

# Regulatory Studies Center

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## Benefit-Cost Analysis Problems with Product Failures

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# Effects of Regulation on Product Quality

- Department of Energy appliance standards
  - Residential + commercial appliances
  - Over 60 regulated appliance categories
    - Air conditioners, furnaces, ovens, microwaves, refrigerators, dishwashers
  - Often require technological change
- What are the effects of mandated efficiency on product quality?
  - Some existing literature based on *ex post* studies
  - Numerous class action lawsuits provide information on product defects
    - Class action lawyers have an incentive to identify and develop information on product defects

# Literature

- Sébastien Houde & C. Anna Spurlock (2015)
- Arlan Brucal & Michael Roberts (2015)
- Margaret Taylor, C. Anna Spurlock, and Hung-Chia Yang (2014)
- Ashenfelter, Hosken & Weinberg (2013)
- Hausman & Joskow (1982)
- Leland (1979)

# Literature

- Common themes:
  - Recent papers suggest energy efficiency rules have produced complying **higher “quality”** products at a lower price than projected by DOE
    - **“Quality”** as measured by additional features such as shorter wash cycles, heated dry, etc.
    - Impetus for an increase in product features may come from:
      - Test procedures with credit for less energy intensive options (e.g., shorter wash cycles)?
      - Product differentiation (non-price competition) associated with prohibition on low price, lower energy efficiency products?
      - Regulation spurs product innovation?

# Preliminary Takeaways

Product quality in terms of performance (including energy consumption) and reliability (repair record, product recalls, class action law suits, etc.)

**Strong assertion:** Design changes occasioned by energy efficiency standards have resulted in product quality problems.

**Weak assertion:** Energy efficiency standards have not resulted in improvements in product reliability.

# Case Studies: Appliance Class Action Suits

Regulated appliance	Standard compliance date	Linked to regulation?	Successful litigation?	Costs	Scope
Clothes Dryers	1994 & 2015	?	✓	Safety hazard	?
Side-by-Side Refrigerators	2001 & 2014	✓	✓	Repair, higher energy costs	30% + of refrigerator sales
Dishwashers	1994, 2010, & 2013	?	✓	Safety hazard	All major manufacturers
Front-Loading Clothes Washers	1994, 2004, 2007, 2015, & 2018	✓	✓	Repair, O & M, pedestal costs	All major manufacturers
High-efficiency furnaces	1992 & 2015	?	✓	Repair, replacement	> 3 million consumers
Air Conditioners, Heat pumps, HVAC	2006	✓	✓	Repair, replacement, refrigerant costs	7 major manufacturers

# Front Loading Clothes Washers

- DOE Energy Efficiency Standard, 2001
  - Based on energy savings from front loading washers
  - DOE Standards phased in: 2004 & 2007
- Transition from top-loading washers to front-loading washers
  - Top loading washers accounted for >90% of market prior to 2003
  - Front-loading washers comprised roughly 50% of market over 2005 to 2011 period



# Front Loading Clothes Washers

- Problem: Moldy Washers (and Laundry)
  - Whirlpool’s lead engineer stated in a 2004 memo that while mold can exist in any washer, their front-load machines are the “ideal environment for molds...we are fooling ourselves if we think we can eliminate mold...”
- Class Action Settlements: Moldy Washers
  - Whirlpool (includes Maytag and Kenmore), 2001 – 2010
  - LG, 2002 to 2006
  - Bosch/Siemens, 2004 to 2011
- Other class action cases
  - Samsung
  - Electrolux/Frigidaire
  - GE



# Front Loading Clothes Washers

- Manufacturer and Consumer Report Recommendations: Moldy Washers
  - Wipe down the glass and door gasket daily
  - Leave door open
  - Run a hot water wash w/ chlorine bleach monthly
  - Use high efficiency detergent
  - Use “Affresh” (Whirlpool product) or other cleaning agent
- These recommendations incur operation & maintenance costs
  - Costs borne by consumers
    - Affresh revenues to Whirlpool reported at \$195 million
    - Whirlpool indemnity payment to Sears of \$100 million for service calls under warranty

# Side-by-Side Refrigerators

- DOE Energy Efficiency Standard, 2001
- Side-by-side door refrigerators account for over 30% of market, 2001 to 2011
- Problem: Moisture/water leaks + ice-maker issues



# Side-by-Side Refrigerators

- Class Action Settlements
  - GE: 2006 settlement
    - GE re-designed body to meet 2001 DOE standard; but retained the old door design causing moisture/water leakage problems
    - Settlement covered 2001 and 2002 models (although plaintiffs argued some GE models retained suspect doors through 2005)

# Side-by-Side Refrigerators

- Other Class Action Settlements
  - Electrolux (Frigidaire & Crosley), 2015(?)
    - The lawsuit alleges that Electrolux has a history of making repairs it knows will not fix the ice maker malfunction. Electrolux thought it had a break-through in ice making technology. From the reports on Electrolux and Frigidaire branded fridges, the new technology does not work.
  - Whirlpool/KitchenAid, 2016
    - These 2 models—with Energy Star labels—were not in compliance with Energy Star requirements
  - LG/Sears, 2011
    - Models—with Energy Star labels—were not meeting Energy Star requirements

