Rational Inattention and Energy Efficiency

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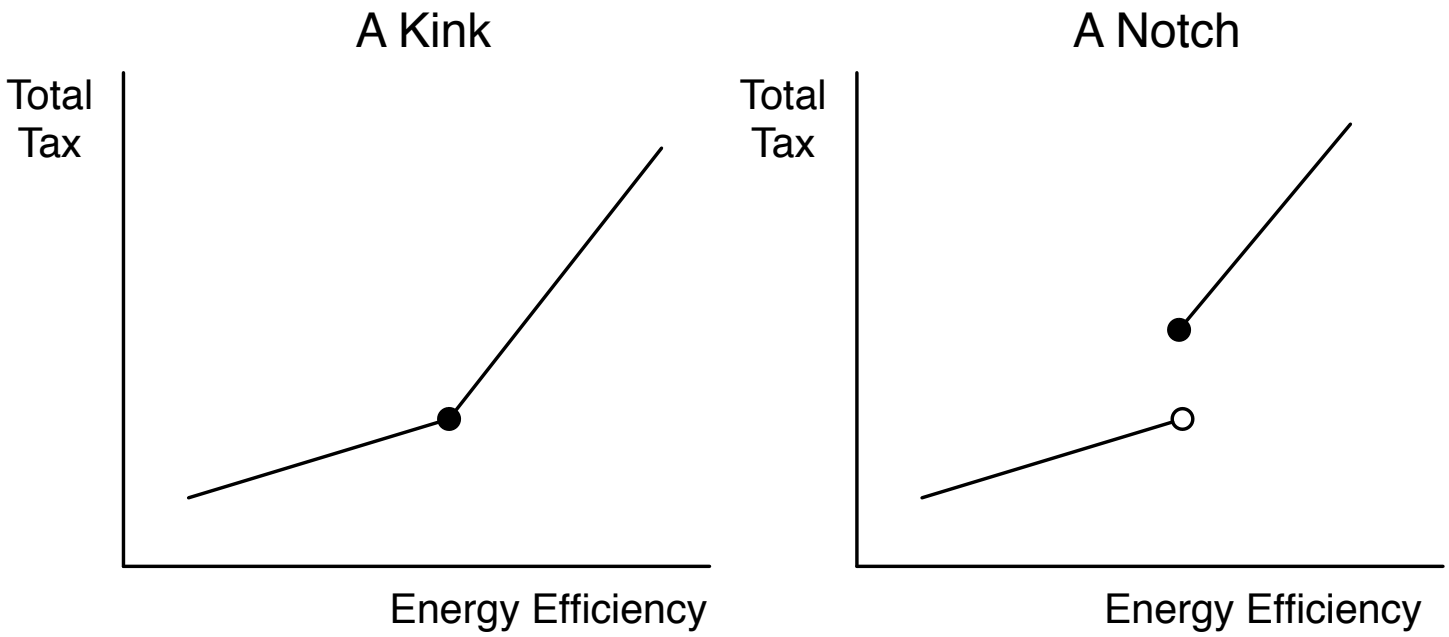
- Notches are ubiquitous in energy policy



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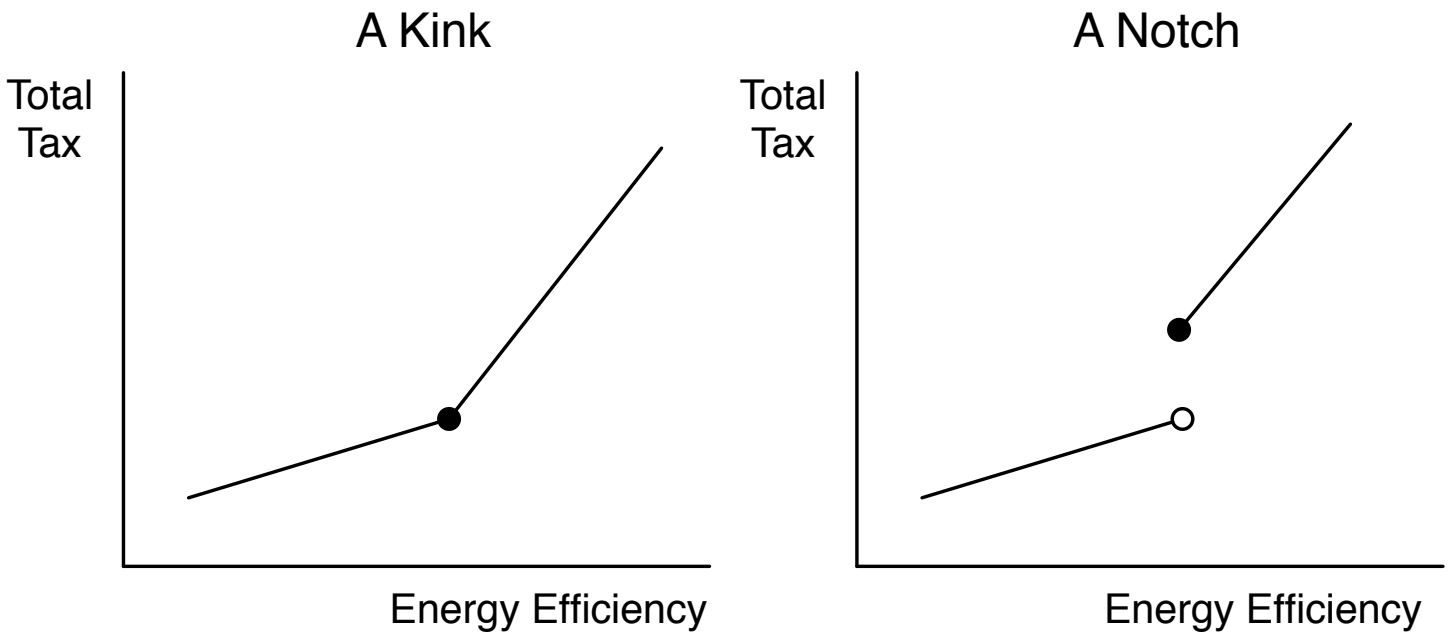

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  - Pigouvian tax efficient because everyone has same marginal incentive
  - Notches provide uneven incentives – may not get low hanging fruit

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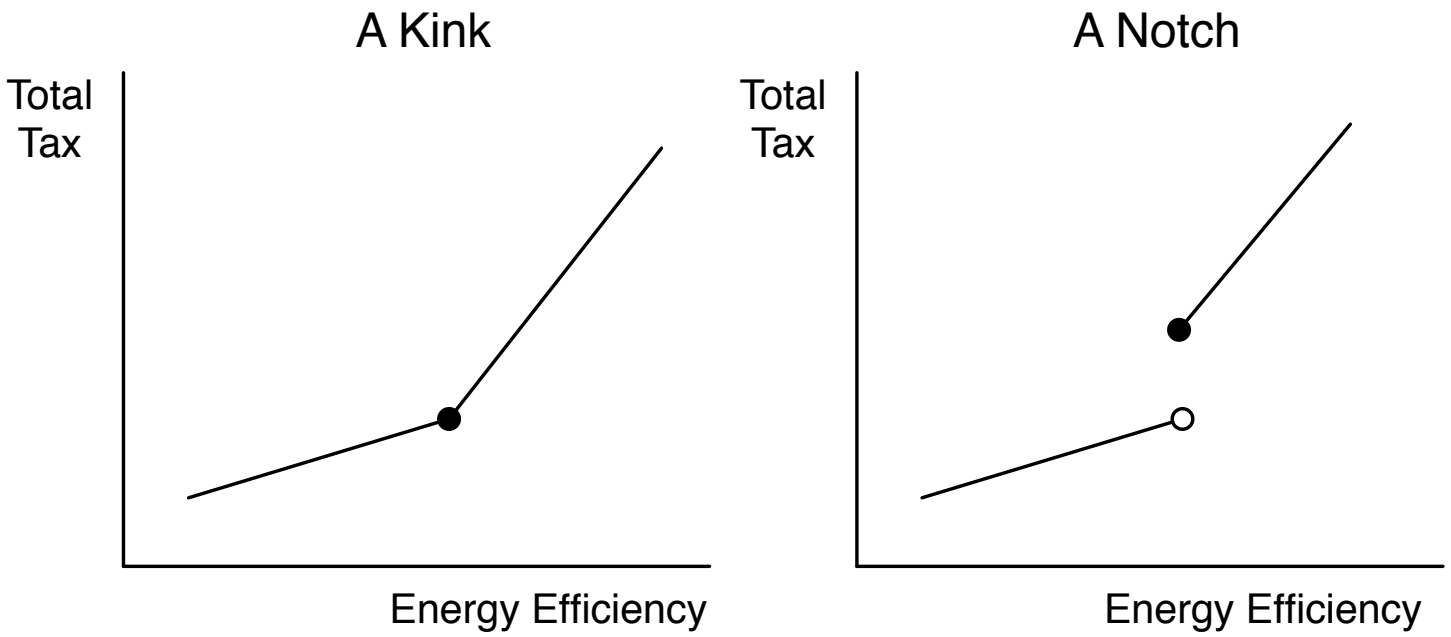

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- Notches in externality-correcting policies are inefficient (Sallee & Slemrod 2010)
  - Pigouvian tax efficient because everyone has same marginal incentive
  - Notches provide uneven incentives – may not get low hanging fruit
- **Are there benefits to notches that might outweigh efficiency costs?**

What are plausible benefits of notches?

