Are dwellers deliberative or heuristic? Decision making regarding energy efficient renovation

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Outline

Decision-making in energy efficient renovation

Survey

- Part 1 Ranking exercise
- Part 2 Choice experiment

Policy recommendations

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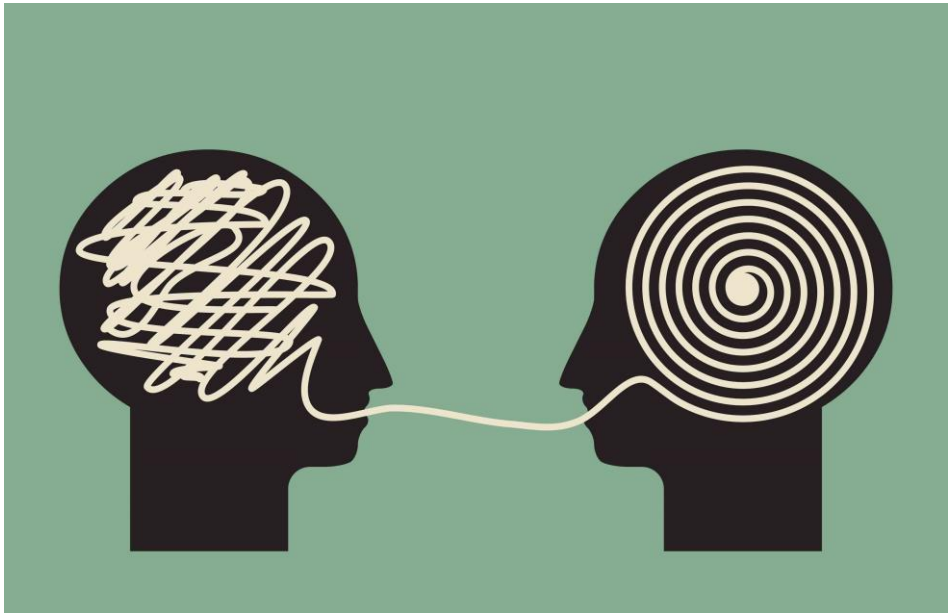
Decision-making in energy renovation

- In Europe 7 out of every 10 persons live in owner-occupied dwellings
- Investments in energy renovation = one-off investments
- Previous policy measures such as monetary incentives and information provision have the assumption of an exclusively rational decision-maker

Deliberative and heuristic thinking

System 1

- Heuristic
- Fast
- Effortless



System 2

- Deliberative
- Slow
- Effortful

Survey

Part 1 Ranking exercise

Part 2 Choice experiment

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Survey

- Motivations and barriers of investments in energy efficient renovation measures
- Focus on the way of reasoning
  - balance between deliberative and heuristic thinking
  - bounded rationality

- Phase 1
  - online
  - 303 responses
  - Hasselt University employees
- Phase 2
  - face-to-face
  - 178 responses
  - Flemish dwellers interested in renovation
    - 30% plan to renovate
    - 43% plan to install EE renovation measures

Part 1 Ranking exercise

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Part 1 Ranking exercise

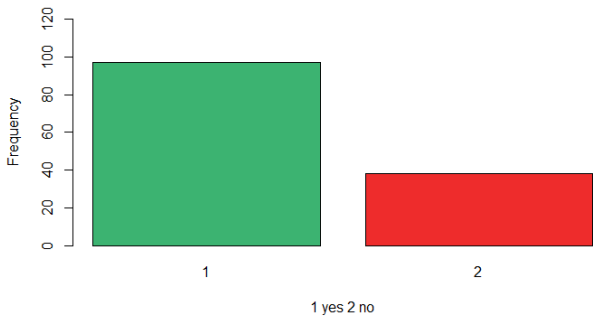
- Energy efficient renovation measures:
  - Wall insulation
  - EE windows
  - EE boiler
  - PV panel
  - solar water heaters

- For each measure
  - Experiences
    - house owners who installed the measure
  - Intentions
    - house owners who did not install the measure
    - renters

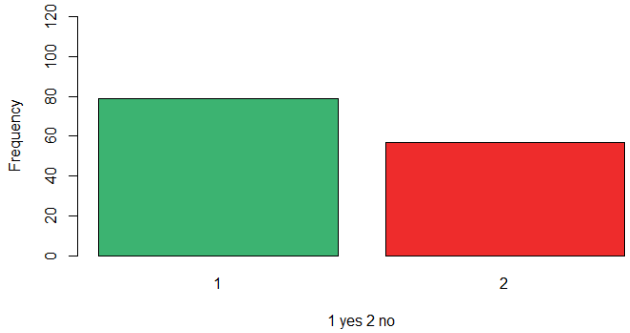
Part 1 Ranking exercise

Uptake of the measures Did you place…? N=136 (house owners)

