# Can Retailers Inform Consumers about Energy Costs? Evidence from a Field Experiment

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# How do consumers learn about product quality?

**Mechanisms:**

1. Government-mandated information disclosure
2. Learning from other consumers
3. Learning from the seller

*Our question: How effectively can retailers encourage adoption of energy efficient products?*

- Our setting: Sales agents advise consumers, provide verifiable info
- Other examples: Retail stores, pharmaceuticals, financial advisers, autos

# Preview

**What we do:**

- Focus on water heaters:
  - Second largest home energy use: Energy cost = \$29 billion/year
  - Lifetime energy cost $\gg$ Upfront price
  - Mundane product $\Rightarrow$ Conceptually interesting
- Randomized control trial (RCT) with large nationwide Retailer
  - At call center: Vary Energy Star info, rebates, and sales incentives
  - Measure effects on demand
- Extensive surveys and audits of sales agents and consumers

**Key insights:**

- Treatments remarkably ineffective at increasing Energy Star sales.
- The Retailer's ability to increase Energy Star demand depends on how well it can motivate sales agents.
- Sales agents won't suggest Energy Star if they know consumers are uninterested.

# Agenda

1. Background on water heater market
2. Simple theoretical model
3. Experimental design and data
4. Results

# Related Literature: Information Disclosure

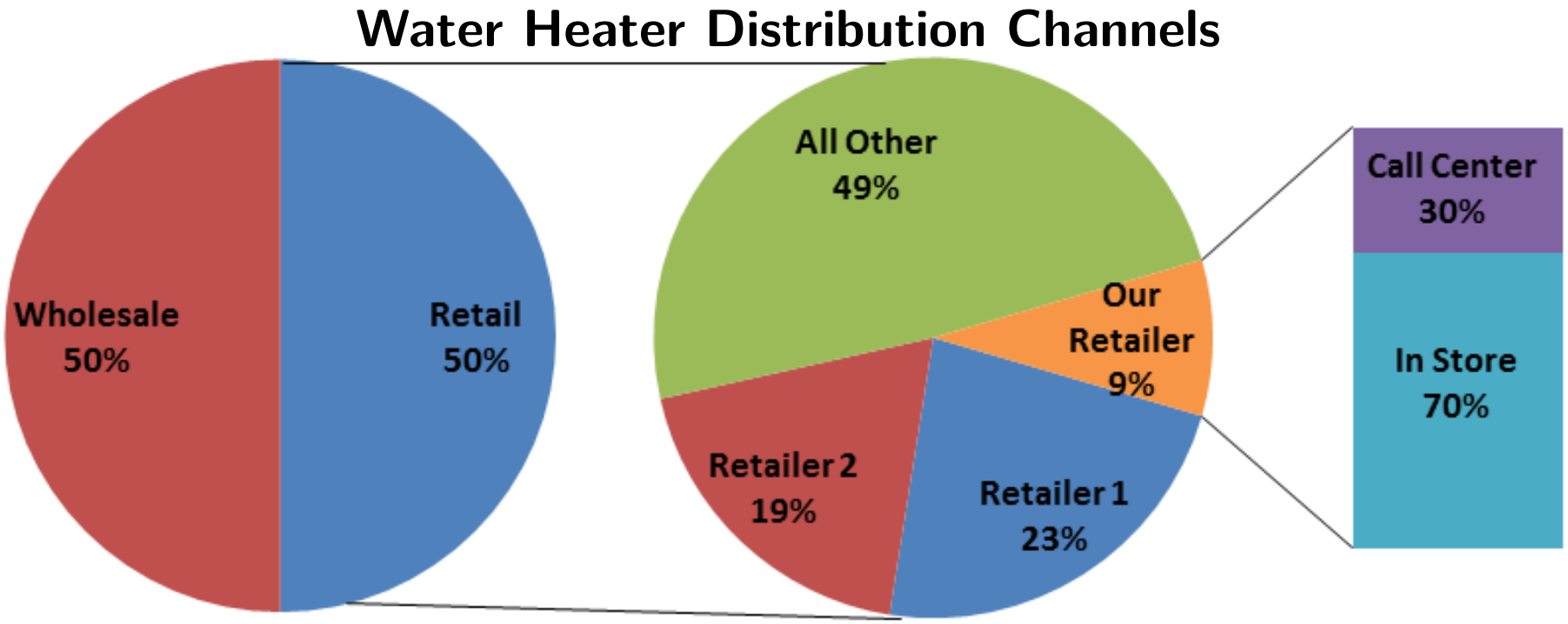
- Information disclosure in other domains; see Dranove and Jin (2010):
  - Financial decisions: Choi, Laibson, and Madrian (2010), Duarte and Hastings (2012)
  - Securities: Greenstone, Oyer, and Vissing-Jorgensen (2006)
  - Social programs: Bhargava and Manoli (2013
  - Health insurance plans: Jin and Sorensen (2006), Kling et al. (2012), Scanlon et al. (2002)
  - Hospitals: Pope (2009)
  - Health and Nutrition: Bollinger, Leslie, and Sorensen (2011), Luo et al. (2012)
  - Restaurant hygiene: Jin and Leslie (2009)
  - HIV risk: Dupas (2011)
  - School choice: Figlio and Lucas (2004), Hastings and Weinstein (2008)
  - Certification markets: Jin, Kato, and List (2010)
- *Our setting highlights information disclosure through imperfectly-compliant sales agents.* Special features:
  - In equilibrium, agent behavior is informative about consumer demand
  - We have unusual direct data on sales agent behavior

