Residential Demand for Renewable Energy: Results from the web-survey

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Outline

- The report structure
- My key questions
- My answers
- Econometric approach
- Results (excerpts)
- Policy implications

The Questions

- 1a. How much are households willing to pay to use only renewable energy?
- 1b Does willingness-to-pay (WTP) vary significantly across household groups?
- 2. How do general attitudes towards the environment (environmental awareness; membership in environmental organization; …) influence demand for renewable energy?

The Answers

- 1a) [**how much?]** WTP 4-7% of current electricity bill to switch to renewable.
  -- 4% (include zeroes)
  -- 7% (conditional on WTP>0)
  -- Differences between (and within) countries
  -- Consistent w literature
- 1b) [**Household variation?**] Yes, heterogeneity. Difference drivers of conditional WTP and market entry. Income: enter decision, but not level.
- 2. [**Attitudes:how?]**
  env concern +
  Membership in environmental organizations+

The data

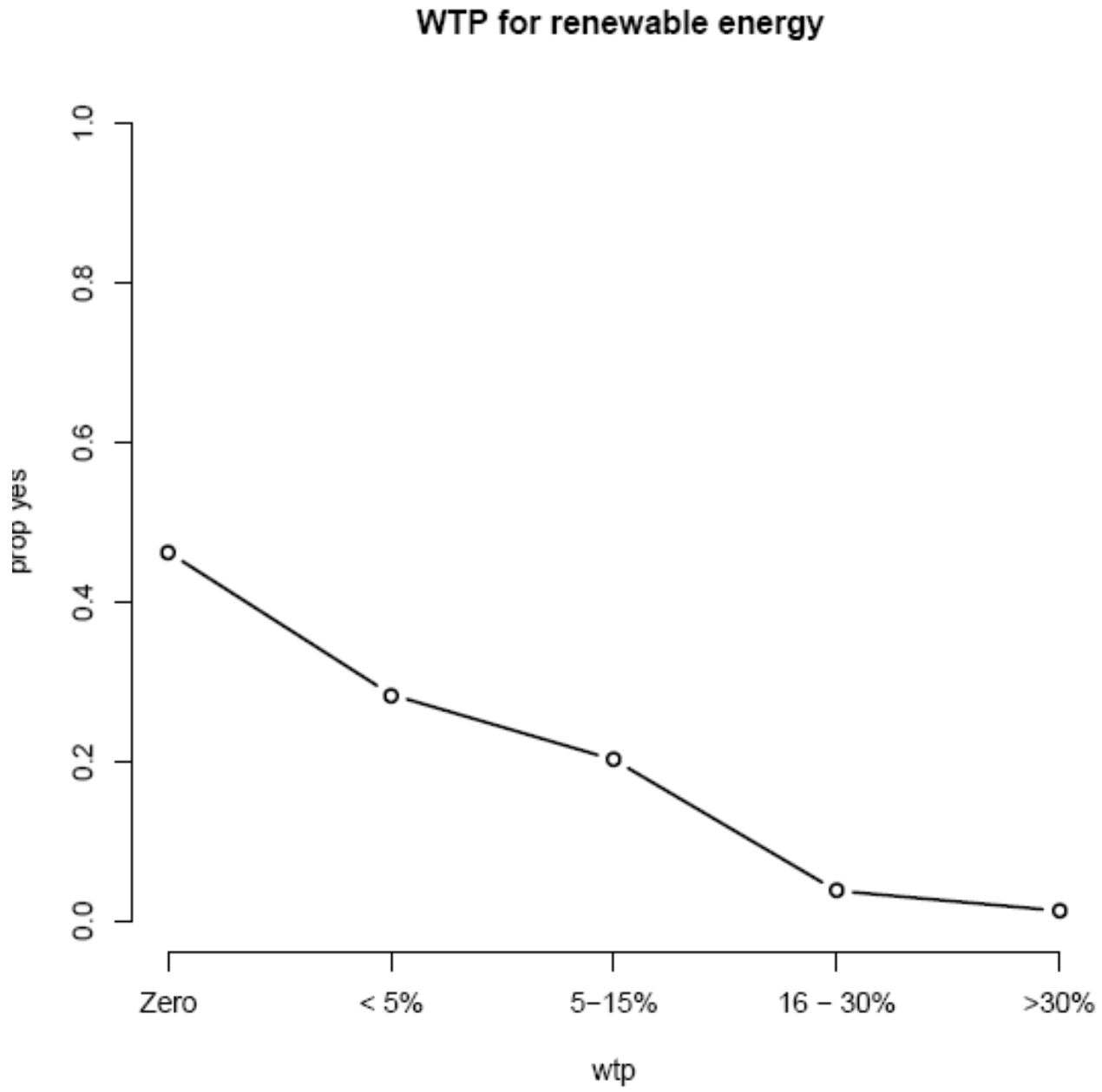
- The websurvey seems to give reasonable answers to most questions. I did a detailed analysis of the Swedish data
- Some questions unclear in the Swedish translation (my fault).
- Focus on Q67 and Q69 here

Does your household take special measures to buy renewable energy from your electricity provider? (Q67)

	yes	no	Do not know
Canada	0.10	0.67	0.23
Netherlands	0.43	0.47	0.09
France	0.05	0.85	0.10
Mexico	0.11	0.71	0.18
Italy	0.09	0.83	0.08
Czech Republic	0.04	0.76	0.20
Sweden	0.16	0.57	0.27
Norway	0.08	0.73	0.18
Australia	0.21	0.65	0.14
Korea	0.33	0.43	0.24
OECD-10	0.16	0.67	0.17

What is the maximum % increase in your Annual bill your are WTP to buy renewable energy from your electricity provider?

