Knowledge is (Less) Power: Experimental Evidence from Residential Energy Use

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November 12, 2012

Motivation

Why are price elasticities so low in electricity markets?

- Costly information acquisition?
- Limited attention?
- Reliance on heuristics?
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What is the impact of information on the price elasticity of demand for electricity?

- Hypothesis: electricity consumers have imperfect information about quantity and price
- Randomized field experiment
- Provide real-time feedback on usage, prices and estimated bill-to-date
- Compare responsiveness to price changes across households with and without feedback

Research Design

Methodology: Randomized Controlled Trial (RCT)

- Exogenously perturb prices and availability of information

Setting and Sample

- Partner: The United Illuminating Company (UI), an electric utility in Connecticut
- Timeline: Summer 2011
- Recruited 437 customers via telephone or email

Research Design: Treatments

Control: 207 households

- Mailed booklet "101 Ways to Save Energy"
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Price: 130 households

- 6 pricing events: vary in magnitude, duration and notification
  - 3 events: \$0.50/kWh, day-ahead notice ("DA")
  - 3 events: \$1.25/kWh, 30-minute notice ("TM")
- Events occur during peak hours on warm days, when generation costs are likely to be highest
- Notification method of HH's choice: email, phone or text

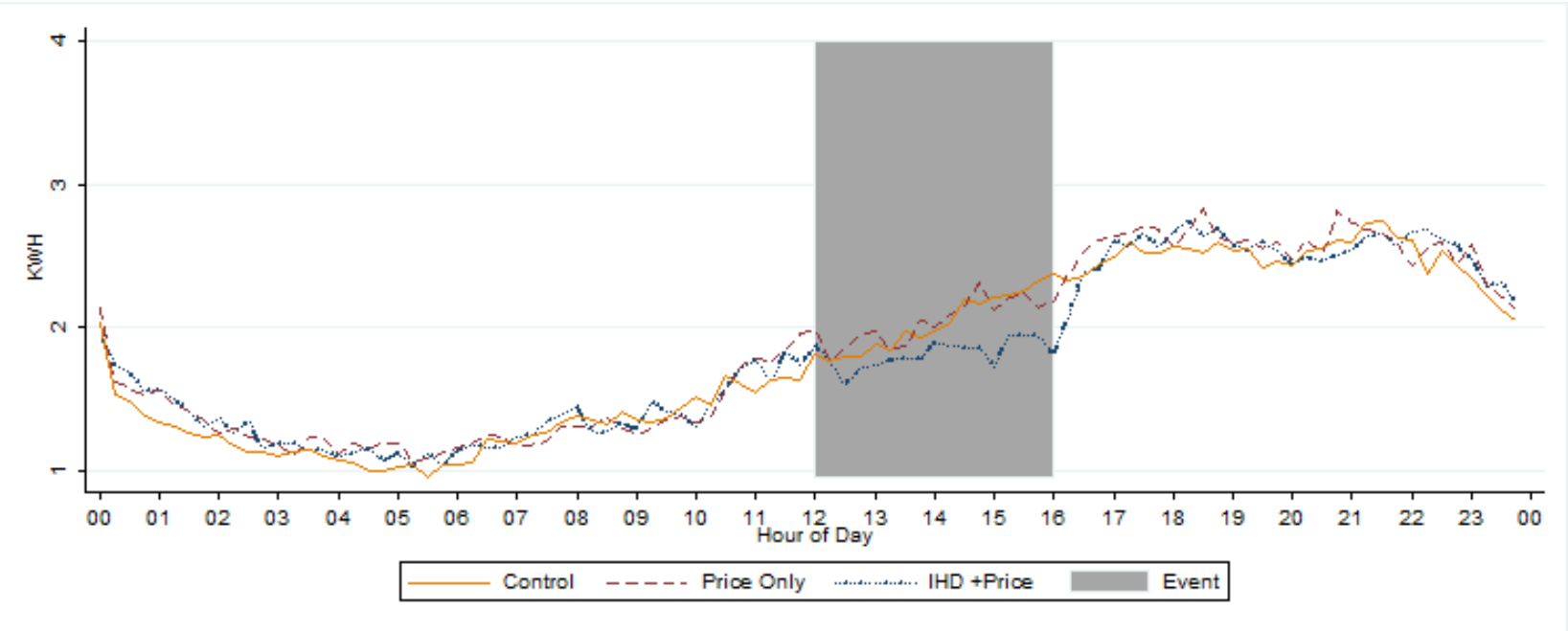
Event Dates and Temperatures

Research Design: Treatments

Price + Information (IHD): 100 households

- Same price treatments as above
- An in-home display (IHD) that displays real-time information about price, usage and expenditure
- Ability to view this information from a web portal
- Also receive email, phone, text notification of price events

Event 1: July 21, 4hr 50cent (day-ahead notification)



Intention-to-Treat

Event Type:	Pooled	Pooled	Pooled	Pooled	Day Ahead (DA)	30min (TM)
Column:	(1)	(2)	(3)	(4)	(5)	(6)
Price Only	-0.031	-0.054	-0.027	-0.038	-0.071*	0.006
	(0.036)	(0.036)	(0.036)	(0.036)	(0.042)	(0.044)
Price + IHD	-0.116**	-0.137***	-0.123***	-0.137***	-0.171***	-0.084
	(0.048)	(0.048)	(0.047)	(0.046)	(0.051)	(0.057)
Prob(P = P+I)	0.096*	0.098*	0.051*	0.044**	0.066*	0.130
Hour-by-day FEs	N	Y	N	Y	Y	Y
HH FEs	N	N	Y	Y	Y	Y
Number of Events	6	6	6	6	3	3
Number of HHs	437	437	437	437	437	437
R-Square	0.00	0.05	0.54	0.58	0.58	0.58

*Notes: Results are reported from an OLS regression where the dependent variable is ln(kwh) in 15-minute intervals. The sample is comprised of households assigned to a treatment for which we observe usage data for AT LEAST ONE pricing event. All specifications include a treatment group indicator and an event window indicator (except where subsumed by time or household fixed effects). In columns 1-4 the treatment window indicator is set equal to 1 if a DA or TM event is occurring. Column 2 includes hour-by-day fixed effects; column 3 includes household fixed effects and column 4 includes both. In column 5 , the treatment window is set equal to 1 only for DA events and in column 6 the treatment window is set equal to 1 only for TM events. Standard errors in parentheses are clustered at the household level. *,**,*** indicates significance at 0.10, 0.05, and 0.01.*

- Households with feedback 3x as responsive to pricing events

Conclusions

Main Findings

- Consumers are responsive to price changes
- Large incremental contribution of feedback
  - 8 to 15 percent incremental reduction in usage
  - Response 2-4 standard deviations larger compared to price-only group
  - No measurable load-shifting ; we're seeing conservation
- Notification matters
- Explaining the differential treatment effect
  - Not salience
  - Learning seems to play an important role

Questions and Comments

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