

# Green Energy household demand: focus on Italian, Dutch and Swedish energy markets.

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# Outline

- Survey Description.
- Data Description.
- Goals.
- H.D.D.
- Estimations.
- Preliminary Conclusions.

# O.E.C.D. DATA + H.D.D. data

- Web-based OECD Survey on Household Environmental Behavior. (2008)
- Subsample (Sweden, Netherlands and Italy)
- Additional data: Heating Degree Days

# Goals

- Estimation of WTP.
- Comparison of the 3 countries.
- Exploration of the factors that affect the wtp.

# H.D.D.

**Heating degree days (HDD):**The number of degrees that a day's average temperature is below 65° Fahrenheit (18° Celsius), the temperature below which buildings need to be heated.

Heating degree days (HDD) are used for calculations that relate to the heating of buildings. For example, HDD can be used to normalize the energy consumption of buildings with central heating.

Heating degree-day figures come with a "*base temperature*", and provide a measure of how much (in degrees), and for how long (in days), the outside temperature was below that base temperature. In the UK, the most readily available heating degree days come with a base temperature of 15.5°C; in the US, it's 65°F.

An example calculation: if the outside temperature was 2 degrees below the base temperature for 2 days, there would be a total of 4 heating degree days over that period (2 degrees \* 2 days = 4 degree days).

# HDD italy

- Weather data from 9 stations:  
Torino, Bologna ,Milano 215.43  
Napoli, Bari, Palermo. 143.88  
Rome, Firenze, Perugia. 98.67

Weighted monthly average per region  
(weights=population)

# HDD netherlands

- Weather data from 10 stations:

Rotterdam, Amsterdam . 243.62

Alkmaar, Utrecht . 237.42

Eindhoven, Venlo. 250.38

Arnhem, Apledoom. 264.33

Leewarden, Groningen. 268.28

Weighted monthly average per region  
(weights=population)

# HDD Sweden

- Weather data from 9 stations:

Stockholm, Vasteras ,Uppsala 353.82

Göteborg, Malmö, Linkoping. 331.61

Umeå, Gävle, Luleå. 436.91

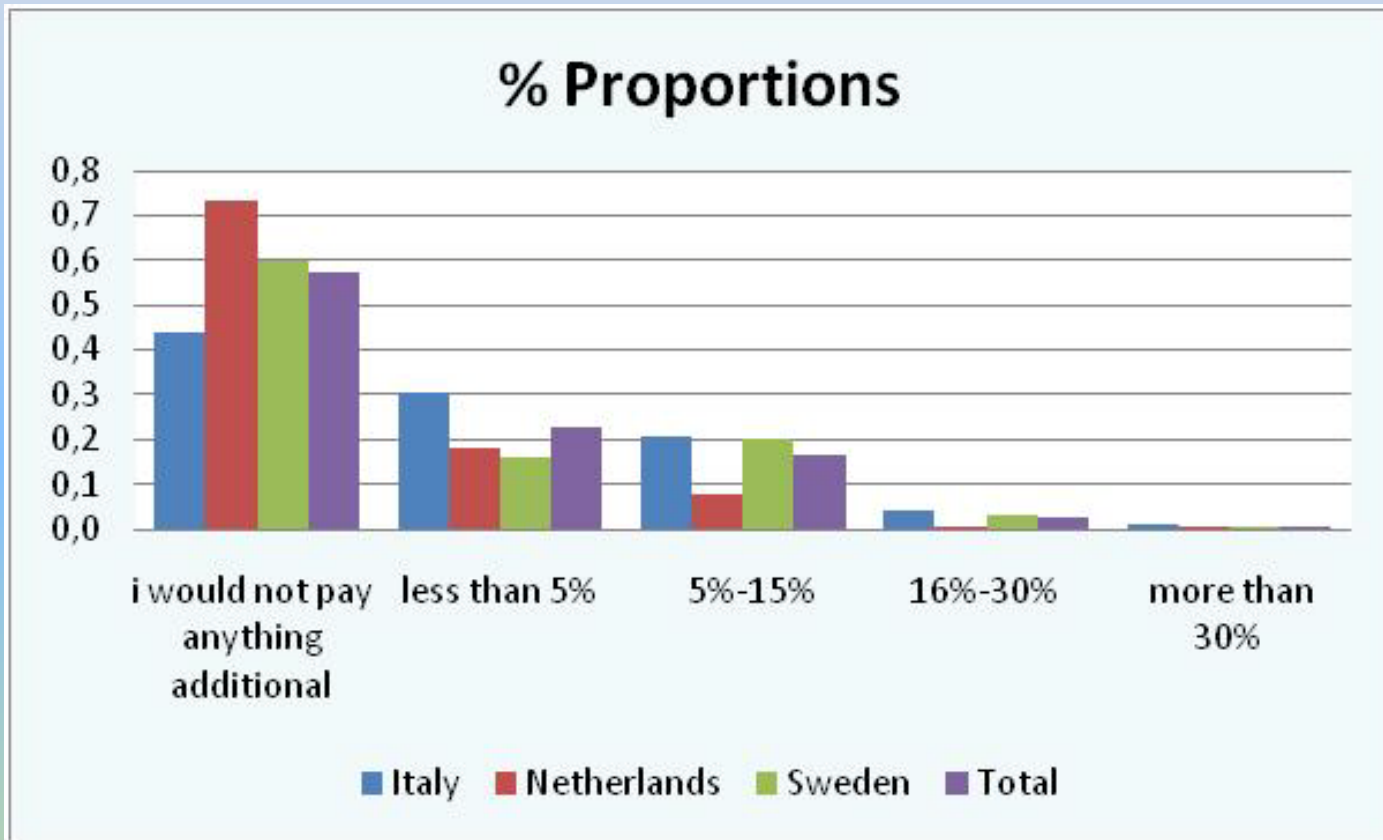
Weighted monthly average per region  
(weights=population)