- Administrative ease
  - "Lawyers prefer tables to formulas"
  - "Staffers can't put logarithms into legalese"
- Salience
  - Notches create first-order welfare changes
  - Notches simplify (coarsen) consumer information
  - Fine-grained information might slip through net of consumer attention, whereas coarse information is snagged

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Why might coarse information be more effective than fine-grained information?

- Assume some cognitive cost of processing information
- Could be rational to ignore fine-grained information if expected gain small relative to cognitive cost
- **Is it rational for consumers to ignore energy efficiency when purchasing durables?**
  - Could justify notches
  - Could explain energy gap

Goal of this paper is to explore whether or not rational inattention is plausible.

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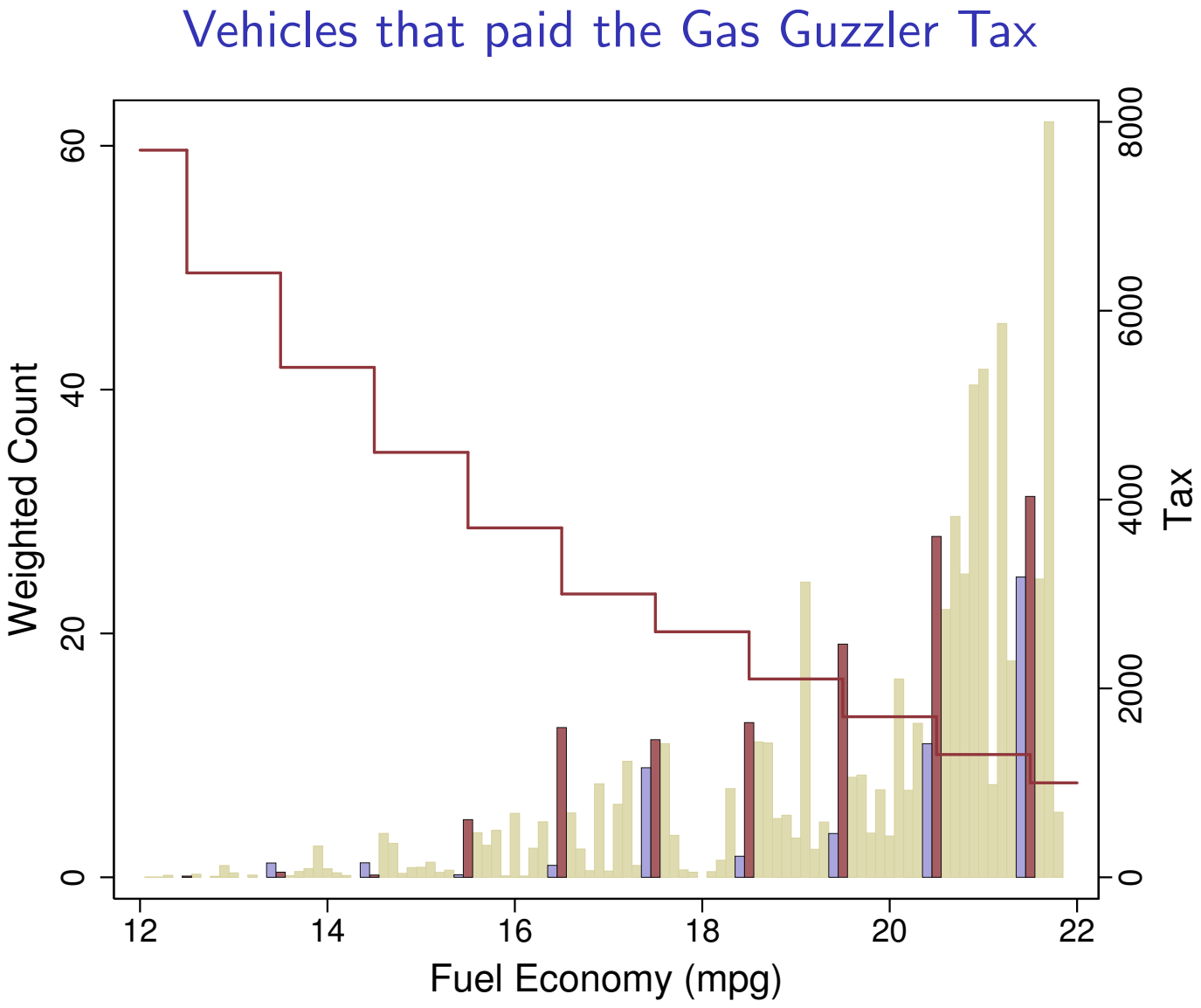
Research summary

1. Energy efficiency notches create distortions
2. Model: inattention more likely rational as...
   - Variance in energy costs smaller
   - Variance in other attributes larger
   - Cost of learning larger
3. Rational inattention is plausible
   - Learning about energy efficiency is valuable
   - But, variation in other attributes quite large
   - Learning is difficult

