16th IAEE
European Conference
Ljubljana
25–28 August 2019

Energy Challenges for the Next Decade

#IAEE19LJ

School of Economics and Business, University of Ljubljana, Slovenia

BEHAVIOURAL ECONOMICS: THE IMPACT OF SOCIAL NORMS AND INFORMATION IN PORTUGUESE ENERGY CONSUMPTION DECISIONS

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CONTENTS

I. INTRODUCTION

Environmental Problems Escalade

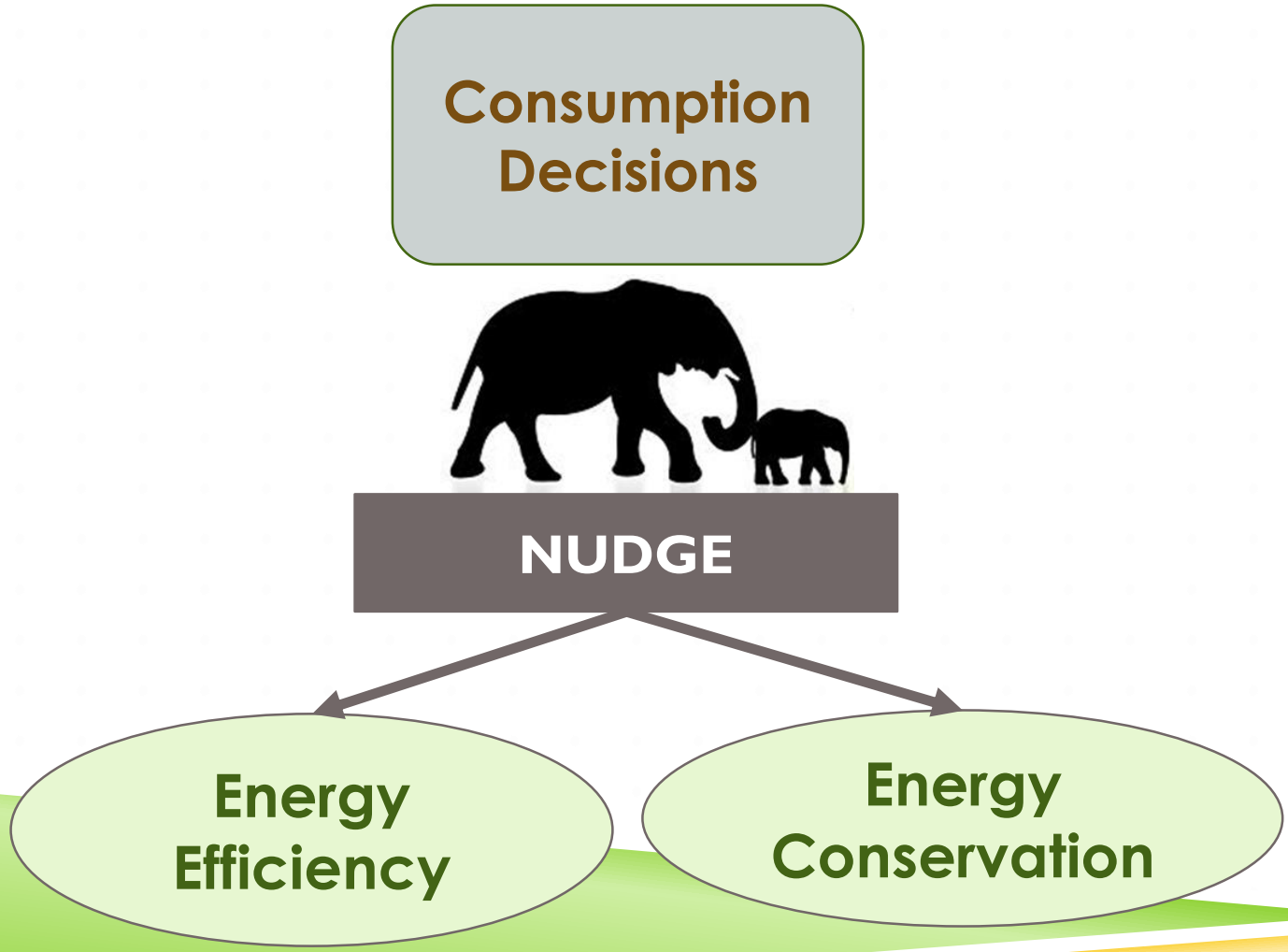
Collective Accountability

Individual Action

Households' intake has a significant weight in current energy consumption
= 20-30%

I. INTRODUCTION

"Nudge" effects on consumer's decision-making process



I. INTRODUCTION

"Nudge" effects on consumer's decision-making process

Biases with the greatest influence on energy consumption decisions:

