Incandescent Light Bulbs, 4-Pack
1)	Purchase **Choice A for free**	Purchase **Choice B for $10**
2)	Purchase **Choice A for free**	Purchase **Choice B for $8**
3)	Purchase **Choice A for free**	Purchase **Choice B for $6**
4)	Purchase **Choice A for free**	Purchase **Choice B for $4**
5)	Purchase **Choice A for $1**	Purchase **Choice B for $4**
6)	Purchase **Choice A for $2**	Purchase **Choice B for $4**

Treatment and control screens

Treatment: cost information



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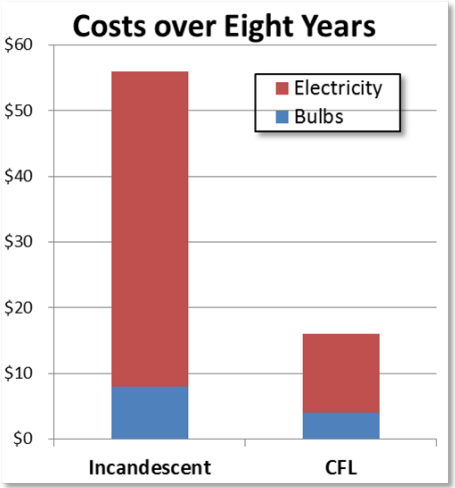
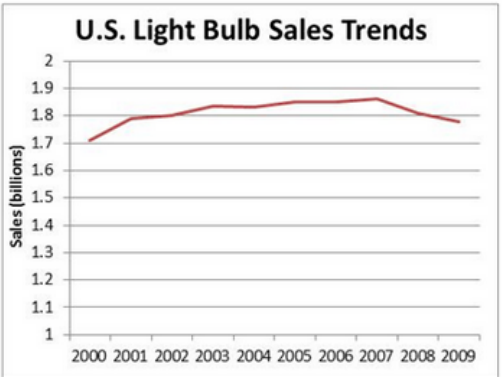


Control: irrelevant info with similar structure



Endline multiple price list

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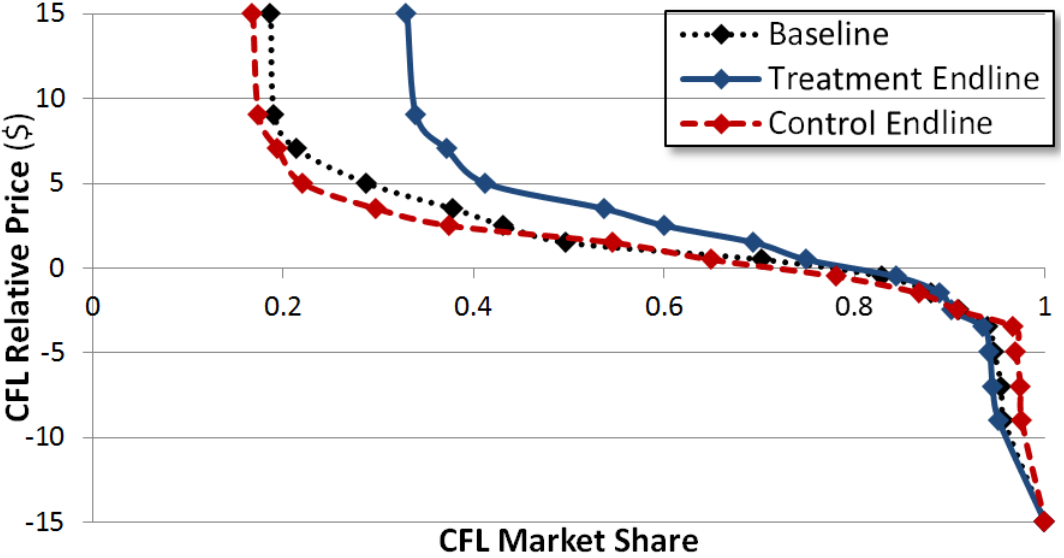
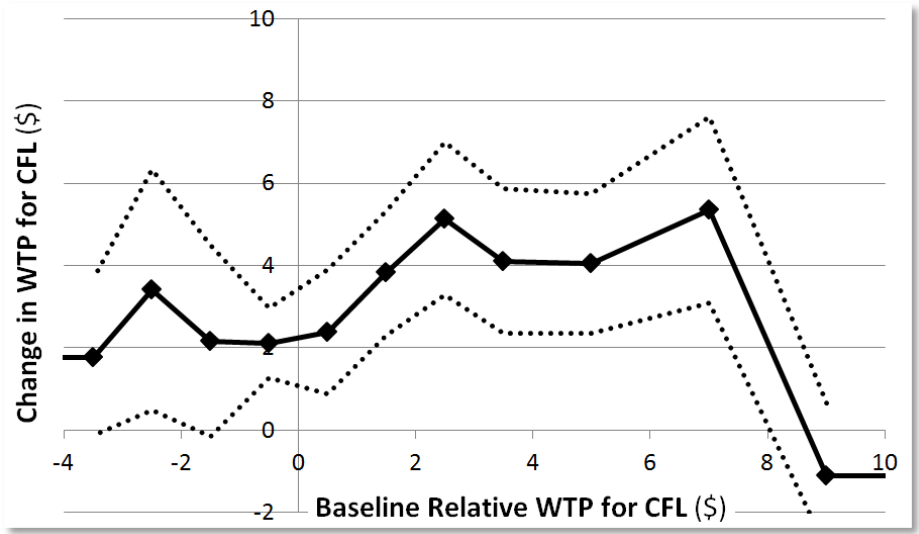
5)	Purchase **Choice A for $1** ○	Purchase **Choice B for $4** ○
6)	Purchase **Choice A for $2** ○	Purchase **Choice B for $4** ○

Effects of information on demand curves

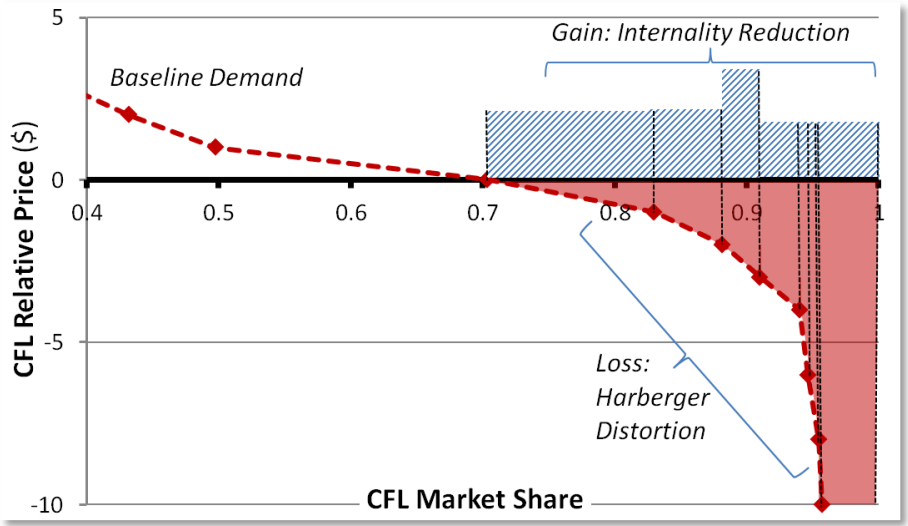


Conditional ATEs on WTP (i.e., average marginal bias)



Welfare analysis

Welfare effects of lightbulb subsidy or ban



Allcott and Taubinsky (2015): comments

- Within-subject design directly identifies average marginal bias, but requires artefactual experiment
- Could implement “comparing demand responses” strategy
  - Combine ideas from Allcott and Wozny (2014), Ito (2014), Sarah Armitage (2022)
- Policy: should we only use information provision to address imperfect information and inattention?