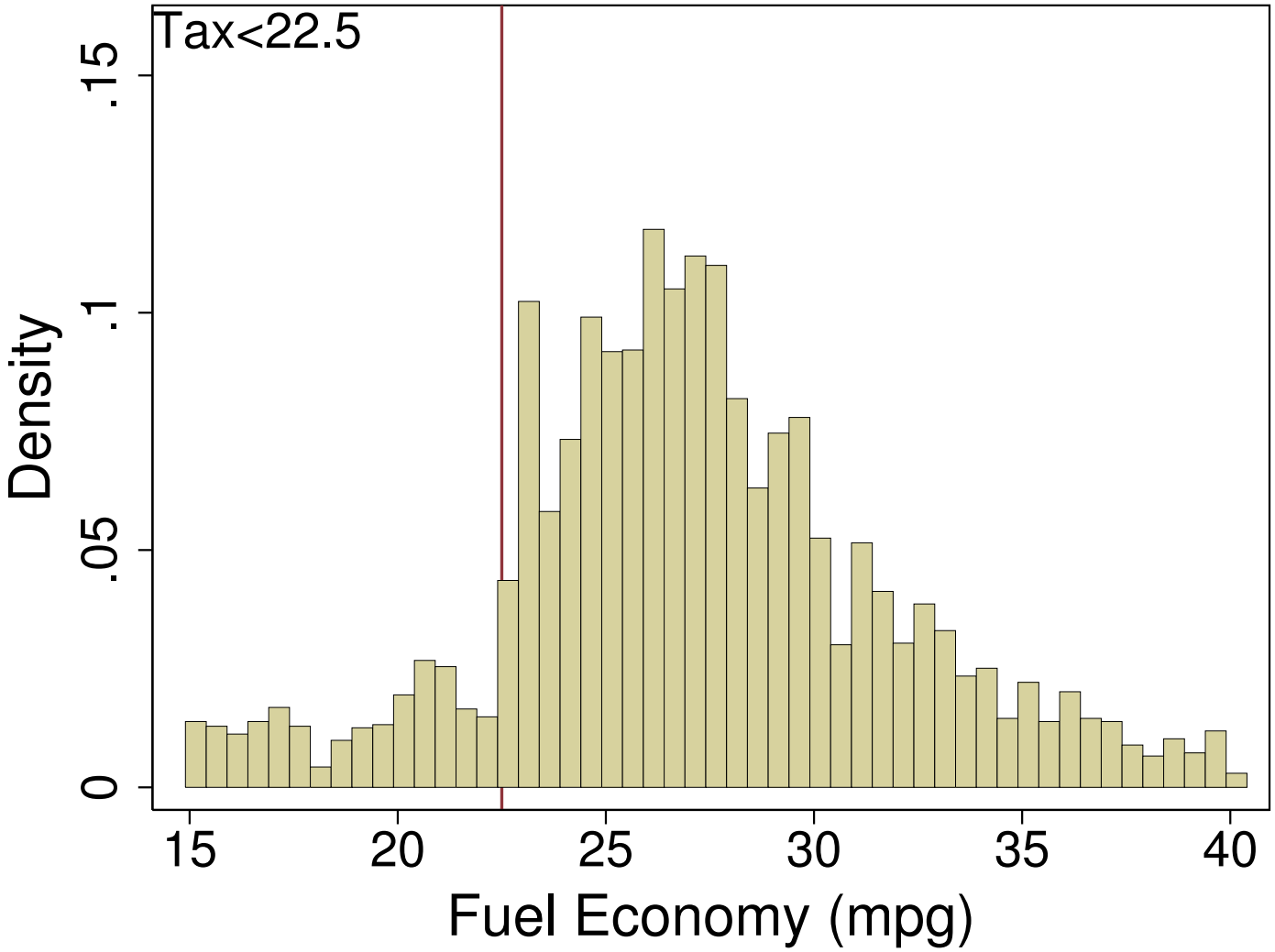
Producers respond to notches



Source: Sallee & Slemrod 2010

Producers respond to notches

Cars subject to Gas Guzzler Tax



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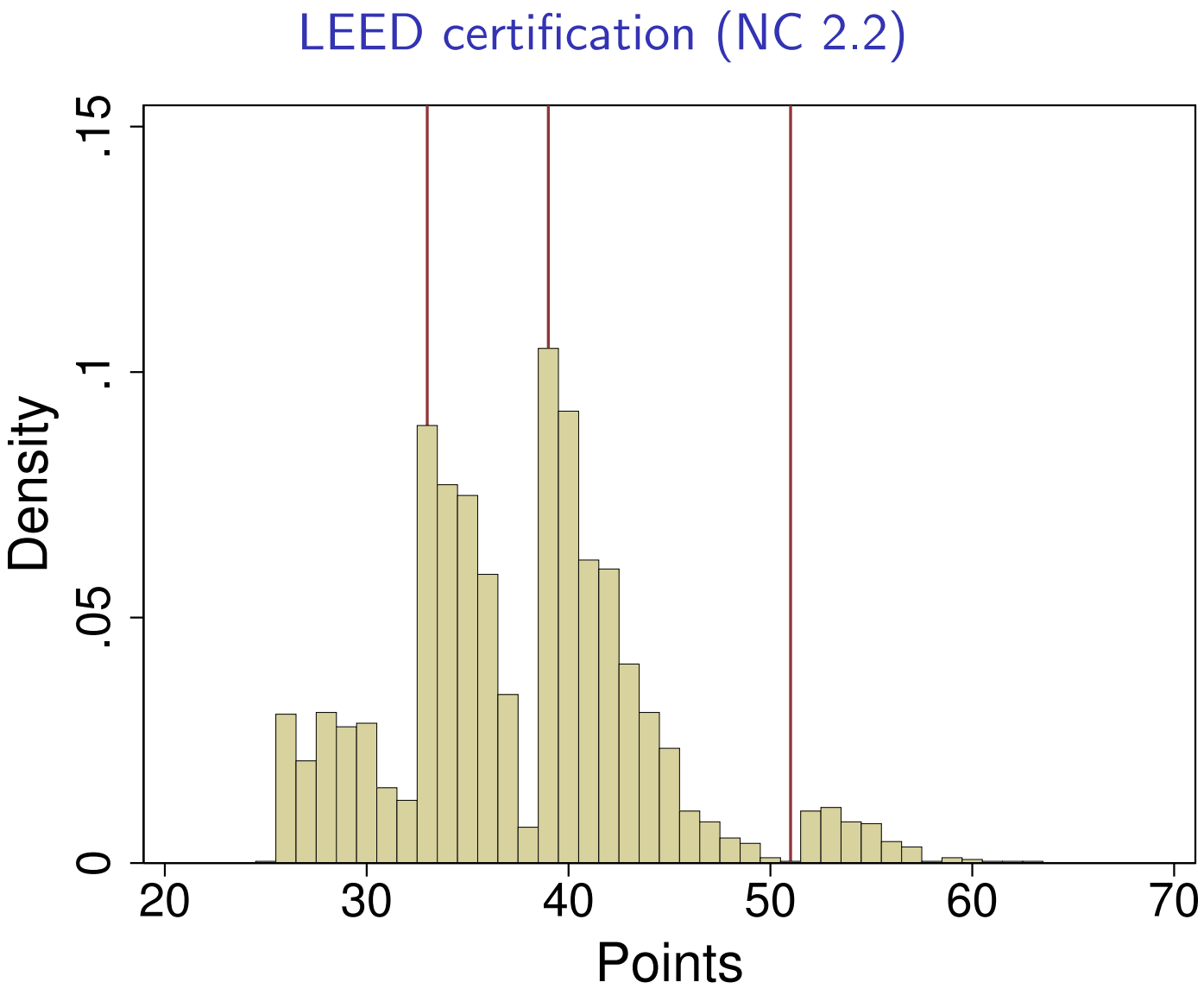

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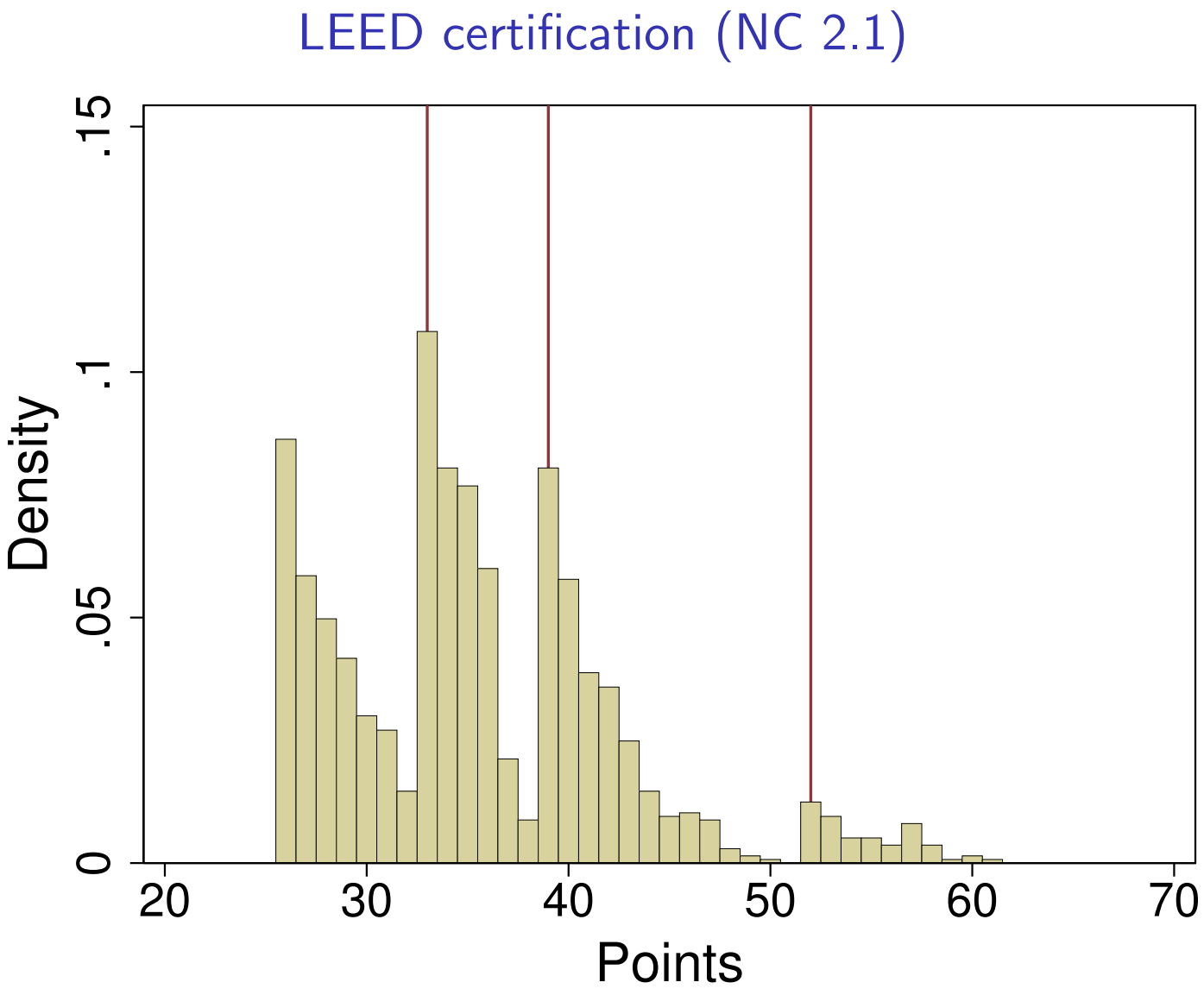

