FACULTÉ
GESTION, ÉCONOMIE, SCIENCES
Université Catholique de Lille 1875

KAPSARC
مركز الملك عبدالله للدراسات والبحوث البترولية
King Abdullah Petroleum Studies and Research Center

Université Catholique de Lille 1875 | LITL

Energy Efficiency Gap: The Role of Behavioral Intervention

Véronique Flambard (Université Catholique de Lille | LITL)

Presentation/Paper written with

Fateh Belaïd (Kapsarc)

October 9th, 2024
EEDAL' 24

Outline

1. Value of Energy Efficiency
2. Energy Efficiency Gap
3. Behavioral intervention
4. Case study

Value of Energy Efficiency

Public Policy Motivation

Controlling energy use & costs through demand management

- The energy we don't need to use
- Saving 1 kWh is more cost-effective than generating 1 kWh

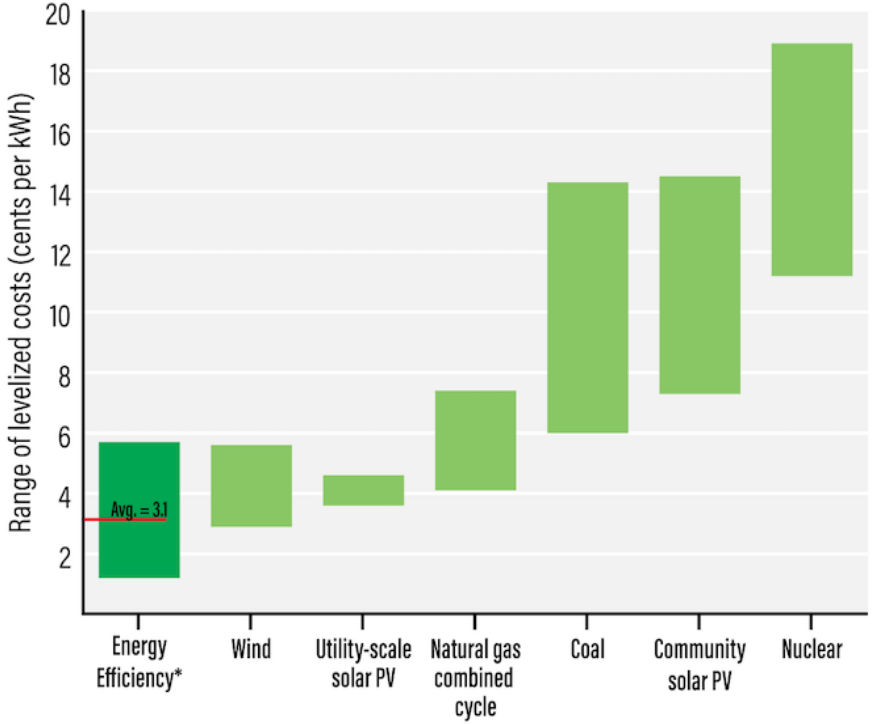
Value of Energy-Efficient Buildings

Building owners
- Lower energy bills
- Comfortable living space

Economy
- Energy security
- Economic growth
- Job opportunities

Electric grid
- Resilient electric systems
- Lower grid costs

Environment
- Lower GHG emissions
- Health benefits



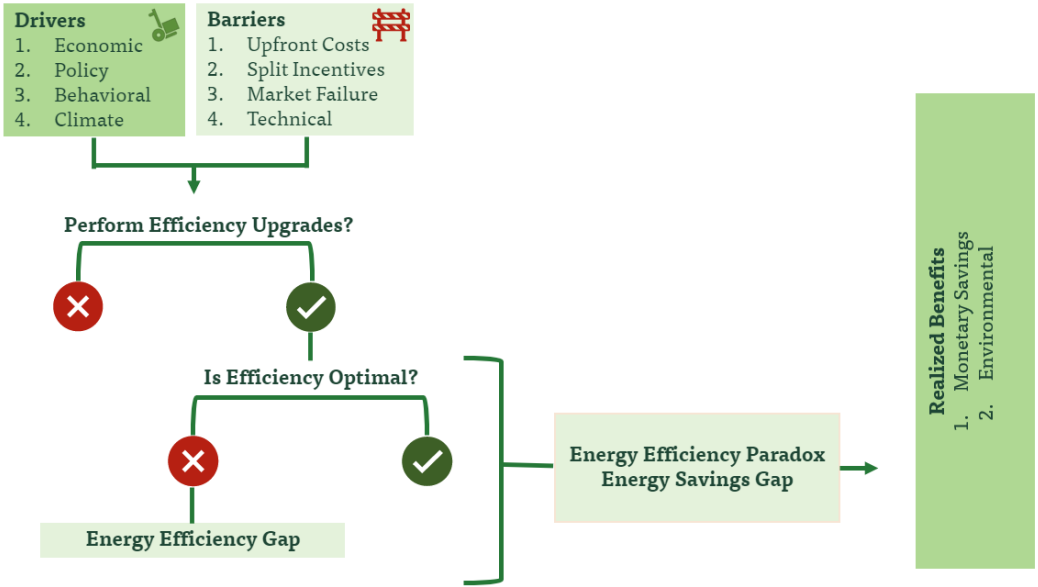
*Notes: Energy efficiency program portfolio data from Molina and Relf 2018. Represents costs to utilities or program administrators only, including shareholder performance incentives if applicable. All other data from Lazard 2018 Unsubsidized Levelized Cost of Energy Comparison.

