Behavioural Energy Economics: Promises, Lessons & Challenges for Sustainable Energy Use

Luis Mundaca
International Institute for Industrial Environmental Economics at Lund University, Sweden
luis.mundaca@iiiee.lu.se

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Behavioural Energy Economics

02 Lessons
Experience

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Implications for Policymaking
01
Promises
Behavioural Energy Economics
Aims

Realism

Accuracy
Foci

Contextual factors

Individual factors

Photo credit: Amber Cazzell
Behavioural anomalies → Barriers

- Heuristics
- Choice overload
- Limited attention
- Loss aversion
- Status quo bias
- Procrastination

Photo credit: Jenniffer MacCormack
Choice interventions & assessment

• Main taxonomy (Münscher et al., 2016):
  – Decision information, e.g. feedback, social comparisons
  – Decision assistance, e.g. goal settings, commitment
  – Decision structure, e.g. choice defaults, framing

• Assessment criteria:
  – Effectiveness (short-term)
  – Persistence (long-term)
Behavioural Economics

Prospect Theory

• Endowment effect/reference (Kahneman et al., 1990, 1991; Thaler, 1981; Knetsch, 1989; Dinner et al., 2011)
• Status-quo bias/reference (Kahneman et al., 1991; Samuelson & Zeckhauser, 1988; Ritov & Baron, 1992; Camerer & Lovallo, 1999; Terrell, 1994)
• Value function (Tversky & Kahneman, 1992; Kahneman & Tversky, 1984; Tversky & Kahneman, 1981)
• Loss aversion/reference (Kahneman & Tversky, 1979; Shogren & Taylor, 2008)

Intertemporal Choice

• Discounting (Hyperbolic/implicit) (Loewenstein & Thaler, 1989; Thaler, 1981; Shane, Loewenstein & O'Donoghue, 2002; Coller & Williams, 1999)
• Risk (aversion) and time-varying decision (Camerer & Loewenstein, 2004; Frederick et al., 2004; O'Donogue and Rabin, 2000; Loewenstein et al. 2003; Bell, 1985; Thaler & Shefrin, 1981)
• Value commitment (Ashraf et al., 2006; Green & Myerson, 1994; Della & Malmendier, 2006)

Norms and Moral Behaviour

• Fairness (Kahneman et al., 1986; Cardenas & Carpenter, 2008; Fehr & Schmidt, 1999; Falk et al., 2008; Forsythe et al., 1994)
• Cooperation (conditional) (Ostrom, 1998; Frey & Meier, 2004; Fischbacher et al., 2001)
• Reciprocity (Croson et al., 2005; Fehr & Gächter, 2000; Gouldner, 1960; Falk & Fischbacher, 2006; Berg et al., 1995)
• Warm-glow effect (Andreoni, 1990; Crumpler & Grossman, 2008; Ilsen & Levin, 1972; Menges et al., 2005; Gneezy & Rustichini, 2000)
• Norm-based motivation (Andreoni et al., 2009; Brekke et al., 2003; Nyborg et al., 2006; Biel & Thogersen, 2007; Goldsmith, 2011)

Cognitive Science & Bounded Rationality

• Choice overload (Schwartz, 2004; Iyengar & Lepper, 2000; Scheibehenne et al., 2010; Reed et al., 2011; Hogarth & Reder, 1987; Smith, 1991; Fehr & Rangel, 2011)
• Sallience (Kahneman, 2003; Avin et al., 2012)
• Satisficing behaviour (Simon, 1947, 1972, 1979; March & Simon, 1963; Winter, 2000; Augier & March, 2002)
• Self-deception (Mijovic et al., 2010; Mazar & Ariely, 2006)

Theoretical framework for sustainable energy use and decarbonisation

Source: Mundaca et al. (2019)
Policy-oriented analytical framework

**Anomalies:**
- Loss aversion
- Heuristics
- Choice overload

**Intervention:**
- Decision information
- Decision structure
- Decision assistance

**Mediators:**
- Pro-env’l behaviour
- Psychographics
- Context

**Outcomes:**
- Tech adoption
- ‘New’ behaviour

**Impacts:**
- Energy use
- Carbon emissions
- Well-being

Adapted and expanded from Ludwig et al. (2011)
Lessons

Experience
Decision information: Simplified feedback

10 Low-cost/No-cost Tips for Saving Energy and Money

Decision information: Simplified feedback

• **Effectiveness:**
  - 0% (Sexton et al., 1987 [US])
  - 4-5% (Hutton et al., 1986 [US/CAN]; Schleich et al., 2013 [AT])
  - 3-6% (Faruqui and Sergici, 2010 [US, FR, AUS])
  - 7-11% (Bager & Mundaca, 2017 [DK])
  - 8-10% (Ruokamo et al., 2022 [FI])
  - 10.5% (Seligman & Darley, 1977 [US])
  - 5-15% (Darby, 2006 [US, UK, CAN, NL, Nordics])
  - 5-20% (Agarwal et al., 2023) (meta-analysis, 33 studies)

