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Household preferences for load restrictions: Is there an effect of pro-environmental framing?

Lars Persson

Aemiro Melkamu Daniel and Thomas Broberg

Centre for Environmental and Resource Economics
Umeå School of Business, Economics and Statistics

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Why household load restrictions?

- Deregulation; Integration; Nuclear phase out; EOM vs capacity
- Production mix; Intermittent generation
- Variable supply that must be matched with flexible demand
- Flexible resources on the demand side required
- Residential sector contributes to hourly demand fluctuations
 - Digitalization and automatic response easy (heating, refrigerator, etc)
 - Behavioral changes harder (appliance level)

Why framing effects?

- Behavioral changes hard to obtain?
 - Research gives that households are not willing to accept load control (at least very expensive)
- Emphasizing environmental benefits (pro-social framing) of policies may help
 - True or False?
 - Monetary “framing” not enough to motivate
 - Opinions that “environmental benefit” is a relevant factor
 - Try to explicitly test this idea

Hypothesis

- For household electricity use, emphasizing environmental benefits encourage consumers to opt-in and accept stricter load control

Results

- In a context of electricity contracts, no strong effects from emphasizing environmental benefits are found
 - We find some effects though...

- No real world data
- Collect data on stated preferences
 - Hypothetical electricity contracts targeted at behavioral changes (appliance level during peak hours)
 - Choice of preferred contracts reveals attribute preferences
 - 2,000 respondents; Swedish households; Detached, semi-detached and terraced houses
- Many challenges and limitations...
 - What attributes?
 - How to define a pro-environmental framing?

Contract attributes

- Maximum load (not incl heating, lighting, low power)
5,000w; 3,500w; 2,000w
- Choice of appliances
fixed; flexible
- Duration and timing
5.30-6pm; 5-6.30pm; 4.30-7.30pm
- Number of days during winter season
5; 10; 20
- Monetary compensation
SEK 300; 750; 1500; 2500

[Communicated 1 day ahead]

Example of choice card

Which of the following A, B or C contracts would you choose if offered to you? Unless otherwise stated in the agreement, everything else works as today (such as e.g. price level and price fluctuations).

	Contract A	Contract B	Contract C – as today
Load control	5000 watt	3500 watt	As today
Choice of appliances	Pre-determined given the load	Flexible given the load	As today
Duration	4.30pm-7.30pm	5pm-6.30pm	-
Number of days	5 days	20 days	-
Compensation	2500	750	-
My choice	[]	[]	[]

Note that each respondent faces 8 different choice cards

Modeling of framing

- What is a pro-social framing?
 - Information emphasizing env. benefits from a policy
 - Several dimensions and levels
 - Related to “information effects” in SP literature
 - Choices contingent on information provided
- How to introduce the information?
 - Too strong – impose preferences, not relevant
 - Too weak – no effect at all
 - Focus groups

- One script before choice-section in questionnaire

[All] Any of the non-status quo contracts make electricity supply more reliable.

[Pro-env.] By reducing the use of electricity during times of high pressure on the grid, the transition to renewables such as solar and wind is facilitated. In this way, Swedish electricity production can be fully CO₂-free in the future.

- One short reminder before every single choice

[Pro-env] The new contracts facilitate the transition to renewable energy sources.

In principle, would like to compare choices (preferences) between treated and non-treated

Step 1: Current habits

Considering weekdays, 4.30-7.30pm, December through February.
How often does your household use the following appliances?