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- Policy: should we only use information provision to address imperfect information and inattention?
  - In practice, companies may try to obfuscate, and people might not pay attention to labels

Application: soda taxes

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- 2009–2016: average American got ~7% of total calories from SSBs

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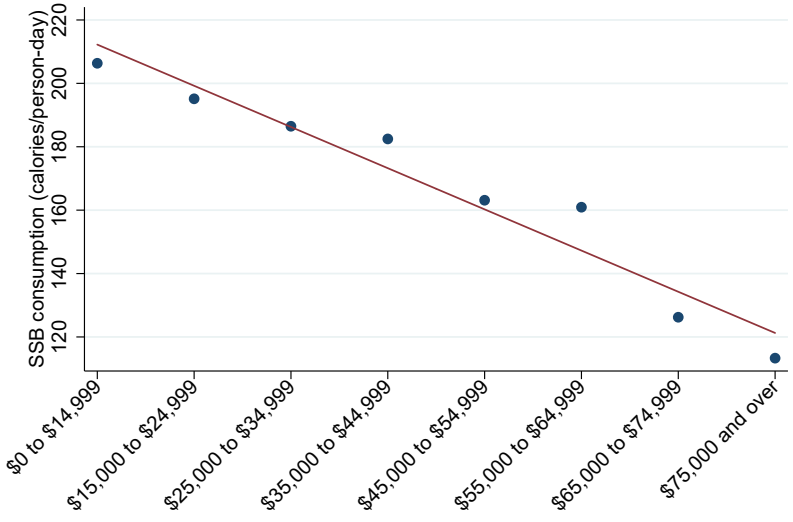
Economic questions

- Does bias increase SSB demand?
- If so: what is the optimal SSB tax?

Low-income people drink more SSBs



Hypothesize and measure bias

Measuring bias

Hypothesized biases

- Imperfect information about health costs
- Self-control problems (+ long-run criterion)

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Bias measurement approach

- “Rational consumer benchmark”: measure bias proxies using surveys, estimate conditional association between bias and consumption, predict consumption without bias

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Welfare-relevant domain: predicted choices if consumers had expert-level nutrition knowledge and no reported self-control problems

Assumptions:

- "Expert-level nutrition knowledge" $\implies$ zero bias
- No unobserved preferences correlated with bias
  - $\implies$ control for demographics and survey-based preference measures
- Our surveys capture all relevant knowledge and self-control problems
- No other biases

Survey

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  - Example: *Which is the main type of fat present in each of these foods?*
    - Options: “Polyunsaturated fat,” “Monounsaturated fat,” “Saturated fat,” “Cholesterol,” and “Not sure”
    - Olive oil (correct answer: monounsaturated), butter (saturated), sunflower oil (polyunsaturated), and eggs (cholesterol).
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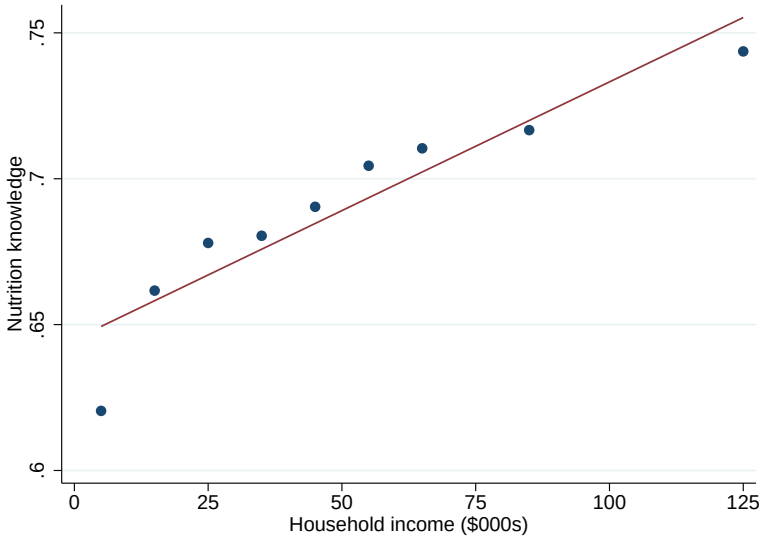
- Taste: *Leaving aside any health or nutrition considerations, how much would you say you like the taste and generally enjoy drinking [soft drinks, ...]?* (scale from 0-10)
- Health importance: *In general, how important is it to you to stay healthy, for example by maintaining a healthy weight, avoiding diabetes and heart disease, etc.?* (scale from 0-10)

Nutrition knowledge vs. income



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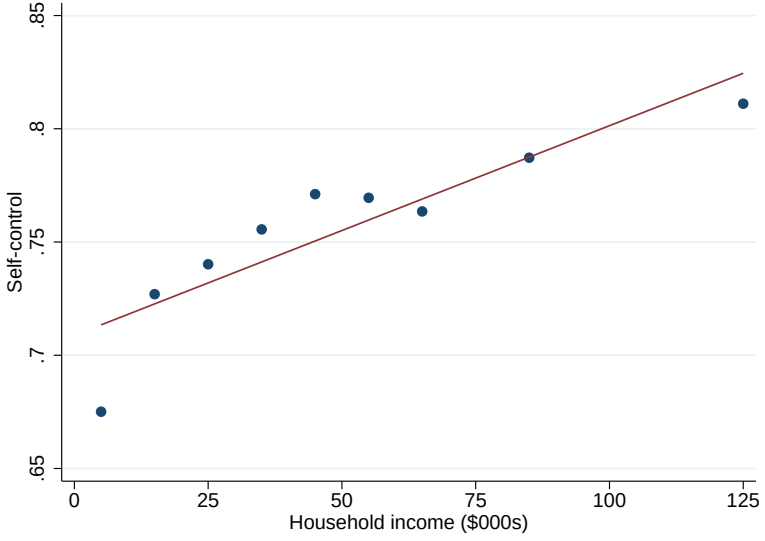
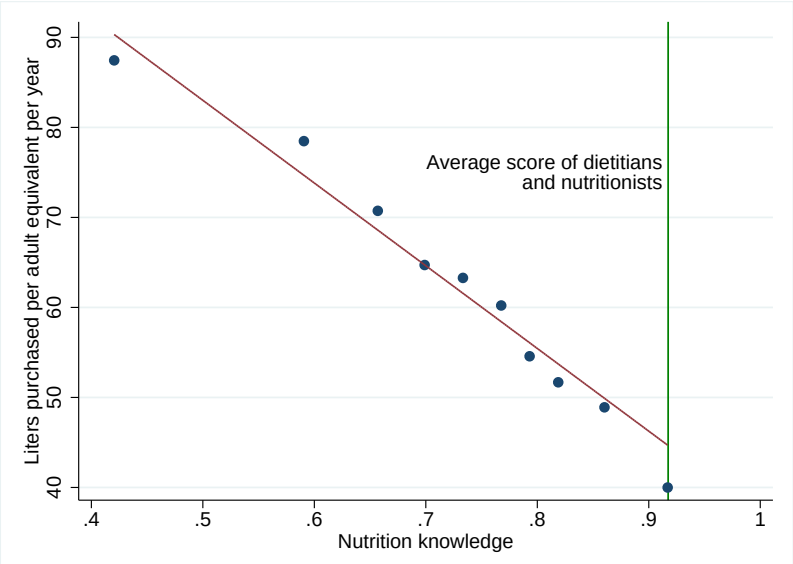