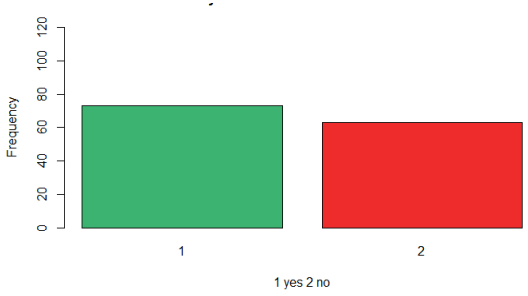
EE windows (82%)



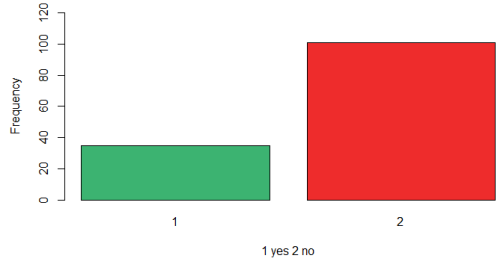
Wall insulation (58%)



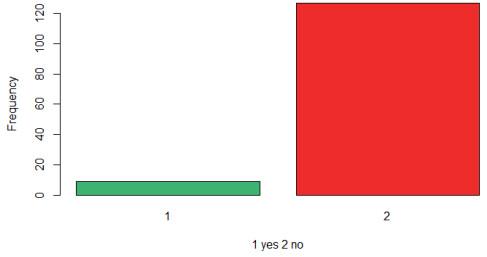
EE boiler (54%)



PV panels (26%)



Solar water heater (7%)



Part 1 Ranking exercise

Hypotheses

The arguments in favour are mostly deliberative Σ (D+) > Σ (H+)

The main reasons for placing wall insulation were…

	1	2	3	4
I wanted to live in a warm, comfortable house	○	○	○	○
I wanted to save money on heating	○	○	○	○
It is good for the environment	○	○	○	○
Everybody does it	○	○	○	○

The arguments against are mostly heuristic Σ(H–)>Σ (R –)

Even if I decided to place wall insulation, these were the reasons that made me hesitate:

	1	2	3	4
I liked my house the way it was	○	○	○	○
I was considering spending money on interior design instead	○	○	○	○
It didn't make a big difference, my energy consumption for heating was not that high anyway	○	○	○	○
It was very expensive	○	○	○	○

Part 1 Ranking exercise

Hypotheses

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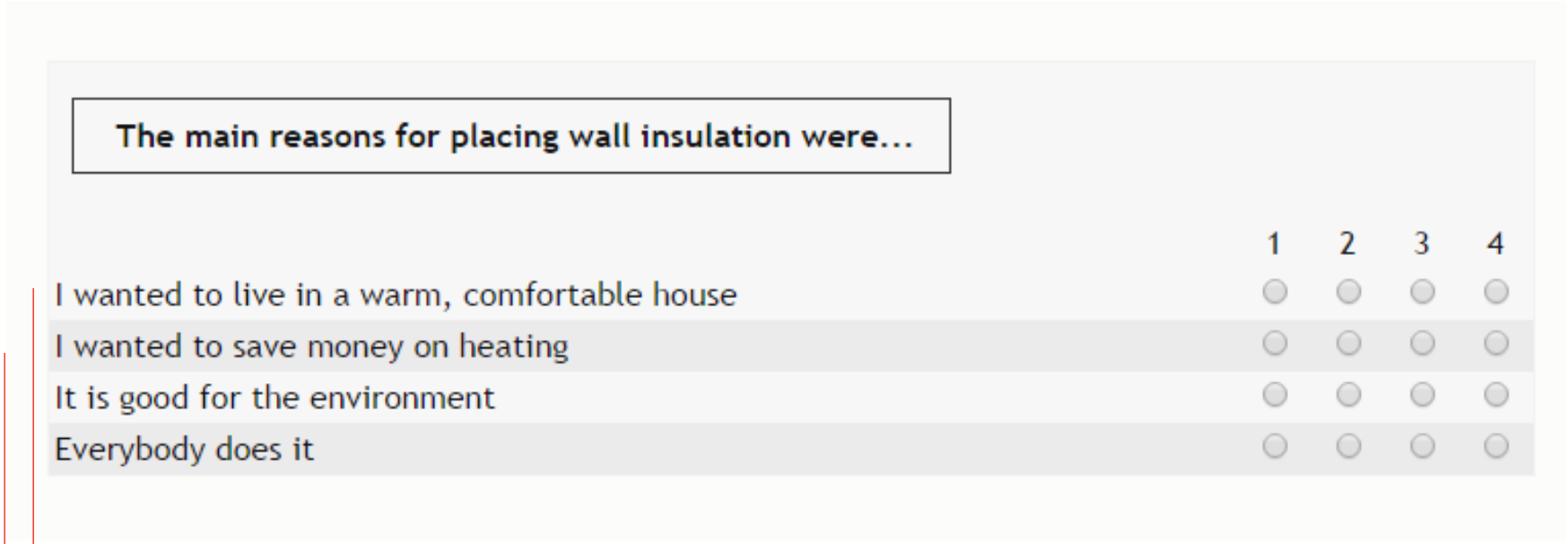