Energy efficiency gap

Individuals seem to under-invest in energy efficiency improvements

Why are we not obtaining an economically efficient level of energy efficiency?

- The energy efficiency gap
- The rebound effect
- Loss aversion, or the endowment effect



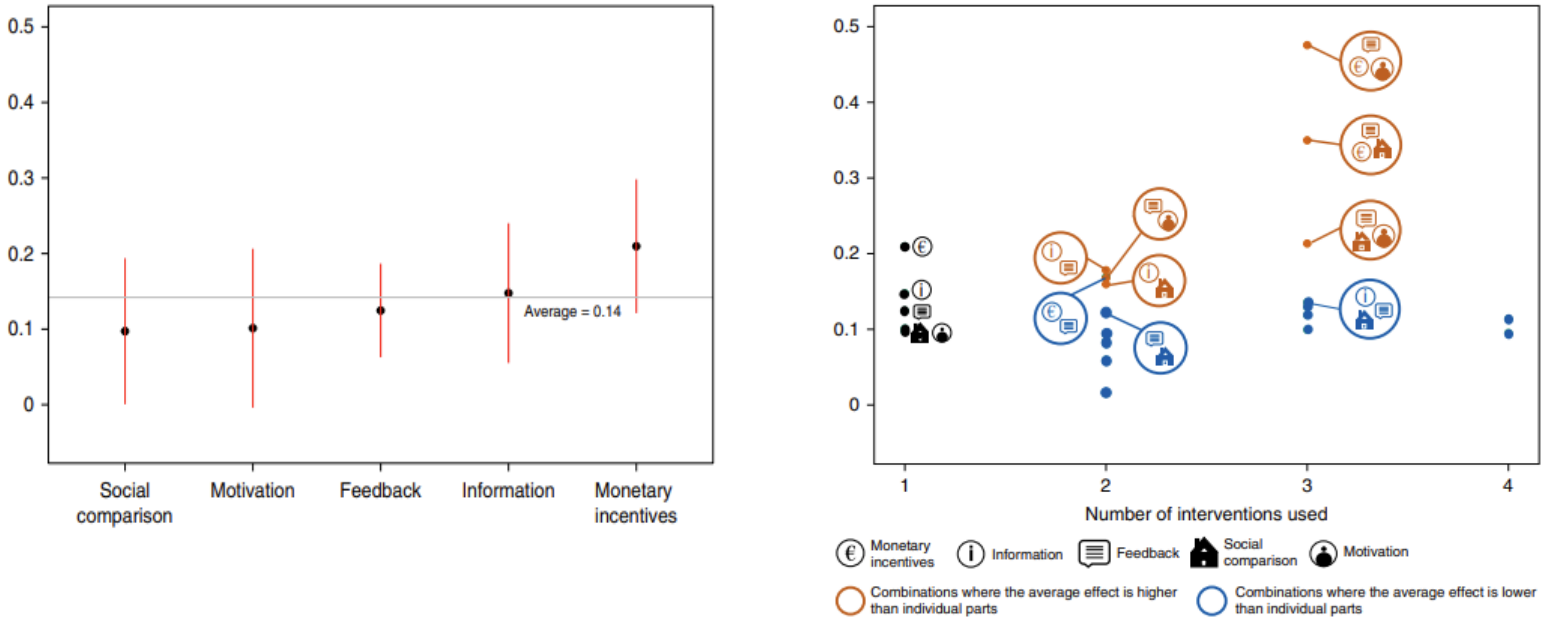
Behavioral Intervention

Instruments to change choice architecture to promote socially desired decisions

Intervention type	Intervention	Description
Monetary incentives	Critical peak pricing, real-time pricing, rewards and rebates	Time-of-use pricing adjusts prices based on peak demand periods, and incentives are given to reduce consumption during those times.
Information	Home audits, tips, reminders	Address knowledge gaps through various activities, e.g., workshops, mass media campaigns, and home audits.
Feedback	Historical, in-home displays	Feedback interventions inspire change by highlighting areas of poor performance, e.g., historical consumption.
Social comparison	Home energy reports, norms-based comparison	Household performance is compared to their social group as a benchmark.
Motivation	Commitment devices, goal setting, gamification	Social pressure, such as public pledges or commitments, e.g., Goal-setting interventions.

Behavioral Intervention

Both monetary and non-monetary interventions reduce the energy consumption



Estimated average effect size of different interventions categories

Source: *Khanna et al., 2021. A multi-country meta-analysis on the role of behavioral change in reducing energy consumption and CO2 emissions in residential buildings. Nature Energy, 6(9), pp.925-932.*

Case Study: Impact of Behavioral Intervention on EE Preferences

Conduct a lab experiment to evaluate how behavioral intervention and individuals' perceptions impact EE preference choice.

What is the role of social norms and motivational feedback on EE preferences?