Nutrition knowledge vs. consumption



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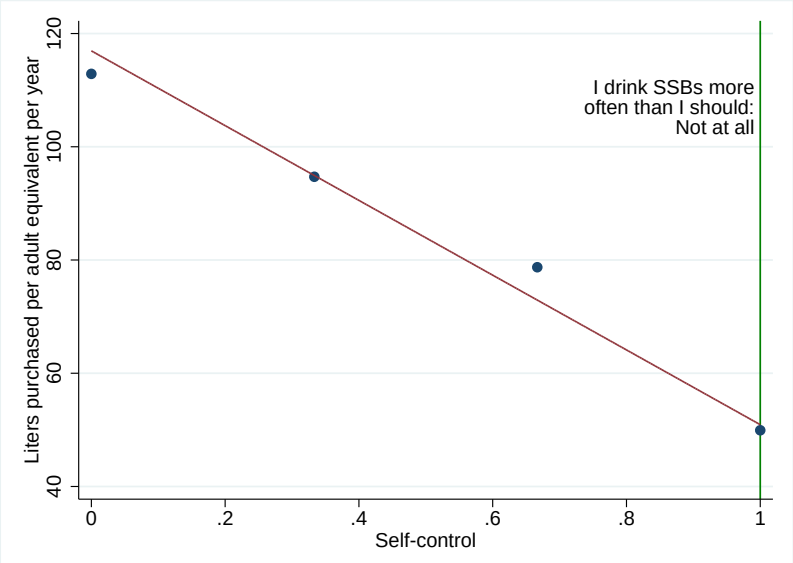
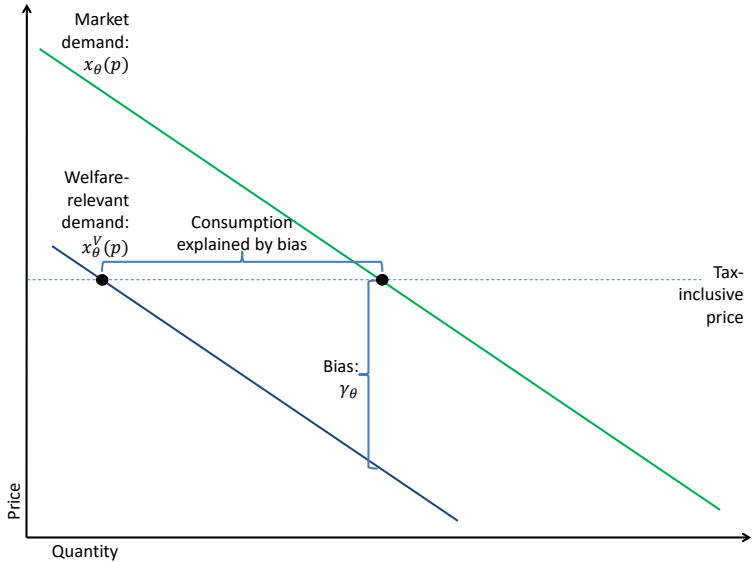
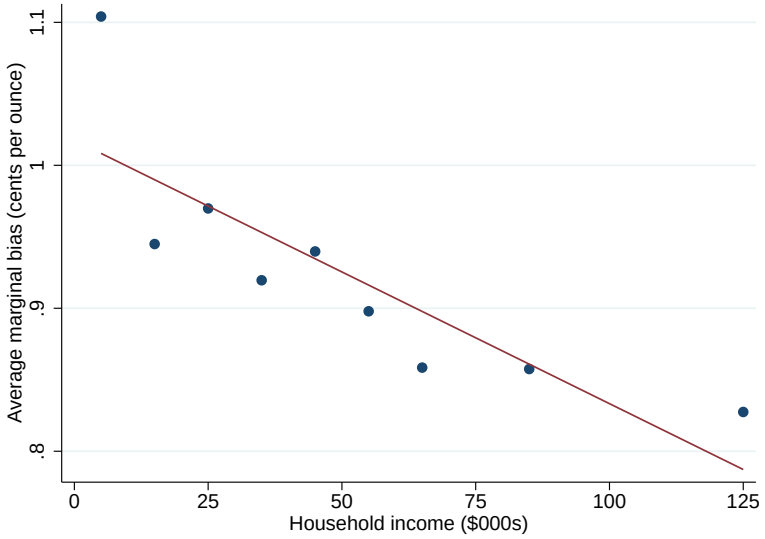


Share of consumption explained by bias

Use price elasticity to transform bias from quantity to price units



Average marginal bias by income



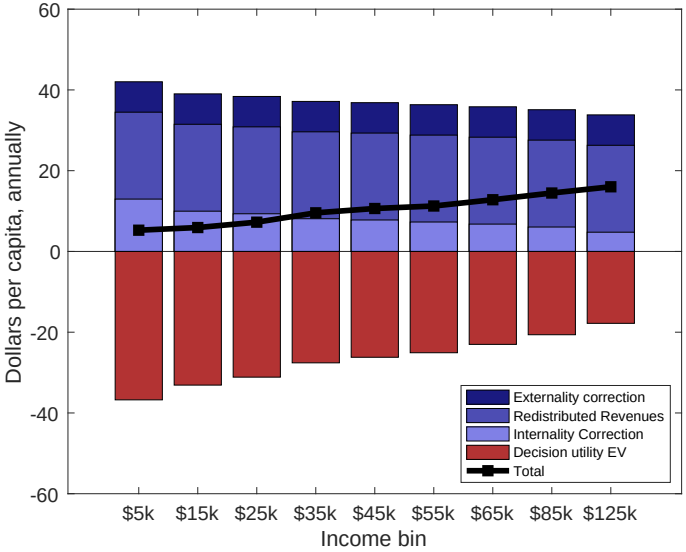
Welfare analysis

Optimal SSB tax

	Existing income tax	Optimal income tax
Baseline	1.42	0.41
Self-reported SSB consumption	2.13	0.96
Pigouvian (no redistributive motive)	1.78	-
Weaker redistributive preferences	1.66	1.35
Stronger redistributive preferences	1.10	-0.64
Redistributive preferences rationalize U.S. income tax	1.73	1.68
Higher demand elasticity ($\zeta^C(\theta) = 2$)	1.57	0.78
Lower demand elasticity ($\zeta^C(\theta) = 1$)	1.23	0.01
Demand elasticity declines faster with income	1.44	0.44
Pure preference heterogeneity	1.44	1.44
Pure income effects	1.49	1.97
Measurement error correction for self control	1.70	0.64
Internality from nutrition knowledge only	1.00	0.08
Self control bias set to 50% of estimated value	1.16	0.20
Self control bias set to 200% of estimated value	1.93	0.82
With substitution: untaxed goods equally harmful	1.48	0.45
With substitution: untaxed goods half as harmful	1.45	0.43
With substitution: untaxed goods doubly harmful	1.53	0.50
With substitution: diet drinks not harmful	1.73	0.66
With substitution: only to diet drinks, equally harmful	1.16	0.20
No internality	0.41	-0.40
No corrective motive	-0.36	-1.01
Optimal local tax, with 25% cross-border shopping	0.97	-
Optimal local tax, with 50% cross-border shopping	0.53	-