# Related Literature: Energy Use Information

- *Use large-sample RCT to study the effects of seller-provided durable good energy use information on purchases*
- Related:
  - How *social comparisons* affect takeup of energy efficient durables: Allcott and Rogers (2014), Brandon, List, Metcalfe, and Price (2014), Herberich, List, and Price (2011), Toledo (2013)
  - How durable good energy use information affects *stated preference*: Deutsch (2010a, 2010b), Newell and Siikamaki (2013), Ward, Clark, Jensen, Yen, and Russell (2011)
  - Large sample *observational data* (non-randomized): Kallbekken, Saelen, and Hermansen (2013)
  - RCTs with a *very small sample* of units (Anderson and Claxton 1982)
  - *Experimenter-provided* information (Allcott and Taubinsky 2013)

# Market Overview

- Approx one water heater per US household
- Half fueled by natural gas




- 96% of production from three manufacturers

# Standard vs. Energy Star Models

- 6-year warranty: ~$220 incremental price, ~$40/year savings
  - 13-18% IRR
  - But Energy Star market share ~1/30.
- 12-year warranty: Energy Star bundled with premium features

Table: Water Heater Model Overview

| | 40 Gallon | | 50 Gallon | |
|---|---|---|---|---|
| **Warranty** | 6 year | 12 year | 6 year | 12 year |
| **Price ($)** | | | | |
| Standard | 420 | 620 | 485 | 665 |
| Energy Star | 645 | 969 | 700 | 1020 |
| **Annual Energy Cost ($/ year)** | | | | |
| Standard | 309 | 290 | 315 | 294 |
| Energy Star | 272 | 261 | 272 | 261 |
| Undiscounted payback period (years) | 6.1 | 12.0 | 5.0 | 10.8 |
| IRR (at 13 year average life) | 13% | 1% | 18% | 3% |
| **Market Share** | | | | |
| Standard | 17.6% | 6.1% | 10.1% | 10.4% |
| Energy Star | 0.6% | 0.5% | 0.2% | 0.7% |

# Experimental Design

| Phase | Dates | Info, Rebates, and Info x Rebates | Spiff | Spiff x Rebates | Consumers in Sample | Sales |
|---|---|---|---|---|---|---|
| 1 | Nov 21-April 6 | Yes | | | 12,629 | 4,675 |
| 2 | April 7-June 13 | Yes | Yes | | 7,254 | 2,523 |
| 3 | June 14-July 6 | Yes | Yes | Yes | 1,974 | 715 |
| 4 | July 7-July 26 | Yes | | | 1,490 | 362 |