H affect heuristic

D Expected Utility

D Value-belief-norm theory

H social norm

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Part 1 Ranking exercise

- Motivations – both groups mostly deliberative

	EXPERIENCES			INTENTIONS		
	Motivations	Barriers	N	Motivations	Barriers	N
Wall insulation	1.19***	0.13	76	1.05***	0.93**	98
EE windows	2.63***	0.39	95	2.89***	0.56*	78
EE boiler	2.25***	-0.11	70	2.90***	0.08	104
PV	-	-	34	1.96***	1.84***	140
Solar water heater	-	-	8	1.84***	1.62***	166

- Student's t - test for paired sample: mean of $\Sigma R - \Sigma H$

  * p-value < 0.05, ** p-value < 0.01, *** p-value < 0.001

Part 1 Ranking exercise

- Barriers
  - Student's t - test for paired sample: mean of ΣR–ΣH
    * p-value < 0.05, ** p-value < 0.01, *** p-value < 0.001

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Balanced
Nor deliberative
nor heuristic

Still mostly deliberative
Except boiler

Part 2 Choice experiment

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Part 2 Choice experiment

Given a limited budget, which of the following measures would you choose?

Attributes	Windows **Energy-efficient windows**	Insulation **Roof and wall insulation**	Heating system **Geothermal heat pumps**	Renewable energy **PV panels**
Changes in the visual aspect of the house	minor	minor	drastic	drastic
Improvement in the level of thermal comfort	big	big	small	small
CO2 reduction of the dwelling	75%	50%	50%	75%
Investment cost	12000 Euros	12000 Euros	12000 Euros	8000 Euros
Level of hassle during works	little	a lot	little	a lot
Source of advice	expert	friend	no advice	no advice
CHOICE	○	○	○	○

Part 2 Choice experiment

Results of an alternative-specific model

- EE windows ––
  - changes in the visual aspect of the house
  - expert advice
- Roof and wall insulation —
  - 75% reduction in CO_2
  - investment cost
- Geothermal heat pumps —
  - 75% reduction in CO_2
  - investment cost
- PV panels ––
  - 75% reduction in CO_2

Part 2 Choice experiment

Results of a generic model

- 75% CO_2 reduction
- investment cost
- expert advice
- thermal comfort improvement

- PV panels and geothermal heat pumps are less chosen no matter their characteristics

Policy recommendations

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Policy recommendations

- Deliberative arguments prevail for motivations
  - Monetary savings and CO_2 reductions are already perceived as main benefits, no need to emphasize them during information campaigns

- Certain measures (PV panels and geothermal heat pumps) are less chosen no matter their characteristics
  - Bounded rationality
  - Halo effect? bias - overall impression of a person or product influences the observer's feelings and thoughts about that entity's character or properties.

- Only for the house owners who did not install them the investment costs and other deliberative arguments prevail over heuristics.
  - Providing information on financing schemes might be more effective than underlining monetary savings during information campaigns.

Thank you

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http://critical-thinkers.com/wp-content/uploads/2015/01/shutterstock_208347706.jpg

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Discussion

- How useful is this approach of applying behavioural insights to policy?

  Trade-off

  - RCTs on nudges – reductive but easily applicable
  - Theory behind behavioural models, balance between systems – less applicable

Part 2 Choice experiment

- Results of an alternative-specific model

Coefficient	Estimate	Standard error
Windows: drastic changes in the visual aspect of the house	-0.46*	0.21
Windows: expert advice	0.65**	0.25
Roof and wall insulation: 75% reduction in CO2	0.59*	0.27
Roof and wall insulation: investment cost	-0.0002***	0.0006
Geothermal heat pumps: 75% reduction in CO2	0.89*	0.44
Geothermal heat pumps: investment cost	-0.0002*	0.0007
PV panels: 75% reduction in CO2	0.60*	0.27

Log-likelihood=-915.00
Pseudo R^2 = 0.05
*p-value < 0.05, ** p-value < 0.01, *** p-value < 0.001