- Optimal tax estimate (holding constant current income taxes): 1.42 cents/ounce
- Most alternative estimates: 1 to 2 cents/ounce

Welfare effects of optimal tax



“Regressive Sin Taxes”: comments

- Selection on observables assumption highly questionable
  - Possible next step: info RCT like Allcott and Taubinsky (2015) plus present focus RCT like Sadoff, Samek, and Sprenger (2020)
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Broader economic considerations (Allcott, Lockwood, and Taubinsky 2019, *JEP*)

- When judging regressivity, consider internality benefits, not just financial incidence
- Leakage (cross-border shopping) seems to matter a lot with city-level soda taxes
- Substitution to other goods could matter, but empirically little in this domain

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Open research questions:

- Could apply same model in other domains (smoking, energy pricing, etc.)
- Study proposed NYC ban on large soft drinks. Well-targeted? Substitution?
- Richer dynamic models with habit-formation:
  - What if behavior not in steady state? Should tax vary over time? How to model substitution?

Application: payday lending

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- Payday loans: unsecured single-payment loans, typically due on next payday
- Typically \$200–\$500 principal, \$15 fee per \$100 borrowed ($\approx$ 391% APR)
- Standard consumption-savings model can explain occasional high-interest borrowing, but median borrowing spell is 10 loans

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- ~18 states ban payday loans
- Obama CFPB finalized national repeat borrowing restrictions, but Trump CFPB revoked

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Economic questions

- Do present focus and naivete increase payday loan demand?
- If bias: what is the optimal regulation *from the long-run self's perspective*?

Hypothesize and measure bias

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Hypothesized bias: present focus

- (Partial) naivete $\implies$ people don't anticipate repeat borrowing
- (Partial) sophistication $\implies$ people want incentive to avoid future borrowing

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- (Partial) sophistication: measure demand for a "no-borrowing incentive"

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Welfare-relevant domain: choices made in advance ("long-run criterion")

Additional assumptions:

- No other biases

Experiment overview

- Partnered with a large nationwide lender
- Negotiated access to Indiana statewide lending database
- January–March 2019: collect data from 41 centers, two weeks per center
- Most people had just taken out a loan

Beliefs about future borrowing

What do you think is the chance that you will get another payday loan from any lender before **[8 weeks from now]?**

	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Choose one	○	○	○	○	○	○	○	○	○	○	○

No-borrowing incentive

If the computer selects you for **$100 If You Are Debt-Free**, we will send you $100 if you **do not** get another payday loan from [The Lender] *or any other payday lender before [8 weeks from now].** We would send you the money by **[12 weeks from now]** on a Visa cash card.

Probability of borrowing with no-borrowing incentive

If you are selected for $100 If You Are Debt-Free, what is the chance that you would get another payday loan from any lender before [8 weeks from now]?

	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
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Valuation of no-borrowing incentive

How might you decide?

Earlier, you told us that you have a **40%** chance of getting another payday loan before June 6, 2019 if you are selected for **$100 If You Are Debt-Free**. In other words, you would have a **60%** chance of being debt-free. So on average, **$100 If You Are Debt-Free** would earn you $60**.**

Given that, which reward would you prefer?

- ○ **$100 If You Are Debt-Free**. This gives you extra motivation to stay debt-free.
- ○ **$60 For Sure**. This gives you certainty and avoids pressure to stay debt-free.

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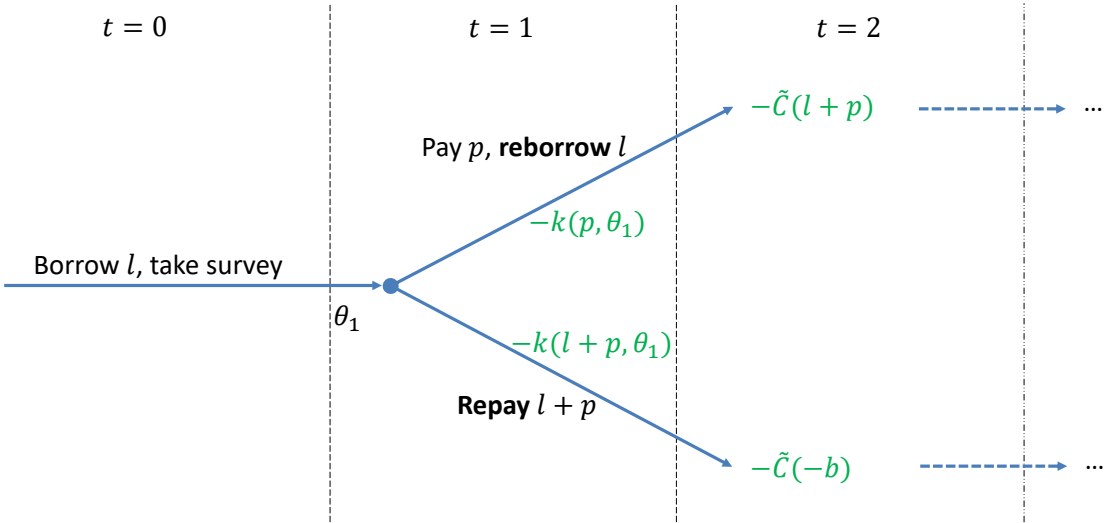
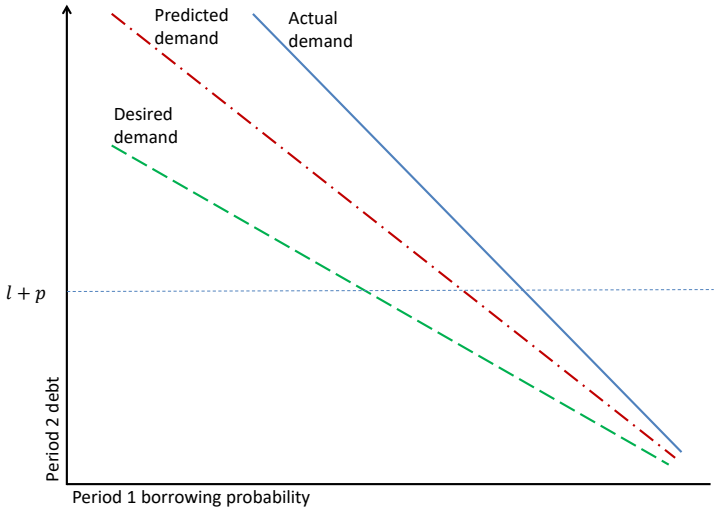
- Iterative questions to determine valuation within $10

Model of borrowing and repayment (extends Heidhues and Koszegi 2010)



θ_1: repayment cost shock. $k(x, \theta_1)$: utility cost of paying x. $-\tilde{C}(x)$: continuation value