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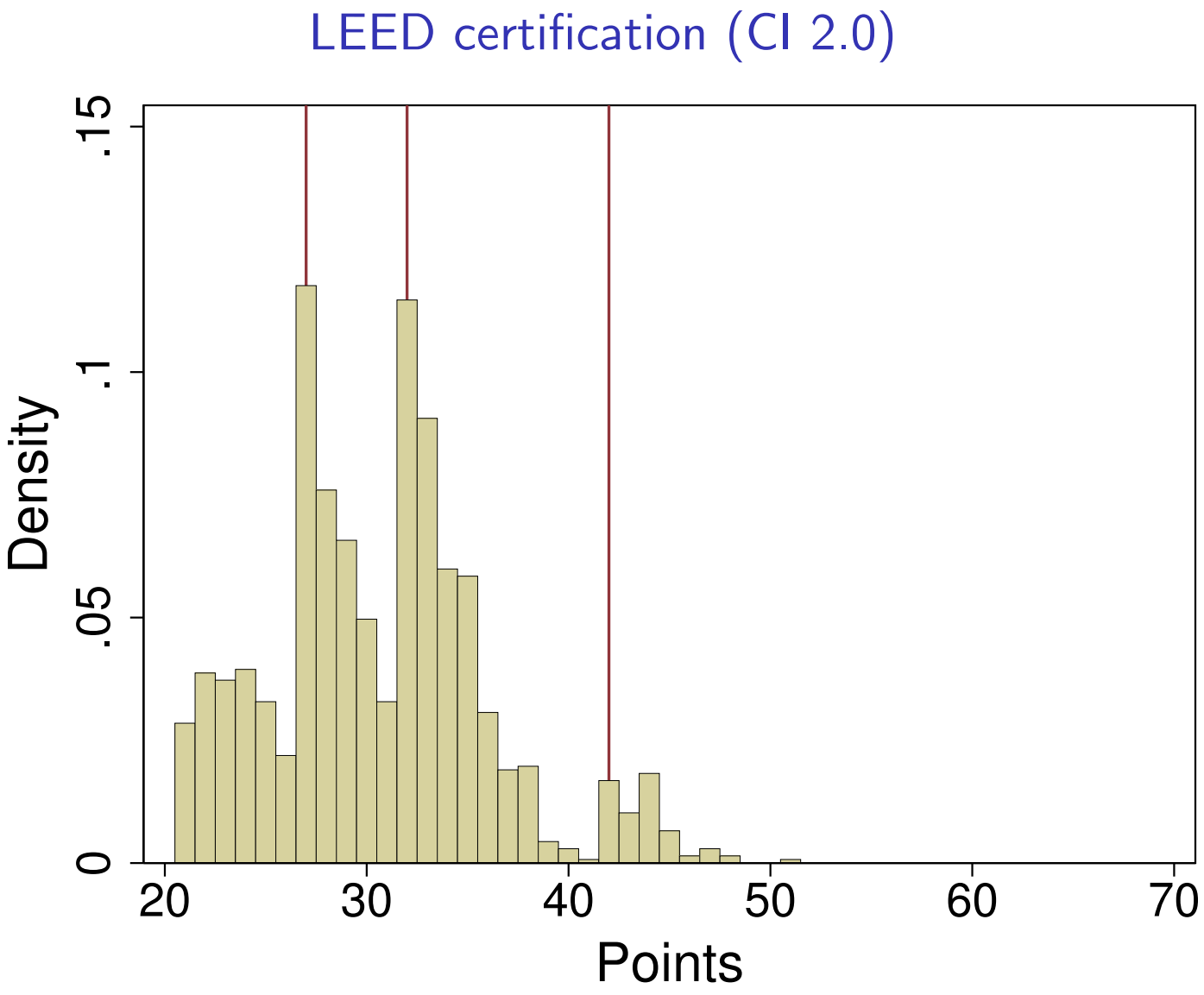

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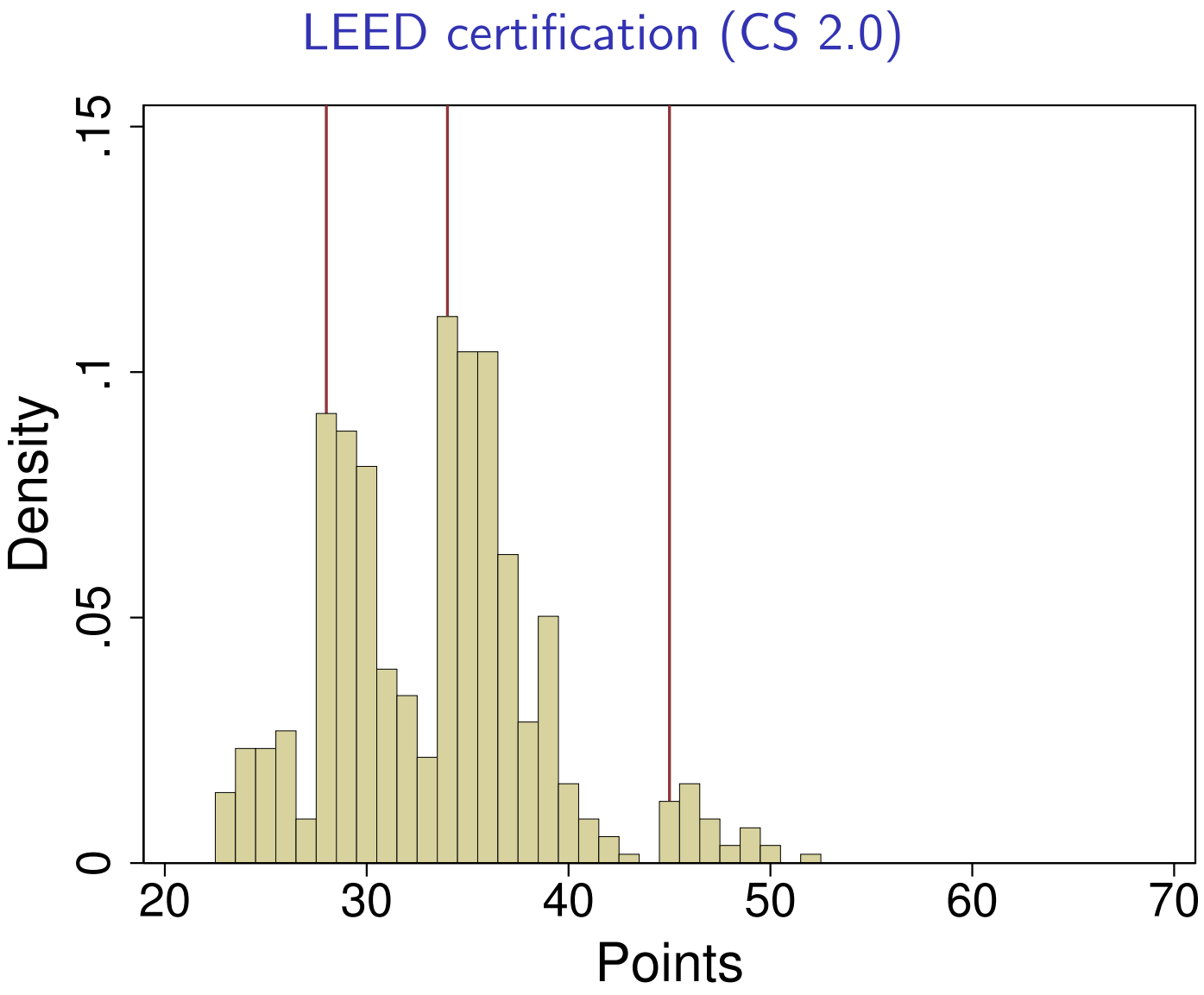
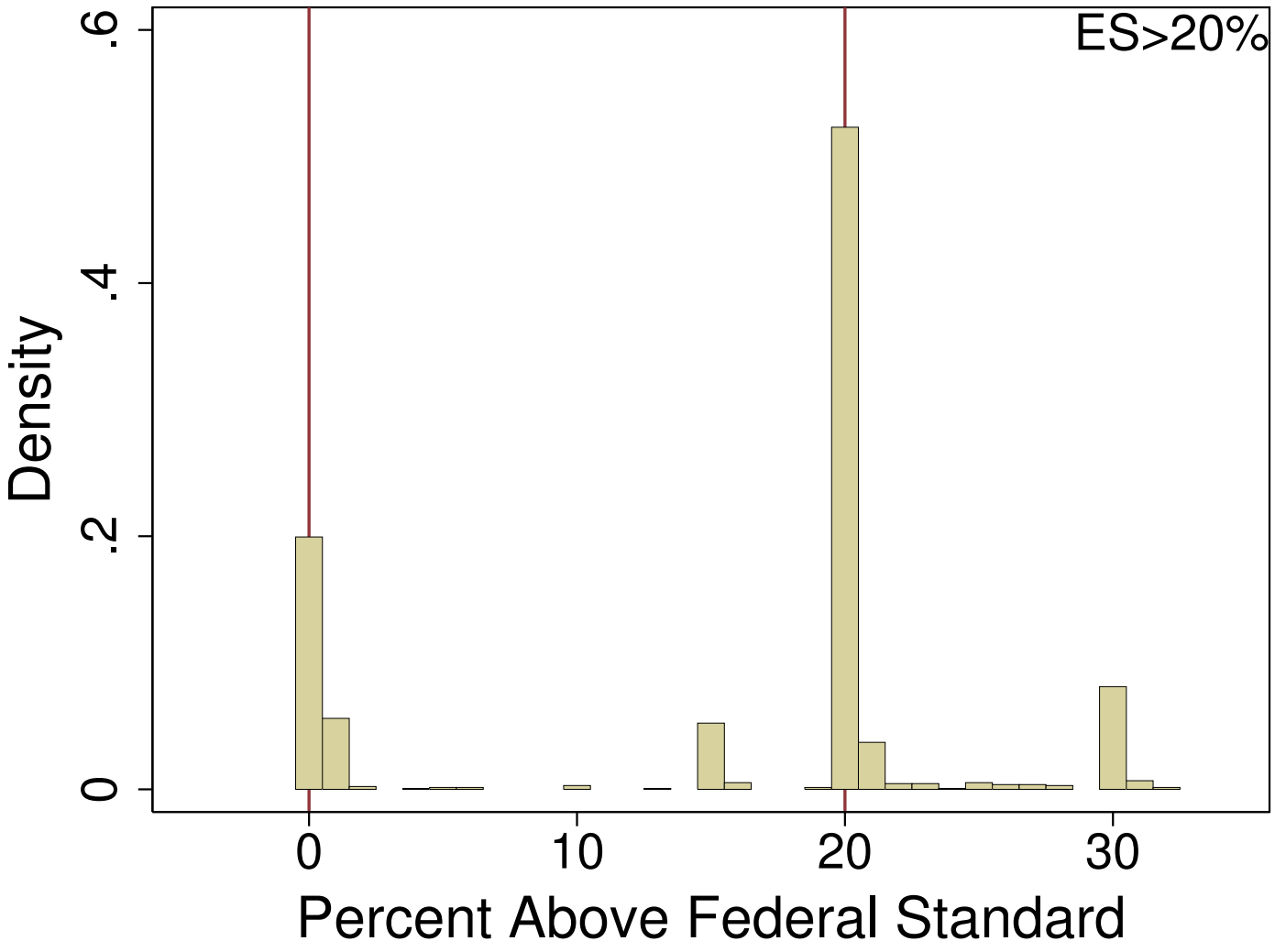