- Caller gives name and phone number ⇒unique reference number
- Website randomly assigns reference number to treatment group
- Extensive internal effort to encourage agent compliance

# Information Treatment Script

*Let me take a moment to tell you about our Energy Star models. Energy Star water heaters cost about $220 more than a standard model, but they save a typical household $40 each year, so you would make up that price difference in about six years. Over 12 years, which is the normal life of a water heater, you would save $480 in energy bills. Energy Star models may not be available for every home. If possible, would an Energy Star water heater be of interest to you?*

# $100 Energy Star Rebate Script

*I have good news. [Retailer] has specially selected you for a $100 rebate on any Energy Star water heater. Energy Star models may not be available for every home. If possible, would an Energy Star water heater be of interest to you?*

# Data

- Retailer call database: Caller reference number, treatment assignment, sales agent ID
  - If purchase: Model purchased and customer address
- Customer data
  - Address-level (Acxiom):
    - Home Value, College Grad, Age, Household Size, Democrat
    - Environmentalist indicator (Contributes to environmental causes; subscribes to environmental magazines)
    - Green Living indicator (Environmentalist indicator | buys green products or organic foods)
  - Zip-level: Median Income (Census), Hybrid Share (Polk)
- Follow-up surveys for 1,091 callers (891 purchasers)
- Independent audits of 2,129 calls
- Sales agent endline survey

# Model of Sales Agent Disclosure

**Setup:**

- Consumers choose between low- and high-quality good
  - Primitives imply market-level price and information elasticities
- Monopolist sets prices and discloses information
  - So far, a standard advertising model, like Dixit and Norman (1979), Dorfman and Steiner (1954), Shapiro (1980), etc.
- In our model, sales agents disclose information
  - Disclosure is costly, firm does not observe
  - Firm sets sales incentive to influence disclosure
  - Sales agents optimize

**Predictions:**

1. If info doesn't affect demand, agents won't disclose info
2. If info doesn't affect demand, agent incentives don't increase disclosure
3. Lower prices and higher sales incentives reinforce each other

