Evaluating the Role of Policy Interactions and Behavioral Mistakes in Understanding Consumer Demand for Energy Efficiency

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Introduction

- Information provision and monetary incentives are environmental policy instruments that are commonly used to encourage **energy efficiency**.
- **Emissions impact information** about energy efficient products and services is a relatively underused policy tool when compared to **energy cost savings information** and incentives (see Allcott and Taubinsky, 2015, and Rodemeier and Löschel**,** 2020, on impact of cost information and incentives as rebates).
- Given that utility likely increases in saving money and, protecting the environment (for some), emissions and cost information should increase demand for energy efficiency in the aggregate*. Does supplementing cost information with emissions information have this expected effect of increasing demand for energy efficiency?* Chatterjee and Guleryuz (2017) suggest 'no').
- **Incentives** have been shown to not always work as intended (Bowles and Polania-Reyes, 2012). *Do incentives always increase demand in the context of energy efficiency in which information about the benefits of efficiency is also provided?* Perino, Panzone and Swanson (2014) suggest 'no.'
- In sum, prior work suggests **negative interactions** might occur between information types and incentives. Limited studies exist and evidence is mixed.

Why study interaction effects?
Interaction effects are **policy-relevant** and potentially **behaviorally interesting**.
- Interaction effects enable rich comparisons between policy treatments that represent different mixes of policy tools.
- They can be used to determine whether behavioral responses to policy mixes are consistent with economic theory, and, in turn, identify behavioral biases.
- For example, information and incentives might interact if incentives might amplify mistakes by distracting consumers from benefits of energy efficiency.
  - Some consumers may underreact to information about energy reduction benefits in the presence of a discount because they overreact to price reductions framed as discounts ("**discount framing**"), causing consumers to maximize **transaction utility** (gains from the deal, function of selling and reference price difference, see Thaler, 1983) instead of total utility.

~~$10~~ $5 vs. **$5**

Research Questions

1. **Does emissions impact information alter the effectiveness of cost savings information in increasing demand for energy efficiency?**
   - *I will test for interactions between cost savings information and emissions impact information to answer this.*

2. **Does a monetary incentive, through transaction utility, alter the effectiveness of information provision in increasing demand for energy efficiency?**
   - I will test for interactions between information and incentives to answer this.
   - I focus on the effect of the incentive through the discount framing channel, one channel by which an incentive might alter information's effectiveness (refer to Introduction for definition of discount framing).

3. **Can deliberative thinking in line with an economic model of behavior correct for 'behavioral mistakes' that impact demand for energy efficiency?**
   - Focus not only on mistakes or reasoning errors that result from **imperfect information or inattention** (identified by impact of information), *but also from a* ***lack of deliberative (System 2) thinking*** *and a* ***framework*** *to evaluate choice optimality* (identified by impact of guided deliberation)
   - This work is empirically evaluating the identifying assumption made by Allcott and Taubinsky (2015) that information fully corrects for behavioral mistakes.

Contribution

I systematically investigate interactions between common environmental policy instruments in a controlled setting in which behavioral explanations – discount framing, deliberation – for them can be investigated.

Primary contributions are to estimate the impact of
1. **policy interactions**, with a focus on negative interactions involving incentives and different types of information, and
2. different types of **behavioral mistakes**, or errors in economic reasoning, with a focus on the lack of deliberative thinking,

on demand for energy efficiency.

In turn, this research may highlight interaction effects and consumer mistakes as **potential barriers** to effective demand-side energy management.

Methods

- Online survey experiment ("**lab-in-the-field experiment**")
- Expected sample of over 2,000 respondents, roughly representative of U.S.
- Outcome is demand for a smart power strip, measured as willingness-to-pay ("**WTP**") a premium for smart power strip on top of price of traditional power strip. Elicited using a multiple price list
- **Smart strips** reduce energy by cutting power off to unused electronic devices

Treatment components (within and between-subjects)
1. Information on **energy cost savings** from using a smart power strip instead of a traditional power strip (**C**)
2. Information on **emissions reduction** resulting from using a smart power strip (**E**
3. **25% discount** on purchase price of smart power strip (**D**)
4. Guided deliberation: after providing information, I will guide respondents in deliberating on the consistency of their choices with their beliefs and preferences for saving money and reducing emissions; the structure of the deliberation treatment is informed by a random utility model ("RUM") of behavior.

CONDITIONS: Info Interactions

	No E	E
No C	Control	E
C	C	C & E

CONDITIONS: Info-Incentive Interactions

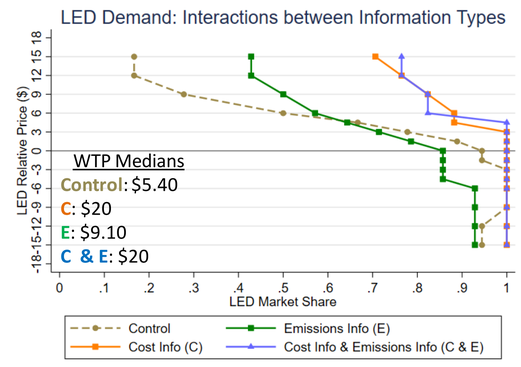
	No Incentive	Incentive
No Info	Control	D
Info	C & E	C & E & D

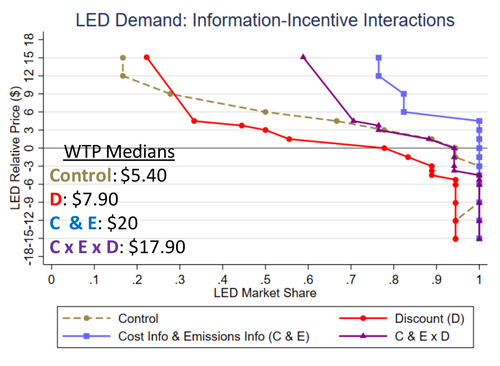
EXPERIMENTAL DESIGN

I. Information
Round 1 (Baseline) Choices
Information screen
Round 2A Choices
II. Guided Deliberation
Round 2B Choices
III. Survey

Preliminary Results

- Results from **exploratory study** of 66 people conducted in 2020 in Cornell's Lab for Experimental Economics & Decision Research; *larger study ongoing*.
- Studied light bulb choices (LED vs. halogen incandescent) (without deliberation)
- (~20 people used for each demand curve below, each curve below corresponds to a cell in the 2x2 tables above; six unique conditions but four treatment groups due to within-subjects design).
- Results from small sample size are indicative but should not be over-interpreted. They suggest counter-intuitive responses to information and incentives.
- **Strong cost savings information-emissions impact information interactions**
  - E *decreased* demand for LEDs when provided with C relative to C alone (**C** demand curve to the *left* of **C & E** curve on graph to left below).
- **Strong information-incentive interactions**
  - A discount on LED purchase prices (D) *decreased* demand when provided with C & E information relative to C & E alone (**C & E & D** left of **C & E** on graph to right).
- Potential **heterogeneity in interaction effects** (analysis not shown)
  - E more likely to *decrease* demand when provided with C for those with *less favorable* attitudes toward the environment.
  - D more likely to *decrease* demand when provided with C & E information for those with *more favorable* environmental attitudes





Potential Implications

- **Information** might be **a more viable policy instrument** for increasing energy efficiency if **deliberation** is encouraged or **discounts** are made **less salient**
- In such a scenario, energy-efficient products would require **smaller subsidies**, which would **decrease the costs** of administering energy efficiency programs.
- If the effects of information, incentives, their interactions, and deliberation are heterogeneous, different policies might be well-targeted for different groups.

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