	Zero	< 5%	5–15%	16 – 30%	> 30%	Do not know
Canada	0.33	0.23	0.16	0.03	0.01	0.24
Netherlands	**0.64**	**0.16**	**0.07**	**0.00**	**0.00**	**0.13**
France	0.43	0.26	0.11	0.02	0.01	0.16
Mexico	**0.20**	**0.28**	**0.29**	**0.10**	**0.03**	**0.10**
Italy	0.37	0.26	0.18	0.04	0.01	0.15
Czech Republic	0.30	0.27	0.19	0.02	0.01	0.22
Sweden	0.47	0.13	0.16	0.03	0.01	0.22
Norway	0.43	0.17	0.19	0.03	0.02	0.16
Australia	0.37	0.27	0.18	0.03	0.01	0.15
Korea	0.29	0.34	0.17	0.02	0.01	0.16
OECD-10	0.38	0.24	0.17	0.03	0.01	0.17


WTP for renewable energy
prop yes
0.0
0.2
0.4
0.6
0.8
1.0
Zero
< 5%
5−15%
16 − 30%
>30%
wtp

Econometric approach

- Model selection philosophy
- AIC criterion: (**Akaike's information criterion**, developed by Hirotsugu Akaike))
  -- ”Shortest possible model that explains salient features of data” (penalize larger models)
- Significance test (95%)

Models

- I= Homogeneity
- II = Country level differences but same slopes
- III = Slopes allowed to differ between countries.

I will only discuss type II models in this presentation. Details for type III in the paper.

Table 6: The econometric models

Question	Objective	Response	Model Type
Q67 "Does your household take special measures to buy renewable energy from your electricity provider?"	Explore potential drivers of the decision to be active in the renewable energy market (electricity)	Binary (yes/no)	1. Logistic ("Standard 'bell'-shape type ") 2. Cauchy ("Fat-tailed") 3. Complementary log-log ("Asymmetric")
Q69. I "What is the maximum percentage increase on your annual bill you are willing to pay to use only renewable energy?	Estimate the "demand curve" for renewable energy (electricity)	Interval censored (willingness to pay belongs to known intervals)	$\Pr(T \geq t) = \exp(-\exp(\frac{\log(t) - X\beta}{\sigma}))$
Q69.II " Are you willing to pay anything?" (inferred from the zero alternative in Q69.I)	Analyze the decision to enter the market for renewable energy	Binary (willingness to pay zero/ greater than zero)	1. Logistic ("Standard 'bell'-shape type ") 2. Cauchy ("Fat-tailed") 3. Complementary log-log ("Asymmetric")

Theory and empirical testing

- Q67

  -- No strong theoretical model

Q69 (WTP to buy ”green electricity”)

-- Linked to a theoretical model.

-- Important to fix consumption of el.

-- to a first order approx. Income **does not** enter the model.

- **Green = Included on AIC criterion**
- **Blue = Included on basis of significance test**
- **Red = Not included and interesting that it was not**

Q67: Does your household take special measures to buy renewable energy from your electricity provider? (Binary data, logit, cauchy and c-log-log)	
Socioeconomics	Marital status **Gender** **Age** Level of education Employment status
Household	**Household composition (#children)** **Household income** Top earner in the household (yes/no)
Residence variables	Residence owner Duration of living in current residence Type of residence Area of residence (town.,village etc) Age of residence
Attitudes	**Economic concerns** **Environmental concerns** (index) **Environmental attitudes** (index)
Other	**Charitable org support (time)** **Env org support (time)** **Taking energy costs into account when buying/renting current residence**

Q69: What is the maximum percentage increase on your annual bill you are willing to pay to use only renewable energy? (WTP>0. Interval censoring type of data)	
Socioeconomics	Marital status **Gender** Age Level of education Employment status (retired)
Household	Household composition Household income **Top earner in the household (yes/no)**
Residence variables	Residence owner (**1. Living alone 2.sharing (Q1)**) Duration of living in current residence Type of residence Area of residence (town.,village etc) Age of residence
Attitudes	**Economic Concern** **Relative env concern (Q22.3)** **Environmental concerns index**
Other	**Charitable org time** **Member of environmental organization**

Mean and Median WTP (% increase of bill, by country. Weibull)

	Mean	Median
Canada	6.8	4.7
Netherlands	4.9	3.4
France	6.1	4.2
Mexico	8.9	6.2
Italy	6.7	4.6
Czech Republic	6.2	4.3
Sweden	6.9	4.8
Norway	8.1	5.6
Australia	6.6	4.6
Korea	6.2	4.3

Q69: Are you WTP anything? (derived from answers to Q69)	
Socioeconomics	Marital status Gender **Age** **Level of education** (**Bachelor, post-graduate**)
Household	Household composition **Household income** Top earner in the household (yes/no)
Residence variables	Residence owner (1. Living alone 2.sharing (Q1**)**) Duration of living in current residence Type of residence Area of residence (town.,village etc) Age of residence
Attitudes	**Economic Concern (Q22.2)** **Environmental Concerns (Q22.3 and index)** **Environmental Attitudes** (index)
Other	**Voluntary organization work** (time) **Member of environmental organization**

Policy conclusions

- The significant support to renewable energy ⇔ fairly weak demand reported in this and several other studies.
- “softer” policy instruments ⇔incentive-based
- Heterogeneities ⇔ “one size fits all“?