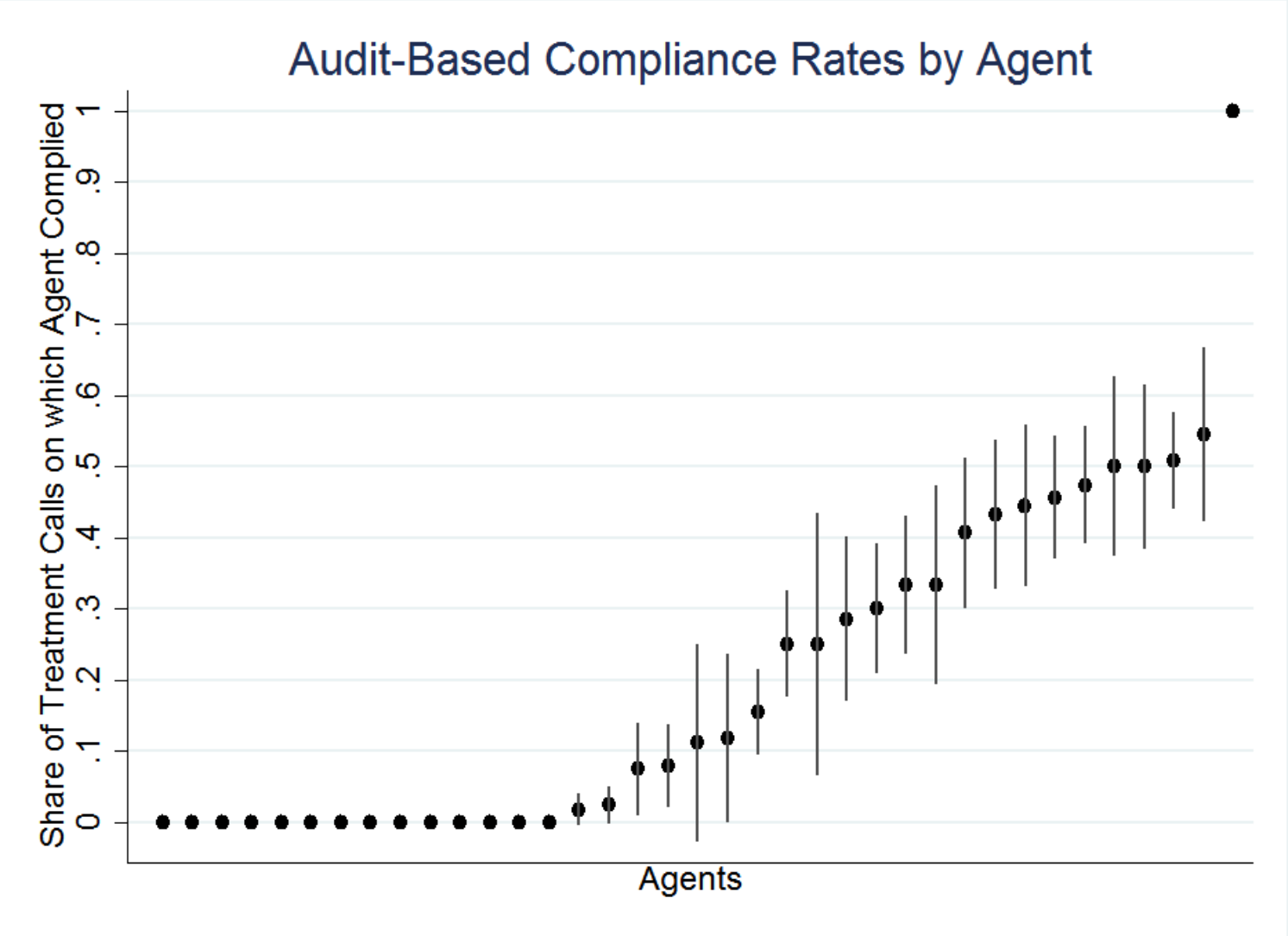
# Results

1. Sales agent behavior
2. Effects on purchases
3. Follow-up surveys

# Low Compliance by Sales Agents

| | (1) | (2) |
|---|---|---|
| Dependent Variable: | Agent Reported | Read Script |
| 1(Information Only) | 0.481 | 0.149 |
| | (0.010)*** | (0.027)*** |
| 1(Info and 25 Rebate) | 0.491 | 0.193 |
| | (0.010)*** | (0.033)*** |
| 1(Info and 100 Rebate) | 0.460 | 0.156 |
| | (0.019)*** | (0.057)*** |
| 1(25 Rebate Only) | 0.491 | 0.214 |
| | (0.006)*** | (0.020)*** |
| 1(100 Rebate Only) | 0.494 | 0.180 |
| | (0.010)*** | (0.033)*** |
| 1(Spiff Only) | | 0.011 |
| | | (0.013) |
| 1(Spiff and 25 Rebate) | | 0.036 |
| | | (0.029) |
| 1(Spiff and 100 Rebate) | | 0.155 |
| | | (0.065)** |
| $R^2$ | 0.39 | 0.25 |
| $N$ | 20,240 | 1,742 |

# Compliance Rates Variable and Low



# Effects on Energy Star Market Share

| | (1) | (2) | (3) |
|---|---|---|---|
| 1(100 Rebate) | 0.006 | 0.012 | 0.037 |
| | (0.003)** | (0.005)** | (0.013)*** |
| 1(25 Rebate) | 0.001 | 0.002 | 0.003 |
| | (0.001) | (0.003) | (0.005) |
| 1(Information) | 0.000 | 0.000 | 0.004 |
| | (0.002) | (0.004) | (0.007) |
| 1(Spiff) | -0.002 | | 0.001 |
| | (0.002) | | (0.007) |
| 1(Spiff and 25 Rebate) | -0.004 | | -0.007 |
| | (0.002)** | | (0.005) |
| 1(Spiff and 100 Rebate) | 0.040 | | 0.219 |
| | (0.022)* | | (0.118)* |
| $R^2$ | 0.01 | 0.01 | 0.01 |
| $N$ | 23,347 | 20,240 | 23,347 |
| Regression Type: | ITT | Self-Report IV | Scaled ITT |