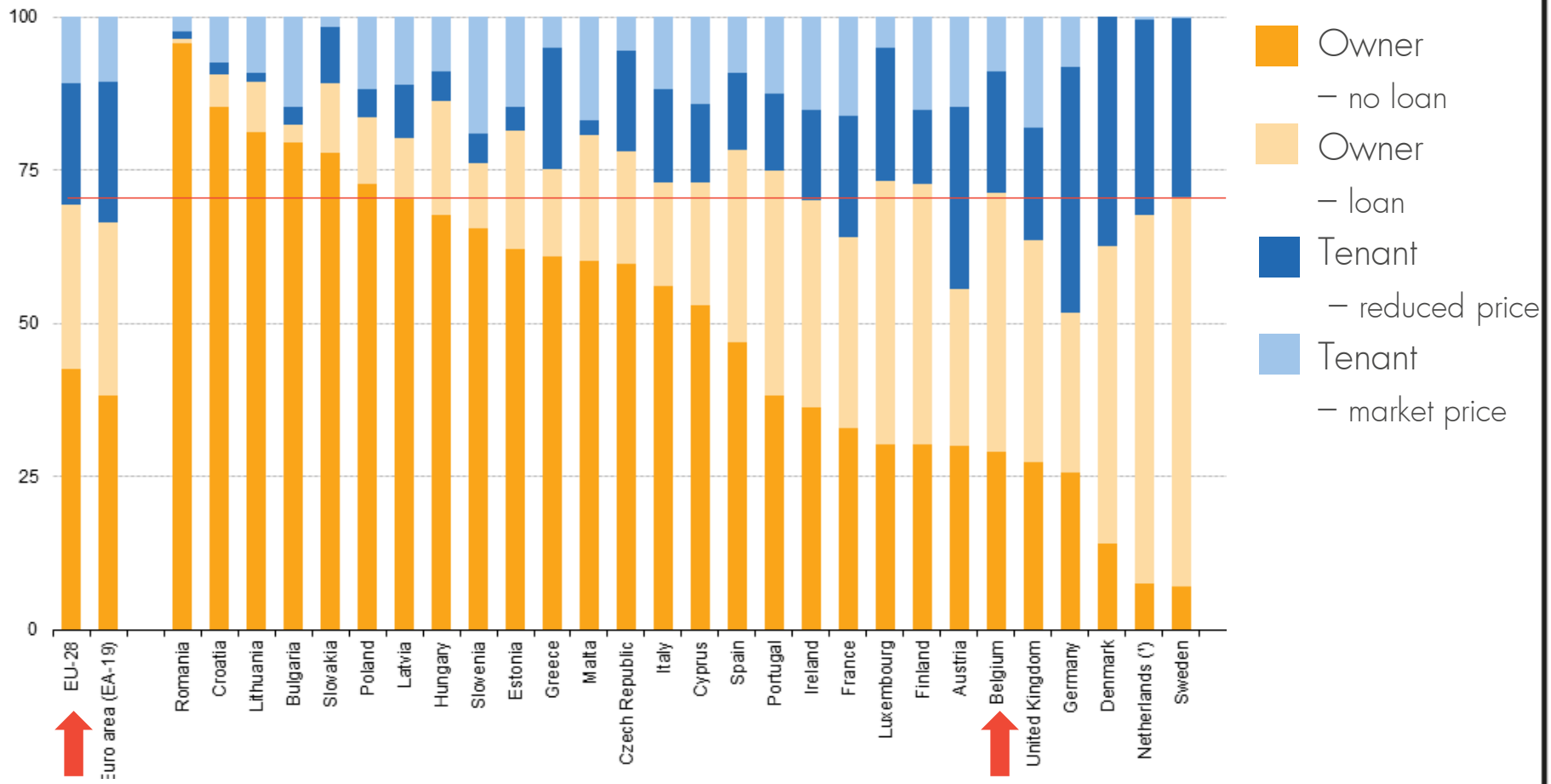
Part 2 Choice experiment

- Results of a generic model

Coefficient	Estimate	Standard error
Windows: ASC	0.40**	0.14
Roof and wall insulation: ASC	0.72***	0.13
Geothermal heat pumps: ASC	0.27	0.22
drastic change in the house's appearance	-0.13	0.12
big thermal comfort improvement	0.30**	0.001
lots of hassle	-0.08	0.08
friend advice	0.003	0.10
expert advice	0.30**	0.11
50% CO2 reduction	0.15	0.13
75% CO2 reduction	0.54***	0.12
Investment cost	$-0.12*10^{-3}$***	$0.3*10^{-4}$

Log-likelihood = -925.36
Pseudo-R2 = 0.06
* p-value < 0.05, ** p-value < 0.01, *** p-value < 0.001

In Europe 7 out of every 10 persons live in owner-occupied dwellings



2015 data Eurostat

http://ec.europa.eu/eurostat/statistics-explained/index.php/Housing_statistics