Desired, predicted, and actual period 1 demand



Quasi-hyperbolic utility:

$$U_t = u_t + \beta \sum_{\tau=t+1}^{T} \delta^{\tau-t} u_\tau$$

- β: present focus
- $\tilde{\beta}$: perceived present focus

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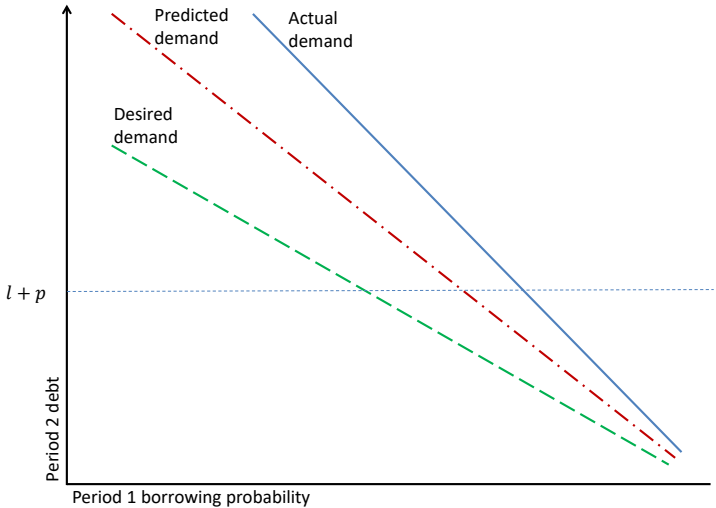

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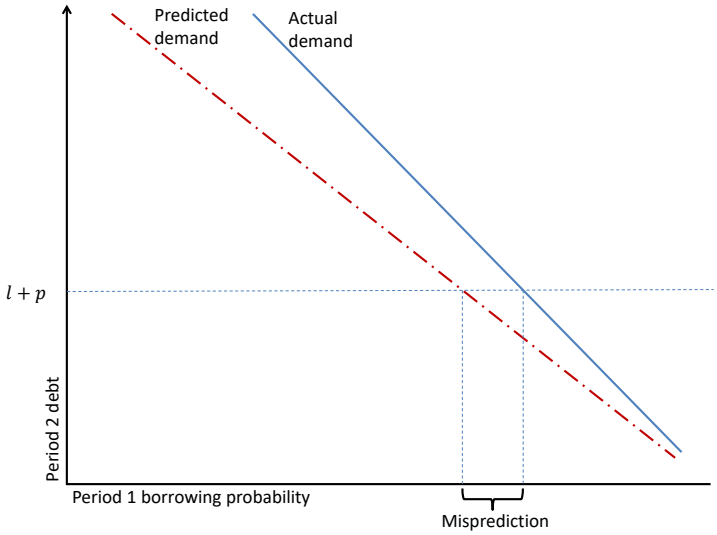
Marginal utility ratios depend on $\beta, \tilde{\beta}$:

- Desired MU $=$ predicted MU$\times\tilde{\beta}$
- Predicted MU $=$ actual MU$\times\beta/\tilde{\beta}$

Identifying misprediction (naivete)



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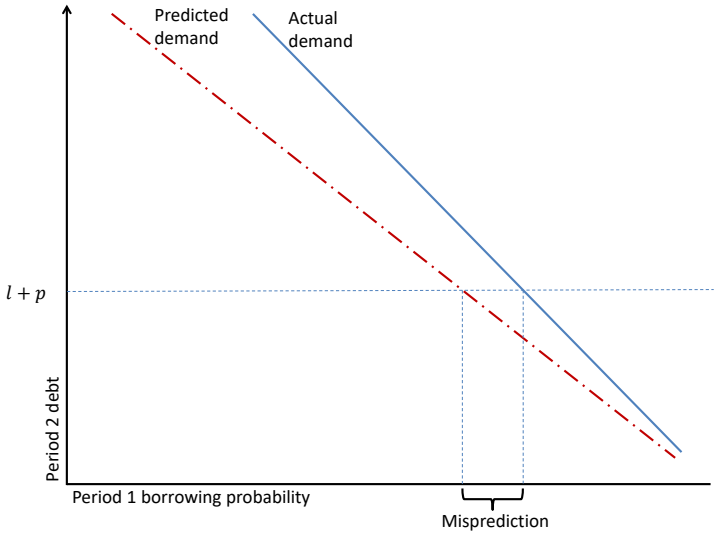
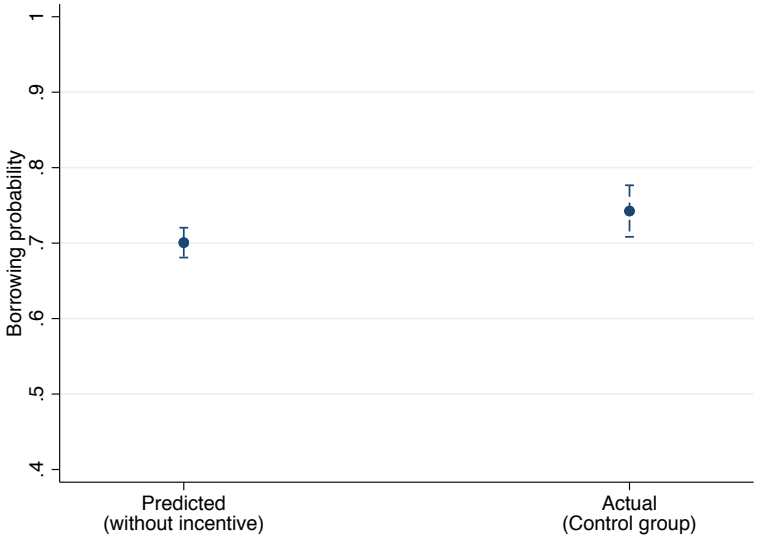
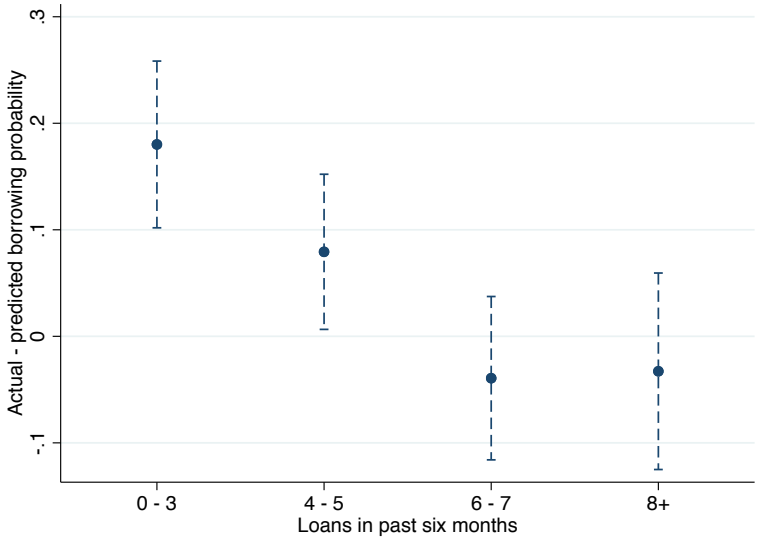