# Agents Target Scripts at Likely Purchasers

$$Y_{iat} = \xi T_i N^s_{iat} + \kappa T_i (1 - N^s_{iat}) + \phi_i + \mu_a + \epsilon_{iat}$$

- $N^s_{iat}$ =Agent-reported compliance
- $\xi$ is selection+treatment; $\kappa$ is purely selection

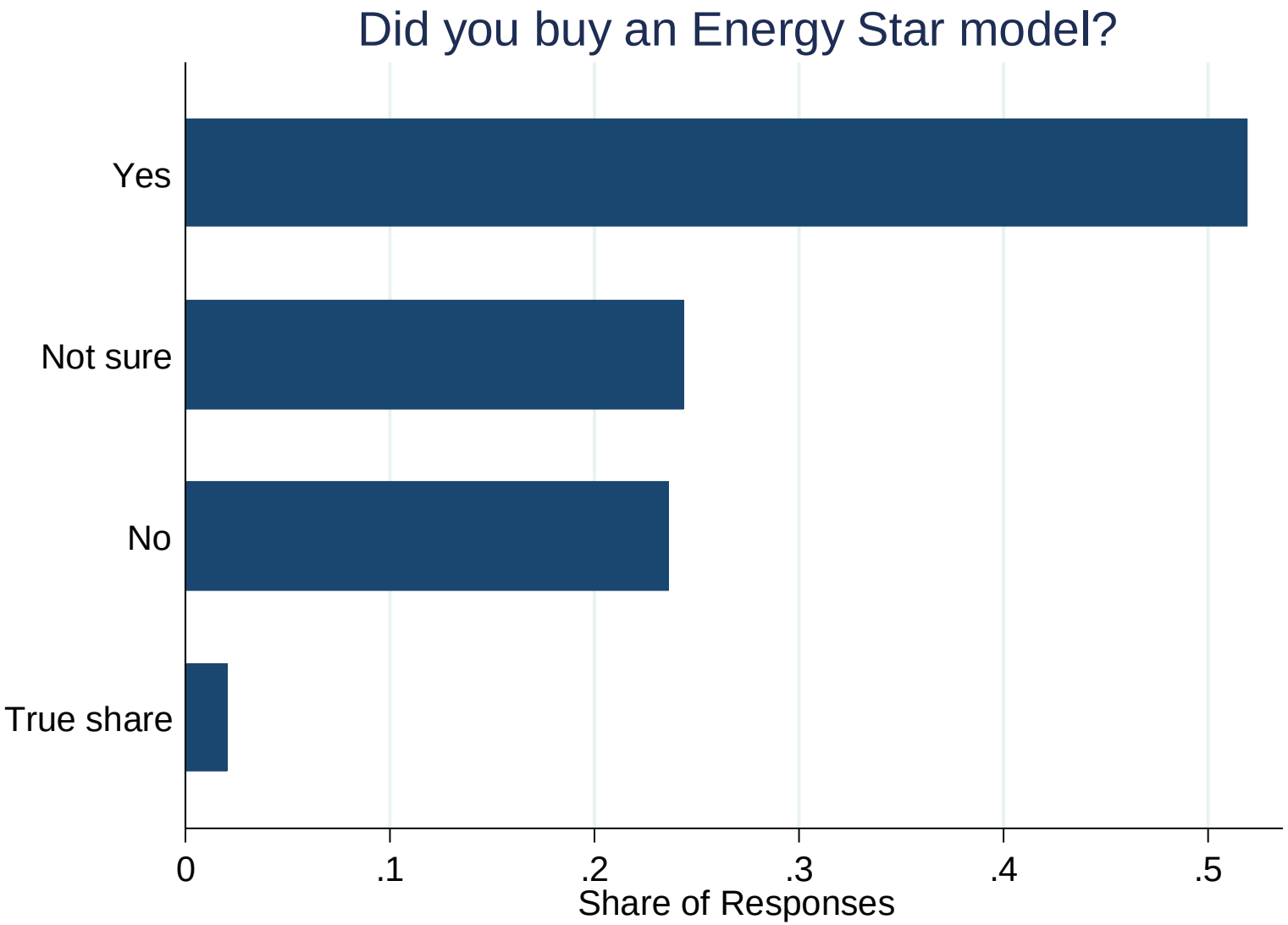
| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Dependent Variable: | 1(Factor) | 1(EStar) | 1(EStar) | 1(EStar) |
| T x Reported Compliance | -0.014 | 0.013 | 0.038 | 0.034 |
| | (0.030) | (0.002)*** | (0.007)*** | (0.006)*** |
| T x (1 - Reported Compliance) | -0.057 | -0.009 | -0.031 | -0.022 |
| | (0.021)*** | (0.001)*** | (0.005)*** | (0.004)*** |
| $R^2$ | 0.18 | 0.02 | 0.05 | 0.05 |
| $N$ | 404 | 20,240 | 5,180 | 6,123 |
| Dep. Var. Control Mean | .061 | .009 | .033 | .025 |