• **Persistence:** Often unknown, but it decreases (Ruokamo et al., 2022 [FI]), and energy use can also increase (Hayes & Cones, 1981 [US])

• **Policy lessons:** Potential! But....
Decision information: Social comparison

Photo credits: Opower, Tibber
Decision information:
Social comparison

• **Effectiveness:**
  - Consistent small effects (Nisa et al., 2019) (meta-analysis, 22 studies)
  - Does not induce statistically significant changes (Ruokamo et al., 2022 [FI])
  - Net effect close to zero (Kaestnera & Vanceb, 2022 [AT])
  - 1.2-30% (Andor et al. 2018) (meta-analysis, 24 studies)
  - 1.4-3.3% (Allcott, 2011 [US, Opower])
  - 1.4% (Mukai et al., 2022 [JP])
  - 9% first week, 7% third week (Schultz et al., 2015 [US])

• **Persistence:** Decrease, but positive indications from Opower

• **Policy lessons:** Cost-effective potential, but…

Decision assistance:
Commitment & goal settings

Photo credits: NewsTribune, Energystar, Lehigh Univ, Sonali Zaveri.
Decision assistance: Commitment & goal settings

• Effectiveness:
  - When goal is 0-15% → 11% savings (Hardin & Hsiaw, 2014 [US])
  - When goal is 10% → 12.3% savings (von Houwelingen & Raaj, 1989 [NL])
  - When goal is 15% → 11-22% savings (Winett et al., 1982 [US]), 24% savings (Lazaric & Toumi, 2022 [MC])
  - When goal is 25% → 19% savings (Lazaric & Toumi, 2022 [MC])
  - But lack of effectiveness also identified (Becker, 1978 [US])

• Persistence: It can show up in the long-term (Katzev & Johnson, 1983 [US]).

• Policy lessons: Potential! But.....
Decision structure: Green energy defaults

'Grey' Electricity → Optional

'Green' Electricity

'Opt-in' decision framework
Decision structure: Green energy defaults

‘Grey’ Electricity

Optional

’Green’ Electricity

’Opt-out’ decision framework
Decision structure: Green energy defaults

- **Effectiveness:**
  
  - **Lab experiments:** 68% (vs. 41%) (Pichert and Katsikopoulos, 2008 [GER]); 69% (vs. 48%) (Momsen and Stoerk, 2014 [GER]); 69% (vs. 7%) (Ebeling and Lotz, 2015 [GER]); 76% (vs. 69%) (Hedlin & Sunstein, 2016 [USA]): 20%—83% (vs. 65%), (Ghesla, 2017 [CH]); 42% (vs. 48%) (Mundaca & Moncreiff, 2021 [UK]).
  
  - **Natural experiments:** 99% (Pichert and Katsikopoulos, 2008 [GER]), 80% (Lieve et al., 2021 [CH]).

- **Persistence:** Yes, after 4 years (Ghesla et al., 2020 [CH]) and 6 years (Lieve et al., 2021 [CH])

- **Policy lessons:** High potential! But....
03 Challenges

Implications for Policymaking
Direct policy implications

• Behaviour and decision processes are driven by individual, social and structural variables
• Sustainability of interventions over the long term
• Important between-study differences → heterogeneity
• Effective, but cost-effective and economically efficient?
• Improvements & synergies with ’traditional’ policy instruments
• Ethical issues
Indirect policy implications

• Still unknown how behavioural insights are incorporated into energy policy design and implementation
• Role of evidence-based evaluation
• Contribution and discussion beyond ’nudges’
• More attention to side-effects, (subjective) well-being and organisations
• Role of policy makers → Governance of BEE for policy-making
Concluding remarks

✓ Behavioural energy economics has shown promise in identifying and overcoming barriers to sustainable energy use. Experimental research has been central

✓ Key lessons include the importance of defaults, social norms, and feedback in influencing energy behaviours

✓ Interventions offer potential, but not the panacea; price mechanisms are still important

✓ Challenges include scalability, long-term behaviour change, equity, and the need for interdisciplinary collaboration
Thank you! Any questions?

Luis Mundaca
International Institute for Industrial Environmental Economics at Lund University, Sweden

luis.mundaca@iiiee.lu.se