4-5 days/week

2-3 days/week

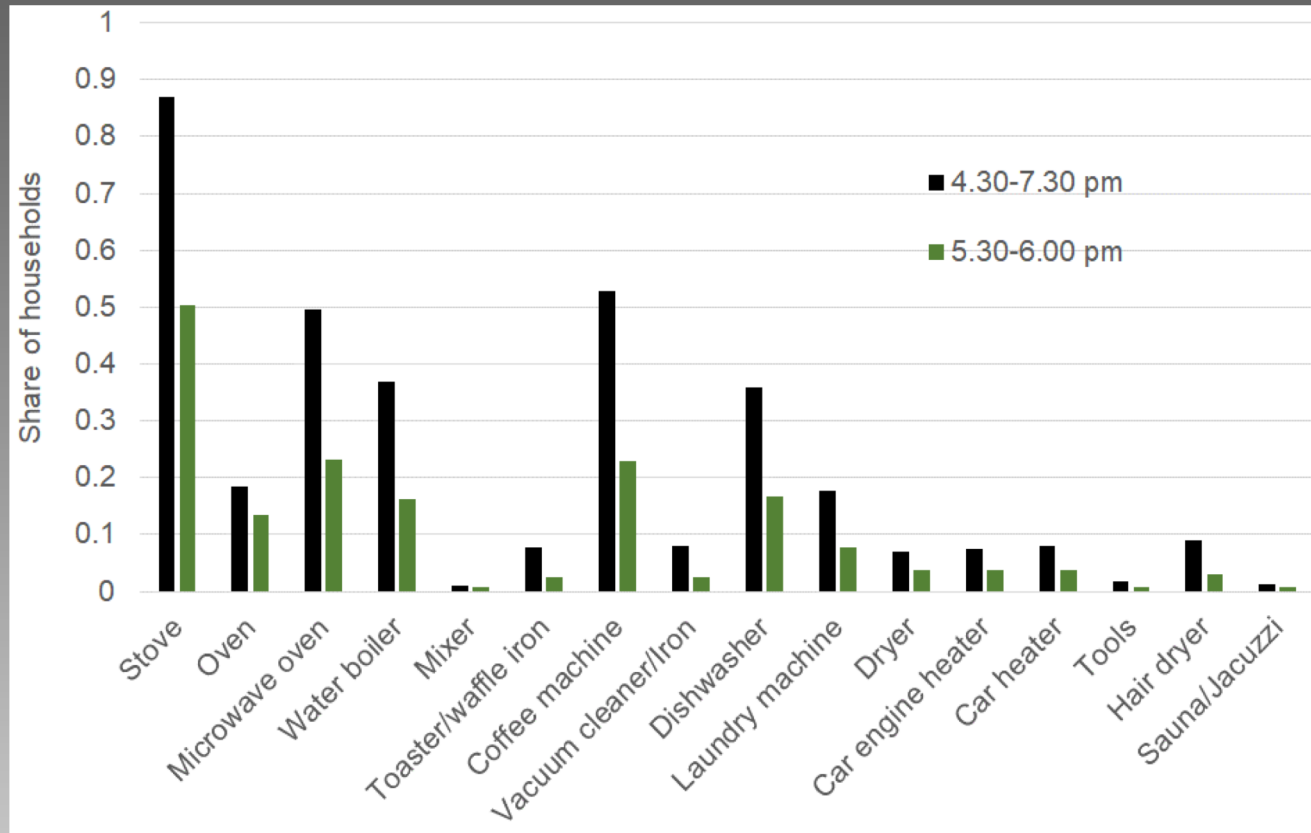
0-1 days/week

Never

[16 different appliances – high power]

[Also asked about 5.30-6pm]

Appliance use in peak hours during winter season



[4 to 5 workdays during a typical week]

Step 2:
How strong habits?
Affected by the framing?

- The choice of contracts in general
 - Lower share of status quo choices among treated
 - Treated are relatively more positive to being restricted
- Attribute specific preferences (general)
 - Restrictions are negative
 - Compensation is positive
 - Financially significant amounts
 - Statistically significant overall difference between groups

- Only towards two attributes, there is a significant effect from treatment
 - Treated are less negative towards many days of restriction
 - Treated perceive flexibility in choice of appliances as less important

Variable	Control		Green		Differences	
	Est.	s.e. ^c	Est.	s.e.	Est.	s.e.
Watt3500	67.2	62.0	197.4***	68.2	130.2	92.2
Watt2000	586.5***	77.3	543.0***	78.0	-43.5	109.8
Flexible Appliances	-67.9	56.1	96.6	61.2	164.5**	83.1
Duration90	228.8***	62.5	235.9***	65.9	7.1	90.8
Duration180	1022.1***	80.7	1161.3***	91.3	139.3	121.9
Days10	447.2***	54.3	326.6***	60.4	-120.7	81.2
Days20	671.3***	67.0	472.0***	74.5	-199.3**	100.2
ASC1	1354.8***	119.6	1165.7***	116.2	-189.1	166.8
ASC2	998.3***	113.3	1084.9***	112.0	86.7	159.4

1 SEK = 0.1 Euro

So, rather weak effects from treatment!

But...

- Could their current pro-environmental behavior matter for the treatment effect?
 - Currently green behavior → No effect from framing
 - Currently non-green behavior → Attitudes related to flexible choice of appliances and duration changes

To conclude

- Done our best to find effects – still just small effects (indications)
- Disappointing? No, not necessary!
- Either there is no strong effect from any framing, or not just this framing...
 - Perhaps too weak?
 - [All] “*Any of the non-status quo contracts make electricity supply more reliable.*”
- Focus on those who are currently “non-green”

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Thank you for listening!

lars.persson@umu.se