Intervention

Module EE: Whether a household would be more likely to purchase a more efficient house or a less-efficient-with-better-view

Renovation Module: Unveils whether households are willing to renovate a newly bought house before moving in

Key contributions

- Literature on behavioral interventions
- Understand EE behavioral barriers
- Insight into EE policy-making process

Case Study: Experiment Design

The survey took place in June 2022

EE Scenario

- **Choose between two properties A & B of equal value for your next real estate purchase.**
- **B is in the same area, has the same features as A, except it's more energy-efficient; however, its view is partially obstructed by neighboring houses.**
- **Same price for both properties: Unit B has a less beautiful view, but Unit A has lower energy efficiency.**

Participants are randomly assigned to one of the groups

Control group (104)	Social norms group (102)	Confidence boost group (100)
No information	Most of your neighbors choose EE	Most of your neighbors who chose EE are satisfied
Dictator game (Donation to an eco association)	Dictator game (Donation to an eco association)	Dictator game (Donation to an eco association)
Risk aversion and time preference	Risk aversion and time preference	Risk aversion and time preference
Socio demographics controls	Socio demographics controls	Socio demographics controls

Case Study: Experiment Design

Renovation Scenario

- Choose between two properties A & B.
- A is less expensive, except it's les energy-efficient (not renovated)
- B has a higher cost. However, the additional costs are reimbursed by the energy savings realized after ten years

Participants are randomly assigned to one of the groups

Control group (104)	Social norms group (102)	Confidence boost group (100)
No information	Most neighbors renovating	Most neighbors satisfied and would do it again
Dictator game (Donation to an eco association)	Dictator game (Donation to an eco association)	Dictator game (Donation to an eco association)
Risk aversion and time preference	Risk aversion and time preference	Risk aversion and time preference
Socio demographics controls	Socio demographics controls	Socio demographics controls

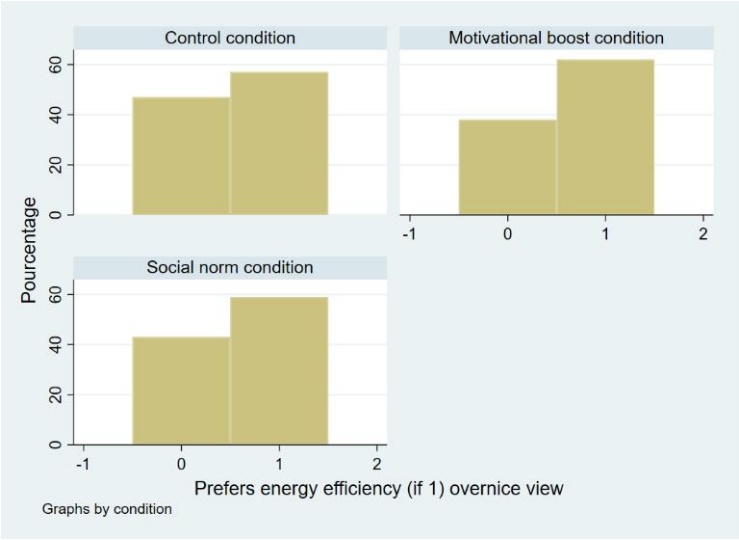
Case Study: Methodology

DESCRIPTIVE ANALYSIS 1	MAIN MODEL 2	ROBUSTNESS CHECK 3
Identify and describe the intervention effect and the key features of each group	**Probit regressions to test the impact of information on a binary factor Y taking a value of 1, if the individual prefers EE** $Prob(Y = 1\|X) = F(X, \beta)$	**Propensity Score Matching:** A quasi-experimental method that matches subjects who receive information with subjects who didn't receive information in a statistically controlled manner .

Case Study: Results

Decisions by condition and measure of association

	Module Efficiency preference		Sample size
	Nice view home	Energy efficiency home	N
Control	47 45.2%	57 54.8%	104
Social norms	43 42.1%	59 57.9%	102
Boost	38 38%	62 62%	100
Chi-square test of independence	Pearson chi2(2)=1.090 Pr = 0.580 No effect of information on choice		Total=306



Case Study: Results

Motivational boost increases energy efficiency selection by 11-13%

The impact of social norms on EE preference is quite low

Environmental awareness has a significant impact on energy EE preference

Risk aversion and time preference affect individuals' decisions regarding EE

Trust in government policies leads to higher preference for energy efficiency

Conclusion and Policy Implications

The results highlight the importance of social norms and motivational boosts in shaping EE preferences.

The results provide new insights into the factors that shape homeowners' decision-making regarding EE.

The findings can inform the design of policies that encourage individuals to invest in EE.

Field experiments with similar instruments could add value to this work.

FACULTÉ
GESTION, ÉCONOMIE, SCIENCES
Université Catholique de Lille 1875

KAPSARC
مركز الملك عبدالله للدراسات والبحوث البترولية
King Abdullah Petroleum Studies and Research Center

Joint work with Fateh Belaïd

Thank you for your attention

veronique.flambard@univ-catholille.fr

Université Catholique de Lille|LITL

Université Catholique de Lille 1875 | LITL