- Predicted MU $=$ actual MU$\times\beta/\tilde{\beta}$
- Infer $\beta/\tilde{\beta}$ from misprediction and predicted demand slope

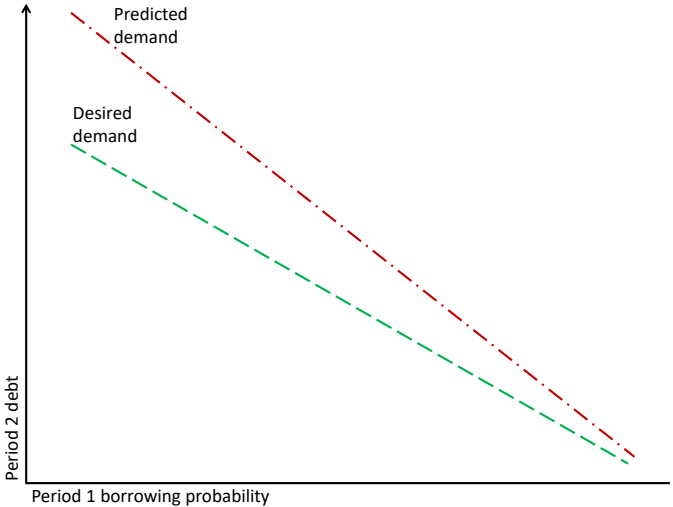
People borrow slightly more than expected



Cross-sectional (suggestive) evidence of learning



Identifying perceived time inconsistency



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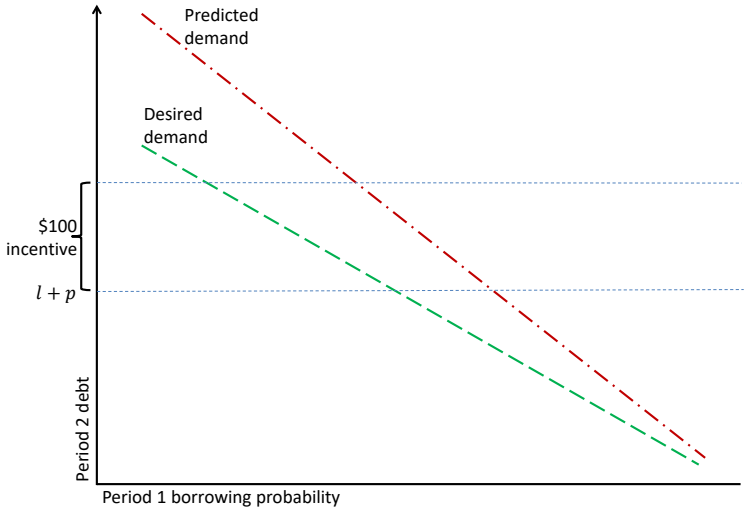
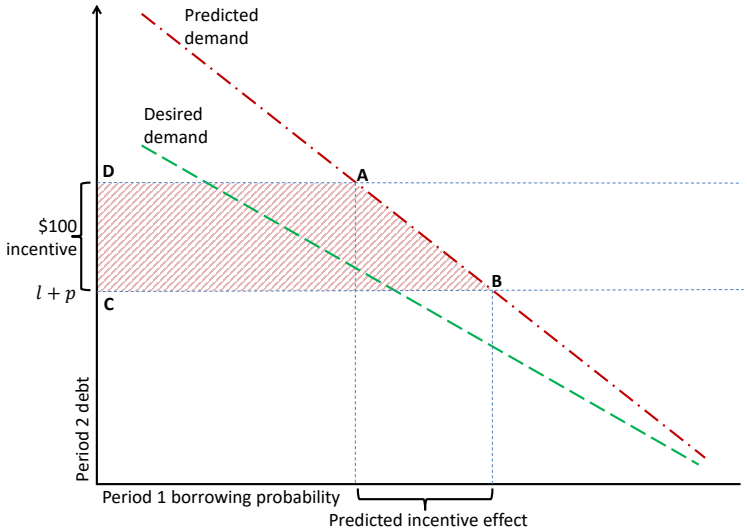


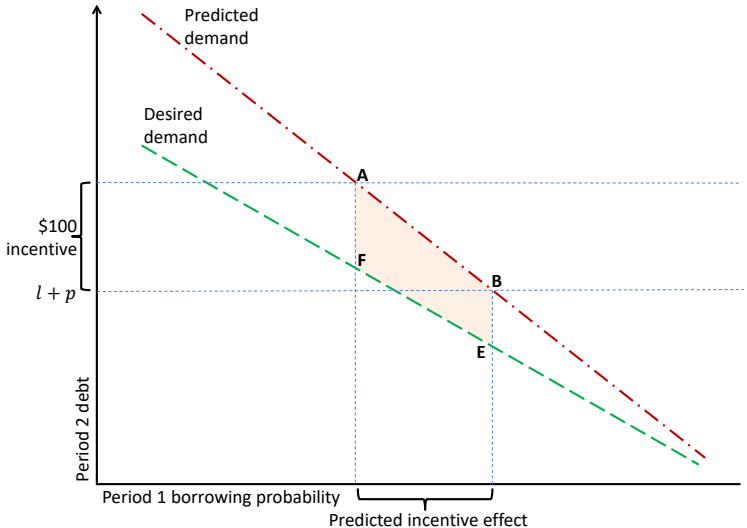
- $100 no-borrowing incentive reduces borrowing probability
- Perceive that future self will "overborrow" $\Longrightarrow$ value incentive more
- Next slides: infer time-inconsistency from valuation of no-borrowing incentive

Identifying perceived time inconsistency



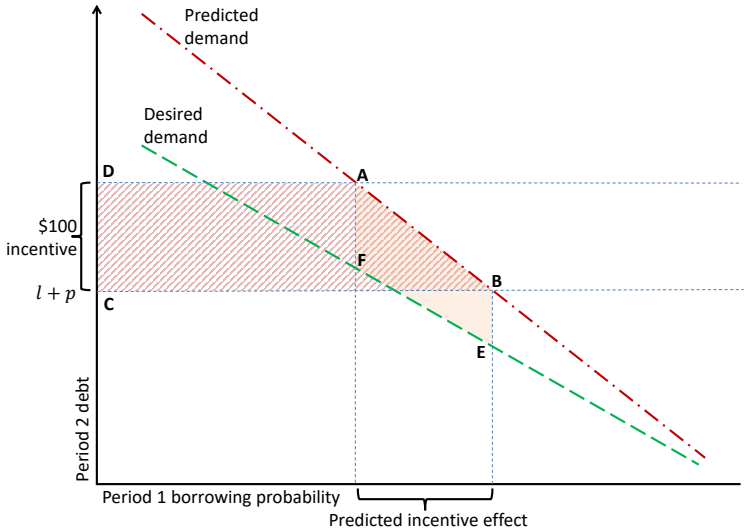
- \$100 If You're Debt-Free = \$100 income + \$100 price increase
- *ABCD*: predicted surplus loss from \$100 price increase, from $t = 1$ perspective

Identifying perceived time inconsistency



- *ABEF*: bias correction benefit from $t = 0$ perspective ("behavior change premium")