# Demand for Green Electricity

- Q69. What is the maximum percentage on your annual bill you are willing to pay to use ONLY renewable energy?
  1. I would pay anything additional
  2. Less than 5%
  3. 5%-15%
  4. 16-30%
  5. More than 30%
  6. Don't Know.

# Wtp bar-chart.



# Estimations

	Turnbull(non parametric)		Weibull(parametric)			
	Lower Bound of WTP		Mean		Median	
	WTP>0	All Data	WTP>0	All Data(Zero)	WTP>0	All Data(zero)
Italy	<b>3.41</b>	<b>1.92</b>	<b>6.47</b>	<b>3.31</b>	<b>4.30</b>	<b>0.88</b>
Netherlands	<b>2.16</b>	<b>1.72</b>	<b>4.62</b>	<b>0.79</b>	<b>2.85</b>	<b>0.24</b>
Sweden	<b>4.30</b>	<b>0.58</b>	<b>7.86</b>	<b>2.66</b>	<b>6.18</b>	<b>3.90</b>

# Estimations(b).

	Turnbull(non parametric)		Weibull(parametric)			
	Lower Bound of WTP		Mean		Median	
	WTP>0	All Data	All data	All Data(zero)	WTP>0	All Data(zero)
Italy	<b>3.41</b>	<b>1.92</b>	<b>3.60</b>	<b>3.31</b>	<b>4.30</b>	<b>0.88</b>
Netherlands	<b>2.16</b>	<b>1.72</b>	<b>1.2</b>	<b>0.79</b>	<b>2.85</b>	<b>0.24</b>
Sweden	<b>4.30</b>	<b>0.58</b>	<b>3.1</b>	<b>2.66</b>	<b>6.18</b>	<b>3.90</b>

All Data(zero):  $0,1 < \text{Zero wtp} < 0,11.$ ,  $0,11 < \text{lessthan5\%} < 5$

# Modelling

## Weibull Survival Analysis

$$Pr\{T \geq t\} = \exp \left[ -\exp \left( \frac{\log(t) - X\beta}{\lambda} \right) \right]$$

\*For WTP>0

# FULL MODEL(a)

Variables	Estimated Parameters	Std. Error	P-value
Sex (female)	-0.1818	0.0780	1.98e-02
Age(18-24)	0.4909	0.1544	1.48e-03
Age(25-34)	0.0781	0.1148	4.96e-01
Age(45-55)	-0.0550	0.1161	6.35e-01
Age(55+)	0.0604	0.1195	6.13e-01
Education (did not graduate from high school)	0.0772	0.1366	5.72e-01
Education (some post- secondary education)	0.0434	0.0963	6.52e-01
Education(bachelor degree)	0.3854	0.1009	1.33e-04
Education(post graduate degree)	0.5142	0.1693	2.39e-03