- Interpretation: Agents are not "shirking." They are "strategic."

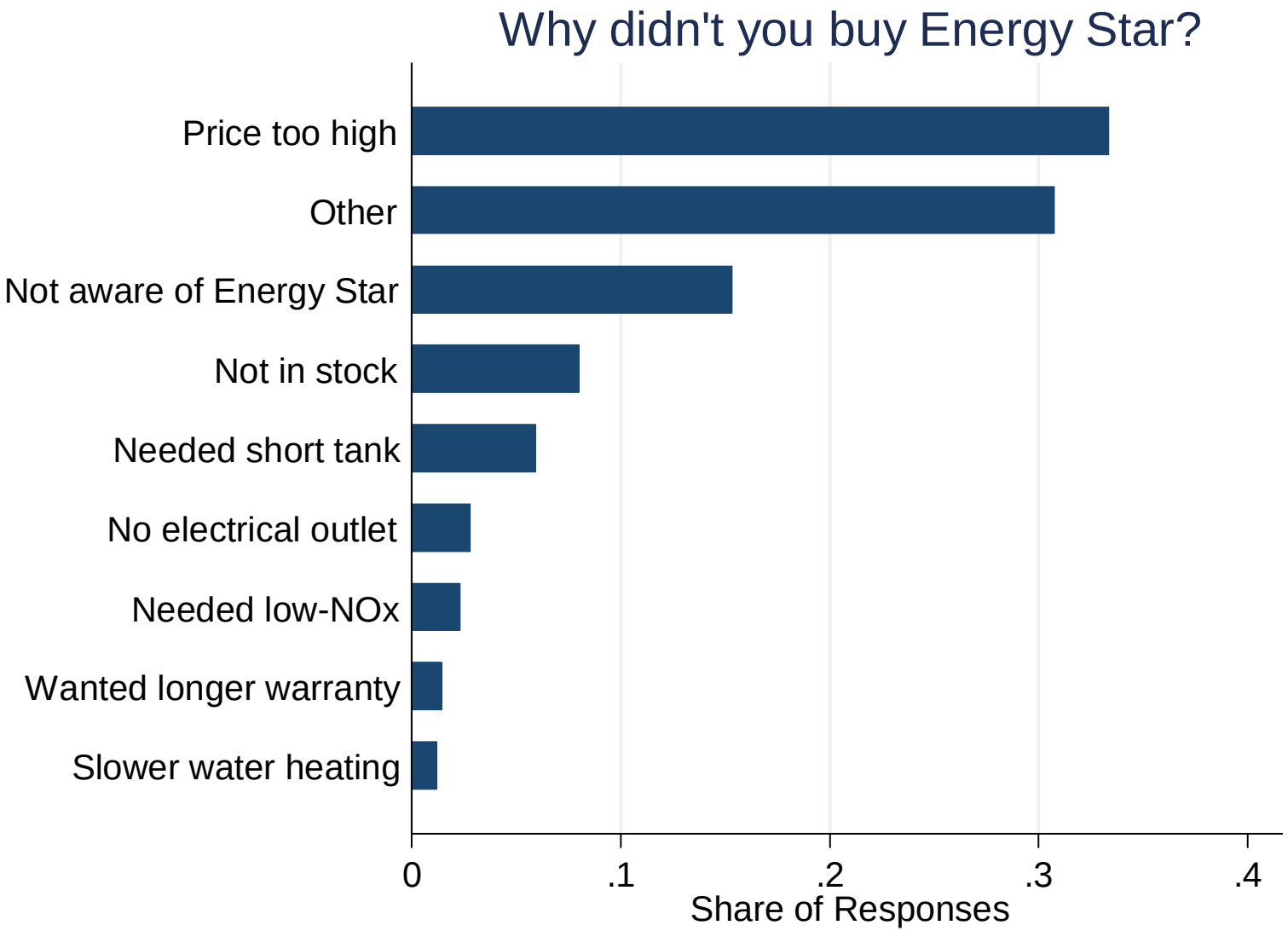
# Why Is Demand for Energy Star So Low?