Producers respond to notches

Energy Star (refrigerators)



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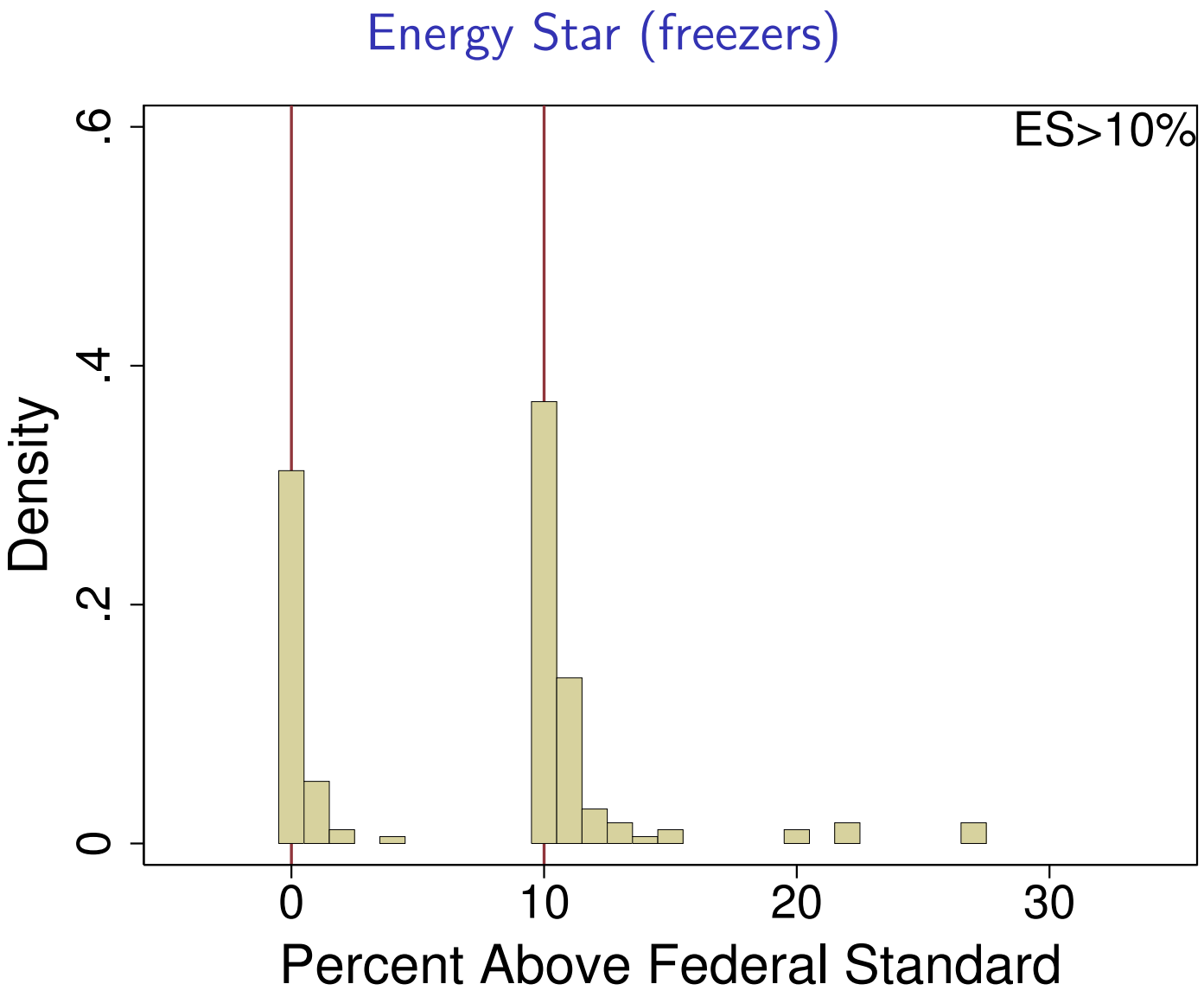
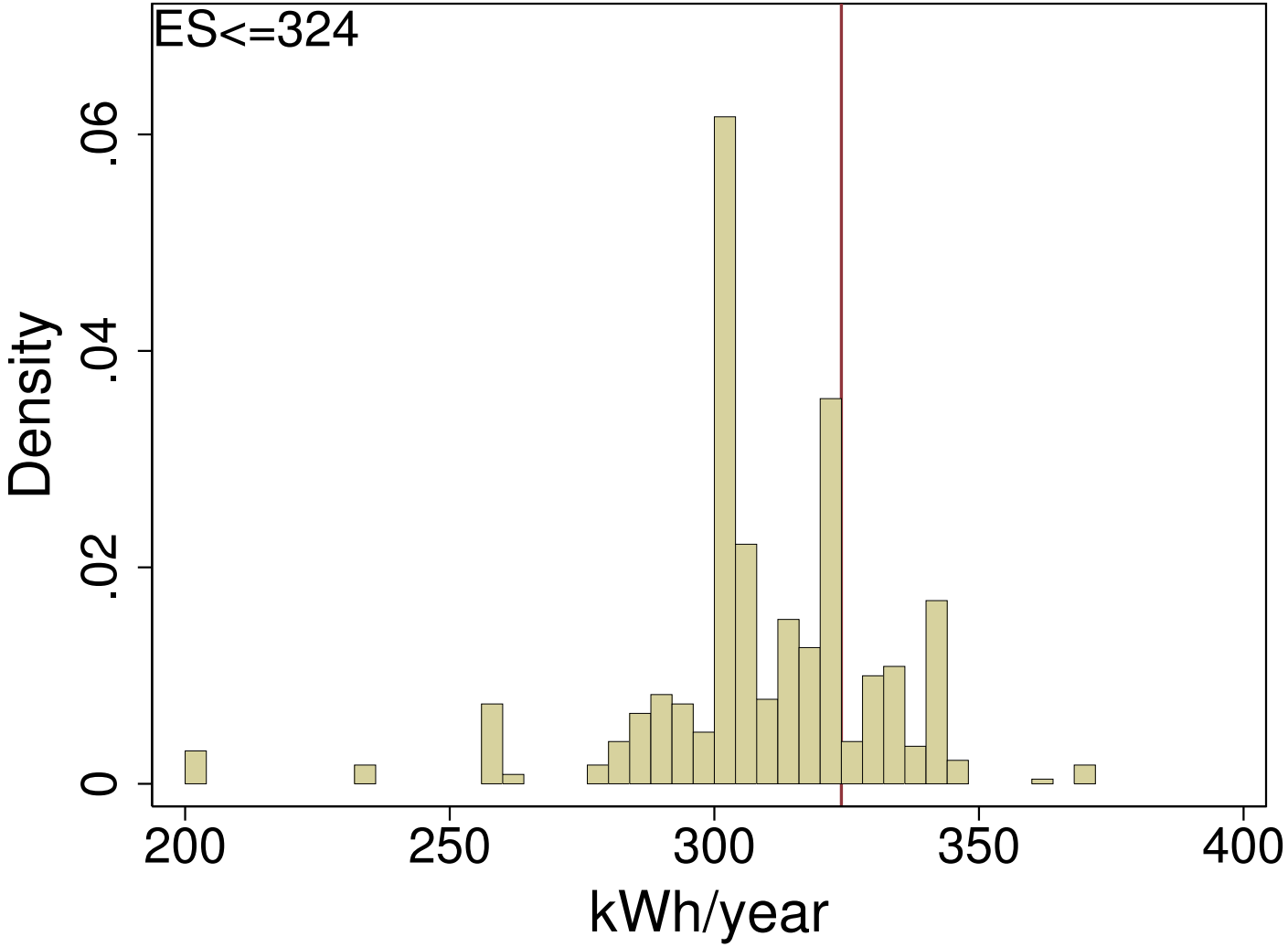


Producers respond to notches

Energy Star (washers)



Heuristic model of rational inattention

- Consumer makes discrete choice between models
- Uncertain of exact lifetime fuel cost
- Can learn exact costs after incurring search cost
- Does consumer pay information cost, or just choose without resolving uncertainty?