# FULL MODEL(b)

Variables	Estimated Parameters	Std. Error	P-value
Employment(part-time-casual)	-0.2332	0.1197	5.14e-02
Employment(retired)	-0.3314	0.1325	1.24e-02
Employment(homemaker)	-0.0073	0.1799	9.68e-01
Employment(seeking of job/unemployed)	-0.5955	0.1896	1.69e-03
Employment(in employment but not currently working)	0.2816	0.2718	3.00e-01
Employment(student)	-0.0273	0.1619	8.66e-01
Employment(volunteer work only)	-0.3668	0.2940	2.12e-01
Employment(other)	-0.5759	0.1824	1.59e-03
Residence Size(less than 25 m <sup>2</sup> )	0.3378	0.3050	2.68e-01
Residence Size(25-50 m <sup>2</sup> )	0.4753	0.1219	9.58e-05

# FULL MODEL(c)

Variables	Estimated Parameters	Std. Error	P-value
Residence Size(101-150 m <sup>2</sup> )	0.0506	0.0920	5.82e-01
Residence Size(151-200 m <sup>2</sup> )	0.1625	0.1290	2.08e-01
Residence Size(more than 200 m <sup>2</sup> )	-0.0162	0.1700	9.24e-01
Safety Concern (Index)	0.1340	0.0232	7.87e-09
Environmental Concern (Index)	-0.1271	0.0255	6.41e-07
Economic Concern (Index)	0.1038	0.0249	3.10e-05
Membership to Env. Orgs (No)	-0.8431	0.0955	1.09e-18
Italy(dummy)	0.3435	0.0920	1.90e-04
Netherland(dummy)	-1.2219	0.1037	4.53e-32
Intercept	0.6041	0.2090	3.85e-03
Log(scale)	0.5947	0.0141	0.00e+00



# Swedish MODEL(a)

Variables	Estimated Parameters	Std. Error	P-value
Sex (female)	-0.31582	0.15535	4.21e-02
Age(18-24)	0.45302	0.28534	1.12e-01
Age(25-34)	-0.19189	0.23055	4.05e-01
Age(45-55)	-0.89908	0.23052	9.61e-05
Age(55+)	-0.54521	0.24258	2.46e-02
Employment(part-time-casual)	-0.67277	0.24938	6.98e-03
Employment(retired)	-0.50935	0.24502	3.76e-02
Employment(homemaker)	-1.06037	1.02528	3.01e-01

# Swedish MODEL(b)

Variables	Estimated Parameters	Std. Error	P-value
Employment(seeking of job/unemployed)	-0.58227	0.33110	7.87e-02
Employment(in employment but not currently working)	-0.17922	0.42889	6.76e-01
Employment(student)	0.08714	0.28646	7.61e-01
Employment(volunteer work only)_	0.32871	1.16937	7.79e-01
Employment(other)	-0.62584	0.37711	9.70e-02
Safety Concern (Index)	0.21044	0.04798	1.15e-05
Environmental Concern (Index)	-0.19663	0.05157	1.38e-04
Membership to Env. Orgs (No)	-0.72234	0.19856	2.75e-04
HDD	0.00461	0.00270	8.73e-02
Intercept	0.02879	1.01092	9.77e-01
Log(scale)	0.65256	0.02743	4.66e-125

# Preliminary Conclusions

- As far as it concerns wtp(2008):  
Netherlands < Sweden < Italy < 4%.
- Positive factors: education, sex(male), safety concern, economic concern
- Negative Factors : unemployment, size of the house(possible instrumental variable for consumption), environmental concern!!!

# Preliminary Conclusions

In Sweden:

- Positive factors: sex(male),safety concern
- Negative Factors : unemployment, age, HDD(instrumental variable for consumption), environmental concern!!!

# Potential Contributions

- Estimation of WTP.
- Comparison to similar results.(bibliography)
- Computational solution to model estimation of spiked distributed data via Weibull survival analysis modeling.

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Have a great summer and  
thank you !