# Side-by-Side Refrigerators

- Other Class Action Cases: Moisture Issues
  - Whirlpool/Kenmore, Samsung, Viking (Amana)
- Basis of Viking lawsuit
  - Viking built into their refrigerators electrical fixes to alleviate moisture problems; but these fixes were not electrically connected in the factory for DOE testing.
  - The fixes were connected in the home when moisture related service problems appeared or *en masse* pre-sale by distributors
  - Service repairman reported that Viking installed the needed equipment; other manufacturers left the task to repair services

# Side-by-Side Refrigerators

- DOE Enforcement/Ice-makers
  - LG was required to remove the energy Star label from certain models (>20) of its refrigerators because it was certifying these models with its tube and ice ejection heaters in the “off” rather than “on” position. (2010 decision)
  - LG was required to make annual payments to consumers for their expected useful life for these LG and Kenmore-brand models to compensate for excess electricity consumption

# Other Cases: HVAC & Furnaces

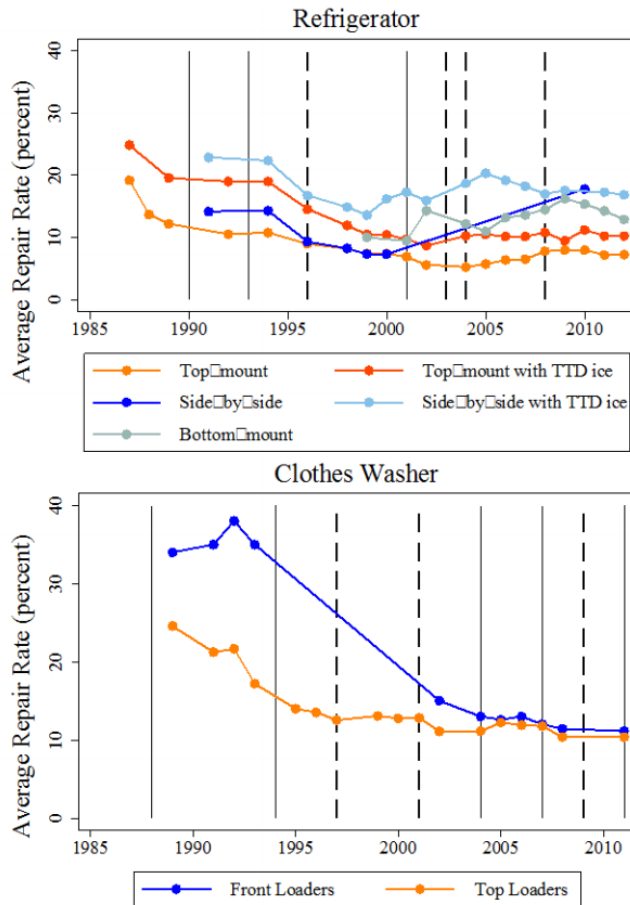
- Central air conditioners & heat pumps
  - Copper coil defects led to costly refrigerant leaks
  - Implicates several major manufacturers
    - York, Goodman, Aspen, Trane, Carrier, Lennox, Rheem
    - Successful litigation against York, Lennox, Johnson
- High-efficiency furnaces
  - Secondary heat exchangers failed
    - Necessary component of high-efficiency condensing furnaces
  - Affected 3 million consumers in U.S., Canada
    - Successful litigation against Carrier

# Other Cases: Dishwashers

- DOE standard: 1994
- Class Action Lawsuits: Electrolux, Kenmore, KitchenAid and Whirlpool dishwashers
  - Electronic control boards overheat and may cause fires
  - Links to energy efficiency standards?
  - Kenmore, KitchenAid & Whirlpool suit settled: 2016
- Product Recalls to Address Fire Hazard
  - Bosch, Maytag, GE
  - Recalls covered over 6 million machines



# Alternative Indices of Product Quality



Source: Taylor et al., *Resources for the Future*, 2015

## Side-by-Side Refrigerators

- Consumer Reports tests found that refrigerators use about 20% more electricity than listed on EnergyGuide labels (2010)
- 2017 CR reports much higher repair rates ranging from 32% to 40% (ice-maker) and 32% to 47% (French door)

## Front Loading Washers

- CR consistently downplayed the moldy washer problem; recommended front loaders over top-loader machines during 2003 – 2010
- 2017 CR reports much higher repair rates for front-loading washers ranging from 18% to 29%

# Retrospective Benefit-Cost Analysis

- What role should this information play in ex post analysis?
  - Ex post appliance studies do not incorporate information on product defects (e.g., information from class action lawsuits)
- Discovery of ex post costs (e.g., repair costs, energy use, O&M costs):
  - Survey consumers? Appliance repair firms?
  - Track record on consumer purchases of warranties?
  - Product recalls?
  - Class action settlements are illustrative of problems
    - Do they provide relevant information on costs?
    - Counterargument: manufacturers are ultimately responsible for product quality (or lack thereof)

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