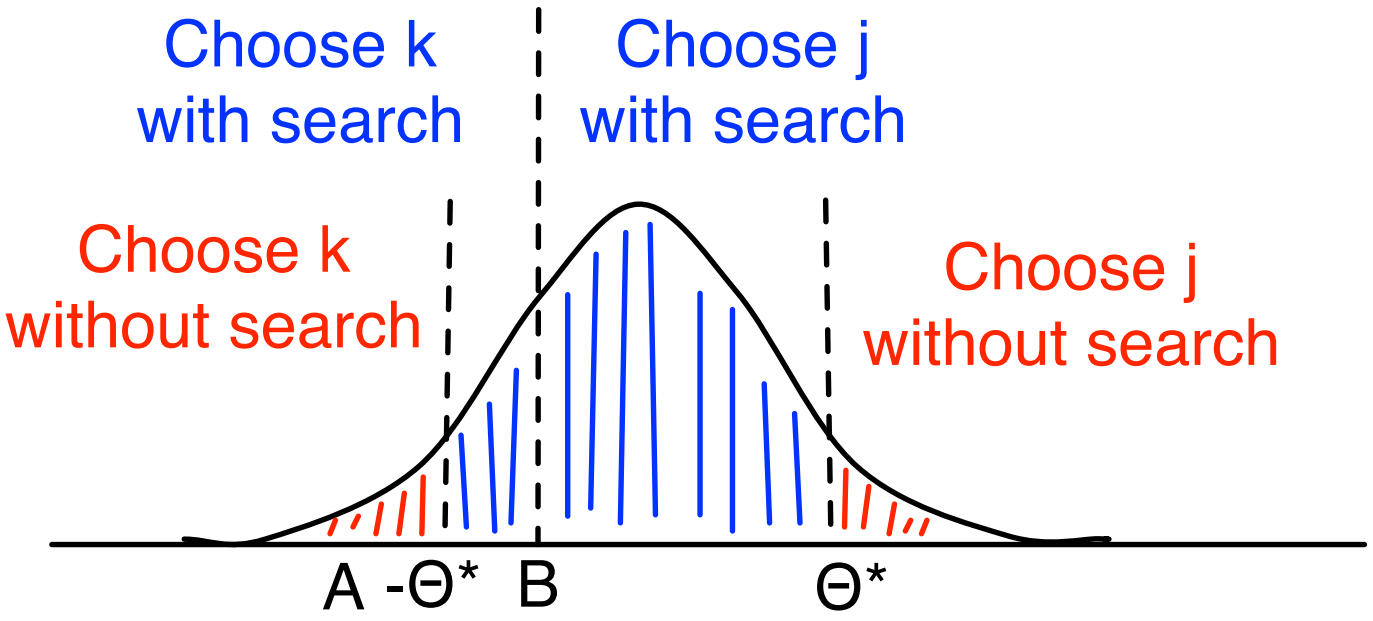
- Two good example:
  - Risk neutral consumer i
  - Models j and k
  - Difference in utility *not including energy cost surprise* is $\theta_i = V_j + \varepsilon_{ij} - V_k - \varepsilon_{ik}$
  - Energy cost surprise is $c \sim \mathcal{N}(0, \sigma_c)$ for both j and k (iid)
  - Search cost is s

- Consumer i will search iff:

$$(1 - \Phi(\theta_i/\sqrt{2}\sigma_c)) \cdot \left[\sqrt{2}\sigma_c \frac{\phi(\theta_i/\sqrt{2}\sigma_c)}{1 - \Phi(\theta_i/\sqrt{2}\sigma_c)} - \theta_i\right] > s.$$

- Search more likely as...
  - utility difference between models θ_i smaller
  - search cost s gets smaller
  - variance in energy costs σ_c bigger

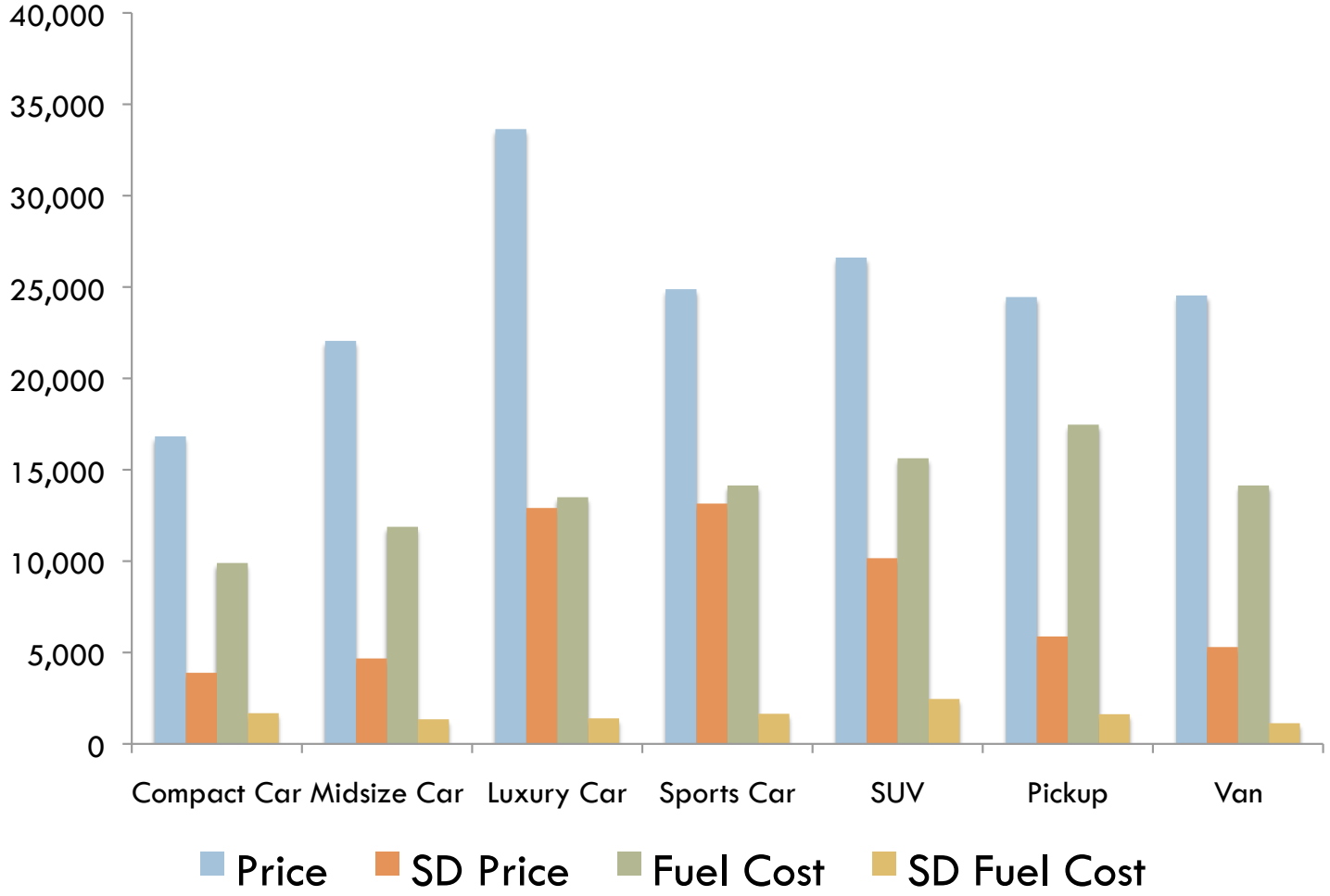
Search decision for different θ_i, holding fixed σ_c and s



- Consumers very far from indifferent $\theta_i > |\theta^*|$ will not search; choose without knowing true costs
- Consumers who like j and k about the same will search
- **Inattention need not induce underprovision**
  - If $-c_j + c_k = B$, then all consumers who would change purchase search; no mistakes are made and demand is a function of true energy cost