Identifying perceived time inconsistency



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$$w = \$100 - ABCD + ABEF$$

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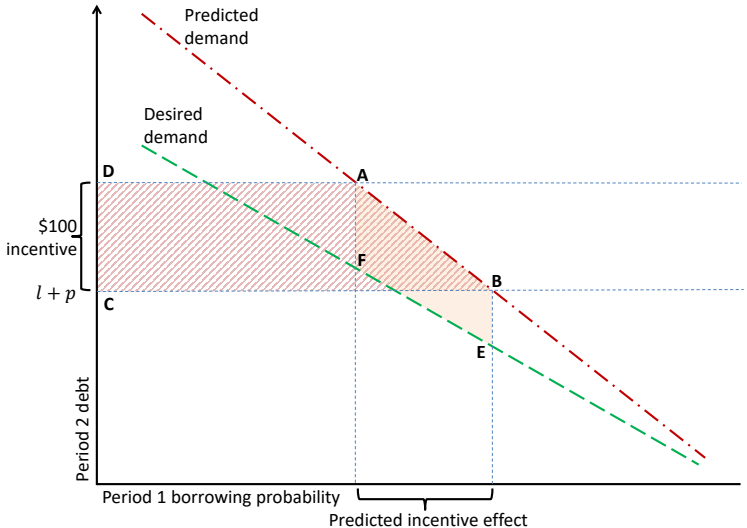

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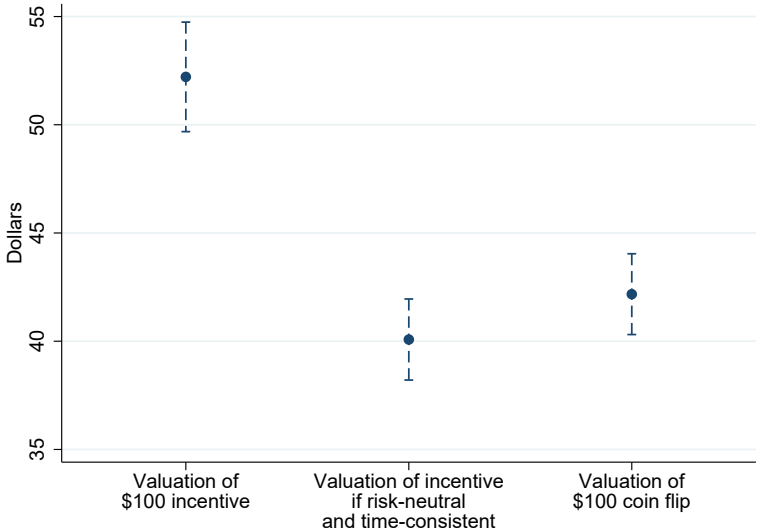
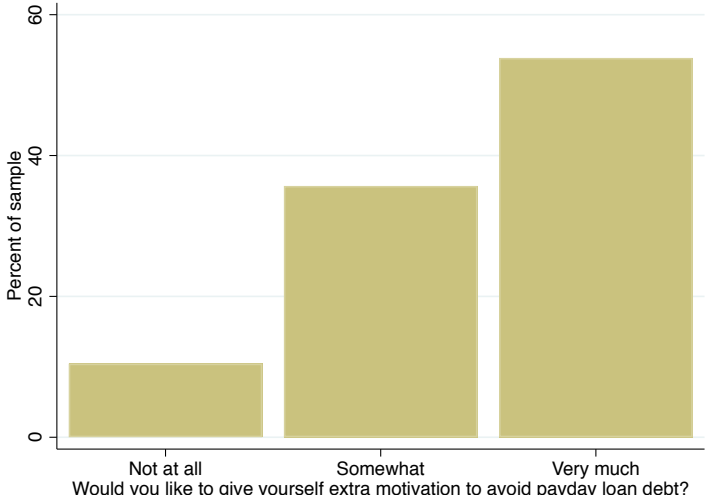
- Back out *ABEF* from survey responses
- Desired MU = predicted MU$\times\tilde{\beta}$
- Infer $\tilde{\beta}$ from *ABEF* and predicted incentive effect

People are willing to pay a premium for the no-borrowing incentive

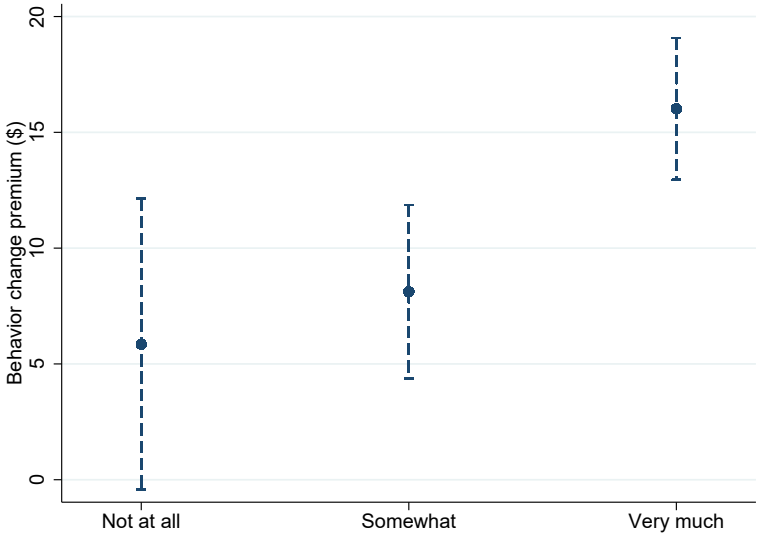


People say they want motivation to avoid borrowing

Would you like to give yourself extra motivation to avoid payday loan debt in the future?