- Are consumers still uninformed/unaware after purchase?
- Or are they well-informed but uninterested?
- Use post-purchase survey to test

# Consumers Confused about Energy Star



# Price and Lack of Awareness Are Barriers



# Consumers Do Not Underestimate Energy Star Savings

*How much money do you think the natural gas for the water heater will cost each year?*

| **10th** | **50th** | **90th** | **Mean** | **Yellow Tag** |
|---|---|---|---|---|
| 50 | 200 | 600 | 305 | Approx 300 |

*How much less money do you think the natural gas would cost each year for an Energy Star water heater compared to a similarly-sized non-Energy Star water heater?*

| **10th** | **50th** | **90th** | **Mean** | **Yellow Tag** |
|---|---|---|---|---|
| 0 | 50 | 300 | 129 | Approx 30 |

*Implied percent savings from Energy Star*

| **10th** | **50th** | **90th** | **Mean** | **Yellow Tag** |
|---|---|---|---|---|
| 5 | 25 | 67 | 32 | Approx 10 |

# Conclusion

- Basic question: How effectively can retailers encourage adoption of energy efficient products?
- Approach: RCT with a large nationwide retailer
- Results:
  - Information treatments ineffective at increasing Energy Star sales
  - Agents know that information is ineffective and strategically don't inform
- Suggests that lack of seller-provided information explains little of the low demand for energy efficiency in this context.

# Speculation on Policy Implications

- Informal speculation: No model or data on these two slides ...

**Quotes from sales agent follow-up survey:**

- "I would say about 90% of our customers only care about how cheaply can they get away with the purchase of a water heater."
- "Customers that were shopping ahead [i.e. not a sudden unplanned failure] seemed to be making more educated decisions ... they were more inclined to use the Energy Star water heaters as item they wanted their quote for. I feel that whenever there was not such a sense of urgency ... customers were in a position to spend more on a better water heater and also able to wait for it to be ordered since they usually are not in stock."

# Speculation on Policy Implications

- *If* you believe there might be a consumer market failure ...
- Simple behavioral/PF model (AMT 2014, Camerer et al. 2003, O'Donoghue and Rabin 2006):
  - Unaware types do not affect aware type's choice set or prices
  - Might be cautious to intervene paternalistically
- Water heaters: Possibly large fixed costs to manufacture and stock a model
  - Energy Star parts cost $\approx$ \$60, not stocked in many locations
  - The existence of unaware types would increase price and reduce availability for aware types.
- Do potential pecuniary externalities provide additional justification for minimum efficiency standards?