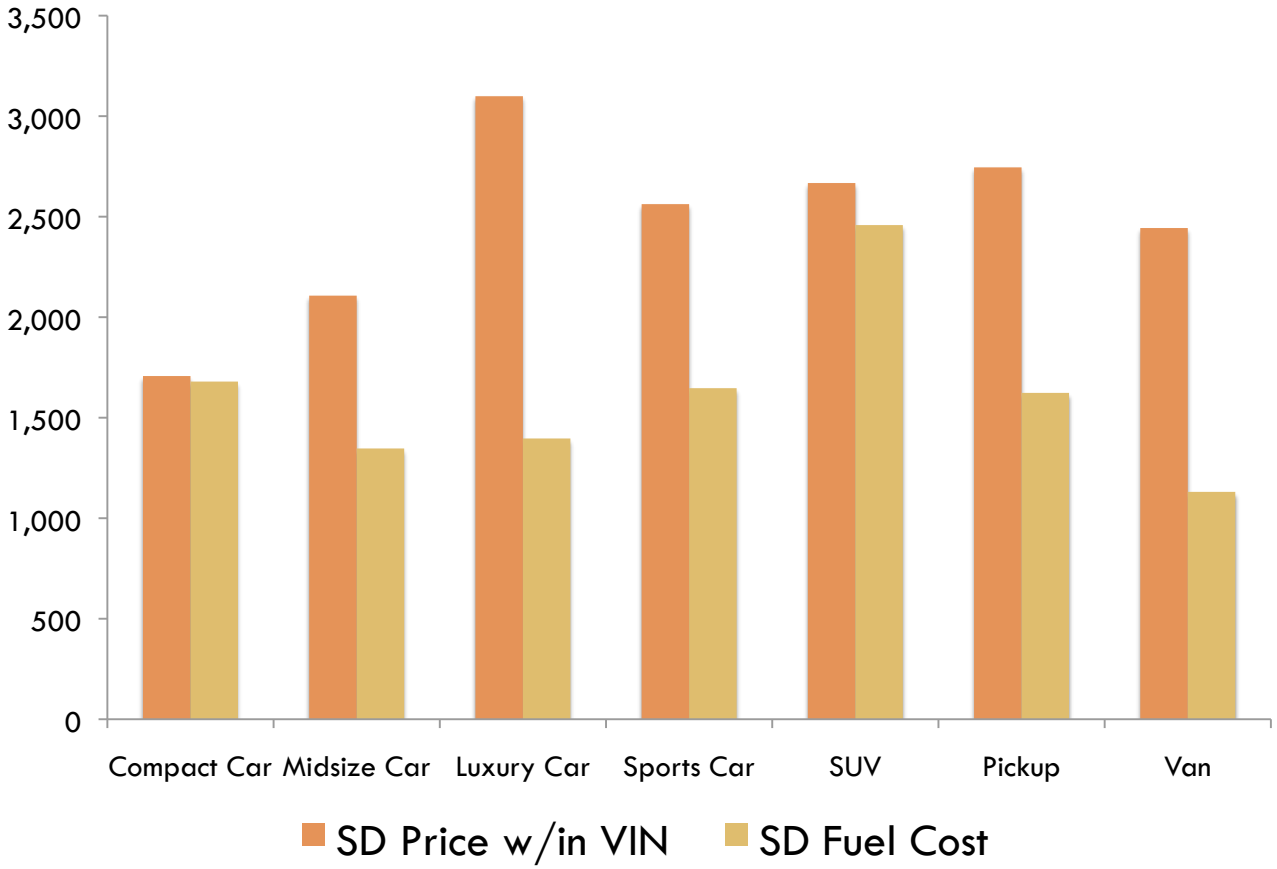
Automobile variation

Median and standard deviation in price and fuel cost by vehicle type



Automobile variation

Standard deviation in price **within VIN** and fuel cost **across VIN**



- Within VIN variation exceeds within class fuel cost variation
- Model year cycle: save $\approx$ \$150/month; one standard deviation change in *timing* $\approx$ \$750

- How hard is it to calculate fuel costs?
- Don't labels solve this problem?

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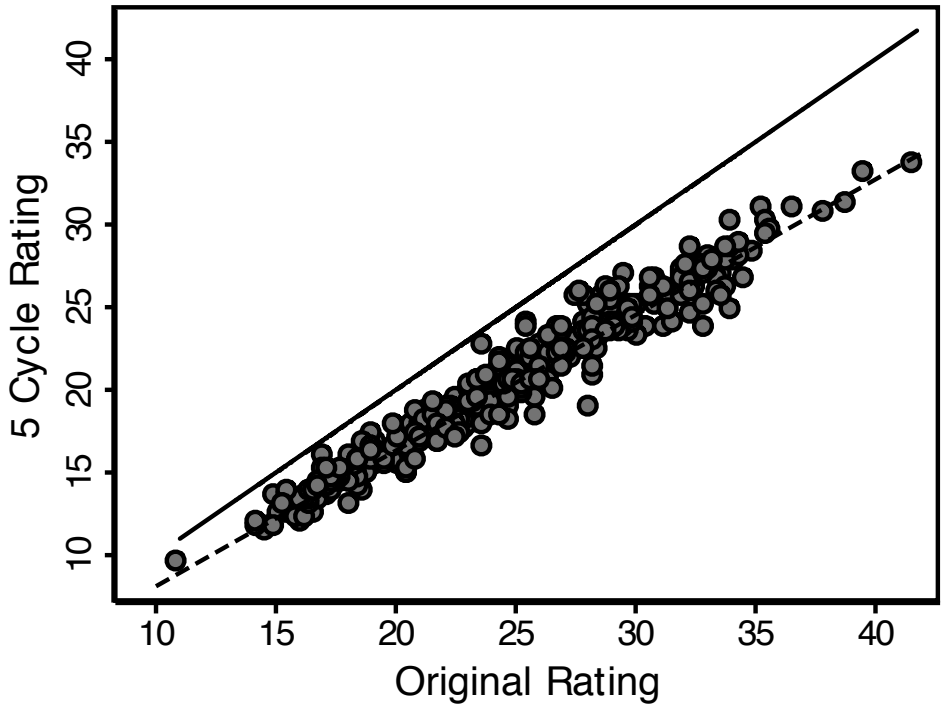
- Don't labels solve this problem?
- Information incomplete and imprecise

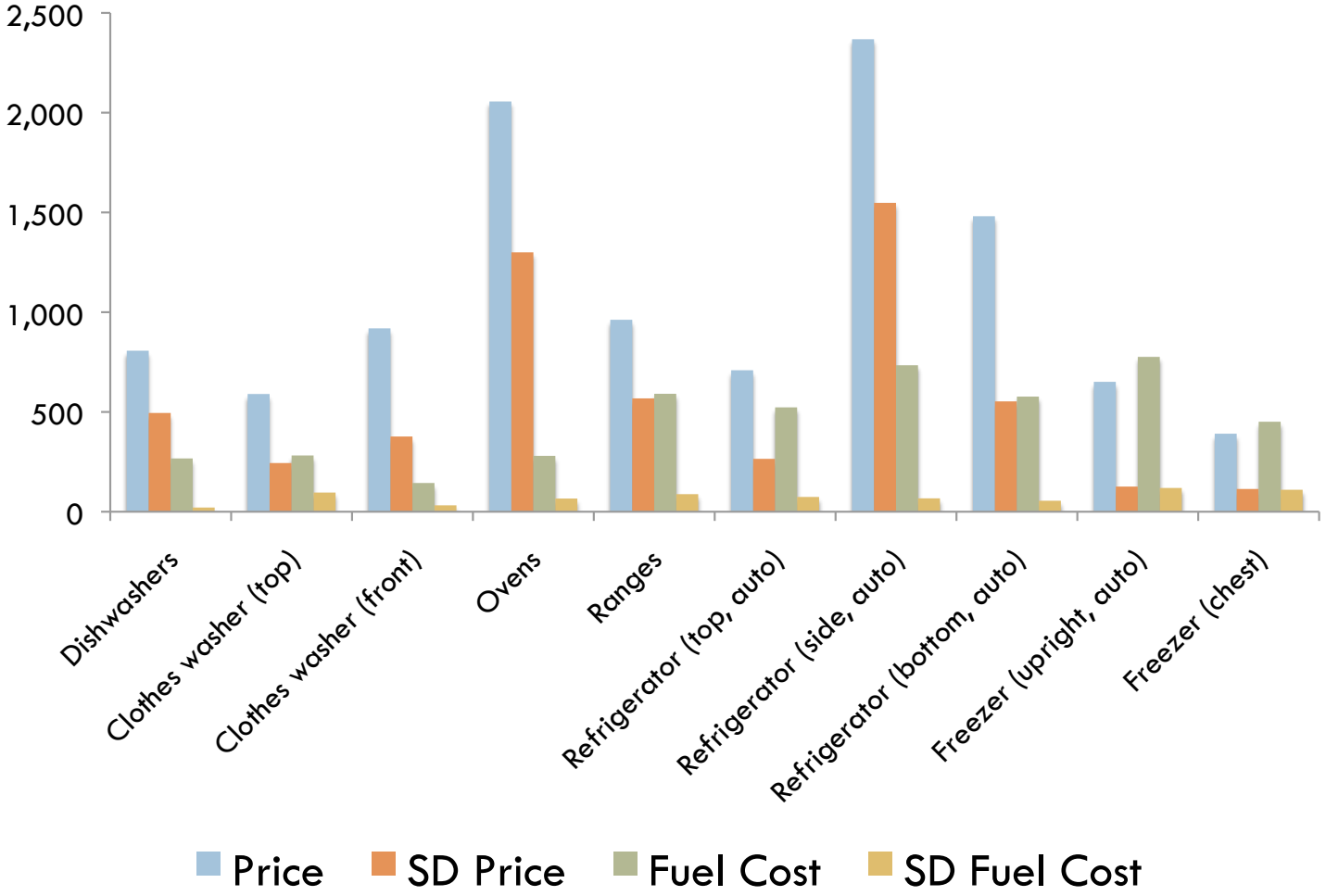
Variation in highway fuel economy between test methods