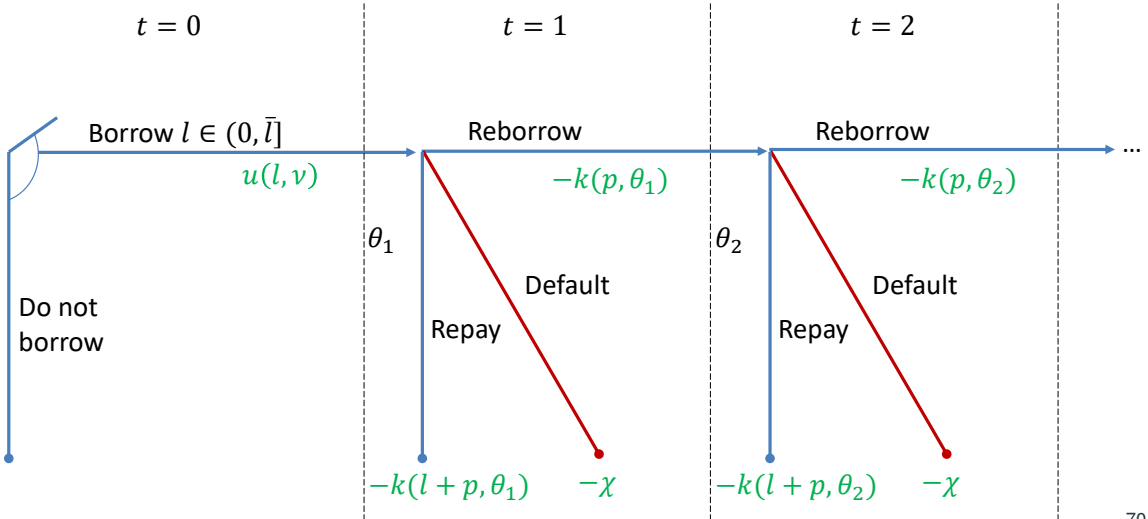


People who say they want motivation have larger behavior change premia

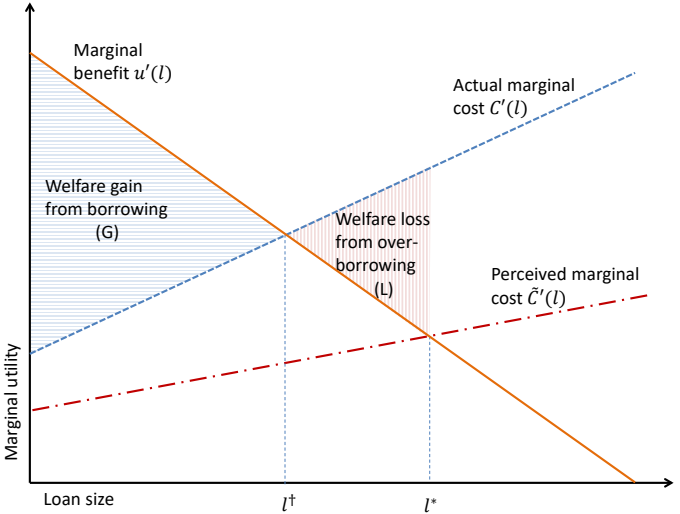


Welfare evaluation

Full model

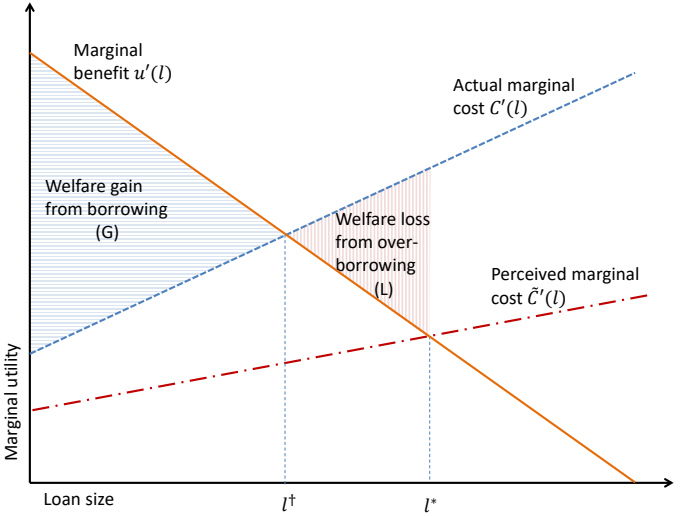

$t = 0$
$t = 1$
$t = 2$
Borrow $l \in (0, \bar{l}]$
$u(l, v)$
Reborrow
$-k(p, \theta_1)$
Reborrow
$-k(p, \theta_2)$
...
θ_1
θ_2
Default
Repay
Default
Repay
Do not borrow
$-k(l + p, \theta_1)$
$-\chi$
$-k(l + p, \theta_2)$
$-\chi$

Period $t = 0$ decision and welfare



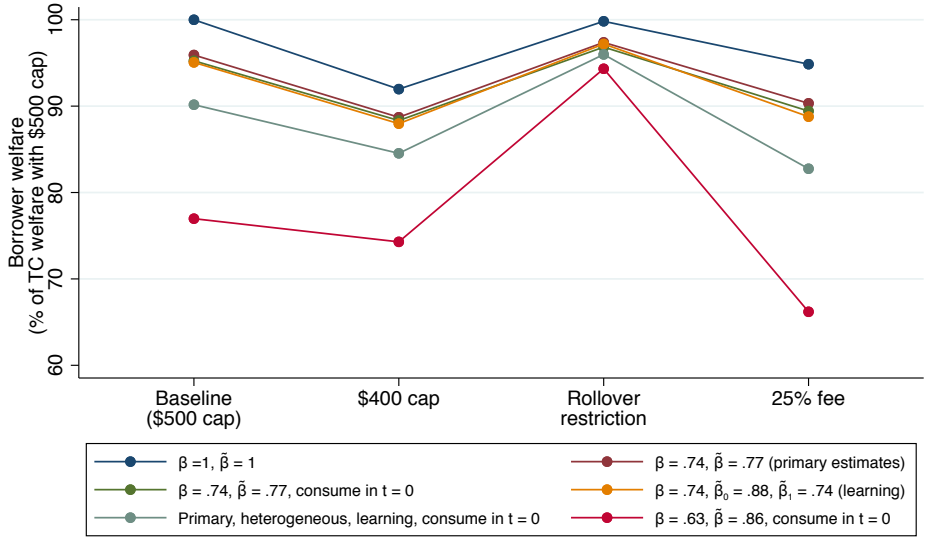
- Borrower sets l^* to equate u' and $\tilde{C}'$
- Use long-run criterion (respect $t = -1$ preferences)
  - Primary: benefits u accrue after $t = 0$
  - Alternative: benefits u accrue in $t = 0$; $\implies$ "overborrow"
- Sophisticated, benefits in $t > 0$: choose l optimally
- Temporarily naive: slightly underestimate C
- Persistently naive: vastly underestimate C

Welfare effects of regulation



- *Payday loan bans*: compare *G* vs. *L*
  - Beneficial only with persistent naivete
- *Rollover restrictions*: reduce *C* from $t = -1$ perspective
  - Could benefit sophisticates and (especially) naifs
- *Loan size caps*: increase welfare if large l^* driven by overborrowing

Numerical simulations



Existing policies versus model prescriptions

- 18 states ban payday lending
- Nearly all states that allow payday lending have loan size caps, some lower than $500
- *Both reduce welfare in our model*

- Only a few states have effective rollover restrictions with sufficiently long cooling off periods
- 2017 CFPB regulation includes a rollover restriction, but implementation delayed
- *Only regulation that might increase welfare in our model*

Conclusion

Taxonomy of bias measurement approaches

1. Exogenous frame variation (RCTs or quasi-experiments)
   - Allcott and Taubinsky (2015)
   - Chetty, Looney, and Kroft (2009), Taubinsky and Rees-Jones (2018), Ambuehl, Bernheim, and Lusardi (2022), ...
2. Rational consumer benchmark (selection on observables)
   - Allcott, Lockwood, and Taubinsky (2019)
   - Bronnenberg et al. (2015), Handel and Kolstad (2015), Lockwood, Allcott, Taubinsky, and Sial (2022), ...
3. Time inconsistency + long-run criterion
   - Allcott, Kim, Taubinsky, and Zinman (2022)
   - Laibson, Lee, Maxted, Repetto, and Tobacman (2020), Sadoff, Samek, and Sprenger (2020), ...
4. Belief elicitation
   - Allcott, Kim, Taubinsky, and Zinman (2022)
   - Allcott (2013), Rees-Jones and Taubinsky (2020), ...

Recap: recipe for optimal sin tax paper

1. Find policy question with important alleged behavioral bias
2. Hypothesize and measure bias
3. Welfare analysis

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1. Find policy question with important alleged behavioral bias
2. Hypothesize and measure bias
3. Welfare analysis

- Difficult to measure bias, especially in field settings
- But research could have high impact
  - Important policy decisions
  - Often affecting low-income people
  - Often made without rigorous behavioral welfare analysis