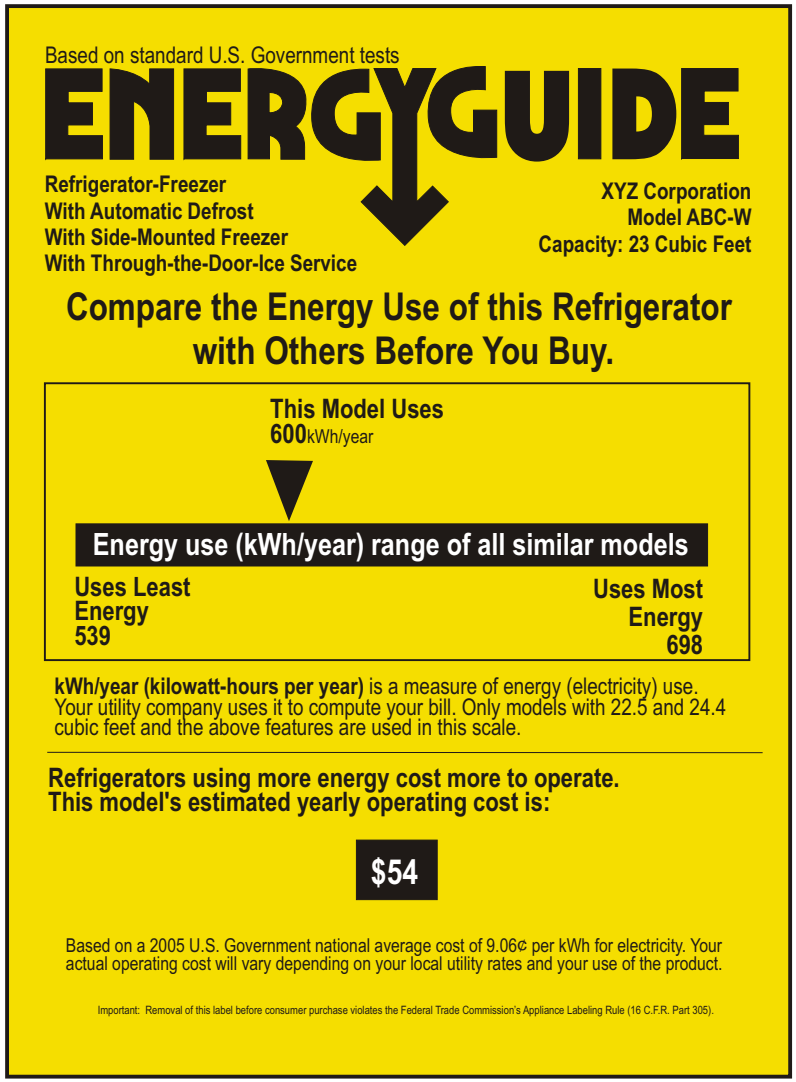
- EPA changed test procedure in 2008
- Mean change in lifetime fuel costs is $1,700
- Standard deviation in change in cost is $600

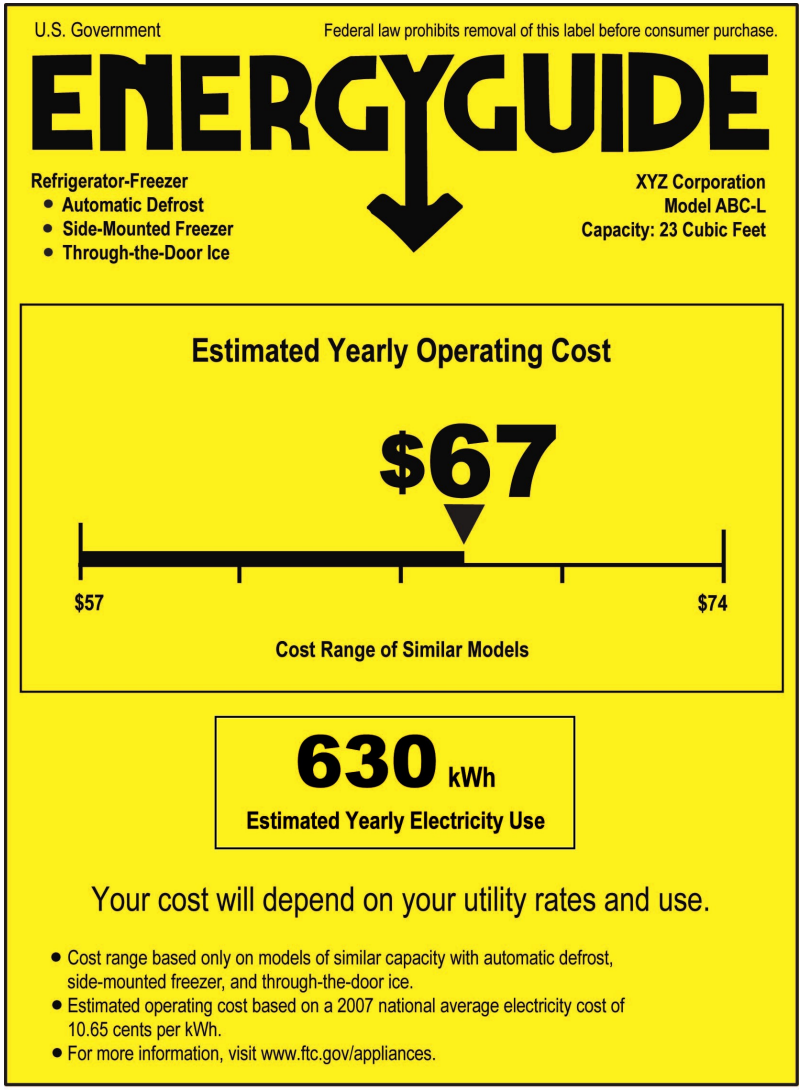
Appliance variation

Median and standard deviation in price and energy cost by appliance

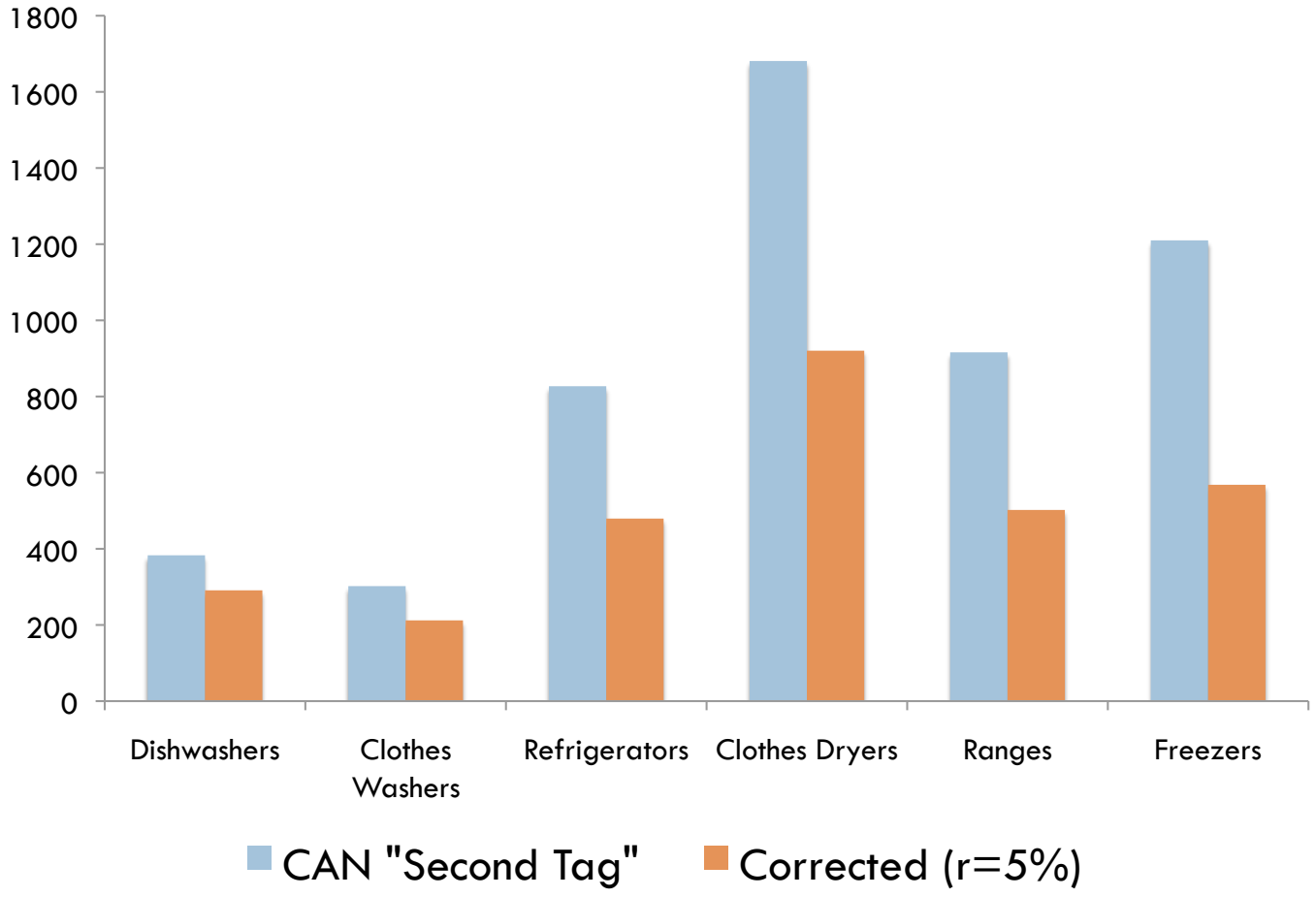


- What about appliance labels?





Lifetime cost without discounting and with 5% discounting



- Natural Resources Canada provides "second price tag" = lifetime cost of energy
- But, they calculate this **without discounting**
- Mistake creates large error in cost estimates
- Mistakes much larger than true standard deviations in fuel costs

Summary

- Markets respond to notches $\Rightarrow$ implies inefficiency
- Rational inattention plausible
  - Costs of information significant
  - Price variation large

Extensions

- Smaller appliances better candidates for inattention
- Discrete choice estimation to quantify distance, match model
- Second choice data to enable direct counting of mistakes
- Field experiments