Status Quo
Ek e Söderholm, 2010; Frederiks et al., 2015; Hobman et al., 2016

Herd Behaviour & Default Settings
Banerjee, 1992; Allcott e Mullainathan, 2010

Future Discounting
Frederiks et al., 2015; Hobman et al., 2016

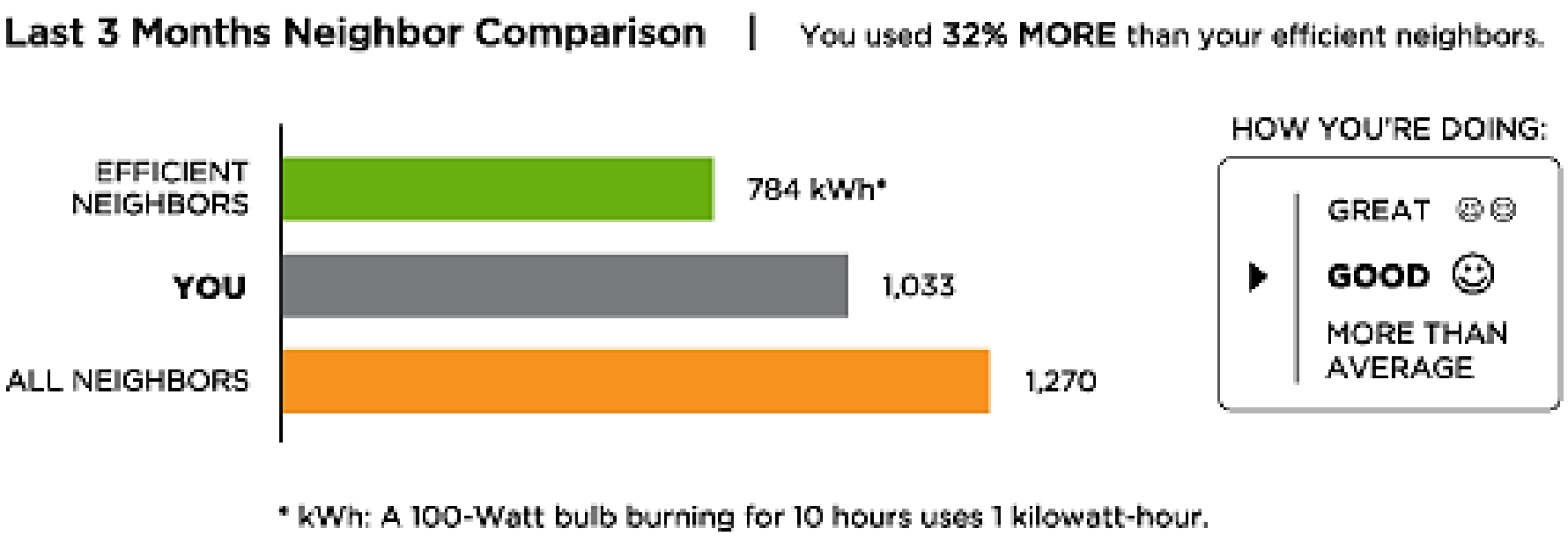
Risk Aversion
Kahneman et al., 1990

Sunk Costs
Frederiks et al., 2015

Social Norm

I. INTRODUCTION

Social Norm and Comparison



Experiments such as the public company Opower (United States) have shown how incorporating the comparison into mechanisms to reduce consumption and improve energy efficiency can have significant effects on residential consumption.

= **reductions up to 6.3%**

I. INTRODUCTION

Social Norm and Comparison

The study focuses the **potential combined influence of social norm and information** on the energy consumption decisions of Portuguese households.

Empirical evidence of a natural field experiment with customers of Galp Energia's Dual service (electricity and natural gas supply). The sample's monthly energy consumption was observed during the months of March, April and May of 2017, when the treatment was applied, and compared to the consumption in the same period of the previous year.

II. DATA AND METHODOLOGY

Experimental Method

Dependent Variable	Independent Variables	
Sample's energy consumption	**Treatment** (social comparison report)	**Time Period** (pre-treatment and post-treatment)

SAMPLE

212 households

Shared features:

1) Geographical location (Évora)
2) Smart Meters Reading
3) Dual product (electricity + natural Gas)
4) Galp's client for at least one year (since January 2016)
5) Monthly invoice by post mail
6) Billing period between 15th and 30th of each month

II. DATA AND METHODOLOGY

To reach a credible comparison between customers similar enough to each other, the sample was divided in comparison groups, which shared the same natural gas' consumption range, the same tariff and the same contracted power for electricity.

Comparison Groups	Electricity Tariff	Contracted Power (kVA)	Natural Gas Consumption Range	Dwellings
1	Simple	5.75 + 6.9	1	68
2	Simple	3.45 + 4,6	1	76
3	Simple	5.75 + 6,9	2	31
4	Simple	3.45 + 4.6	2	18
5	Bi-hourly	5.75 + 6.9	1	9
6	Bi-hourly e Tetra-hourly	5.75+6.9	1	10

II. DATA AND METHODOLOGY

Experiment Procedure:

- ***Timing:*** During March and April, the treatment group received the incentives along with the monthly invoice.

- ***Description:*** A first part of the sent report describes the characteristics shared by the comparative households, **appealing to intragroup similarity**. Then, the **descriptive norm** compares customer consumption with that of its neighbours. Finally, the **injunctive norm** (pictograms) is used to evaluate the customer's performance.

II. DATA AND METHODOLOGY

TREATMENT

Appeal to intragroup similarity

Dear Customer,

We compared the energy consumption of customers in the same geographical area, with the same natural gas consumption range, and the same contracted power and electricity tariffs.

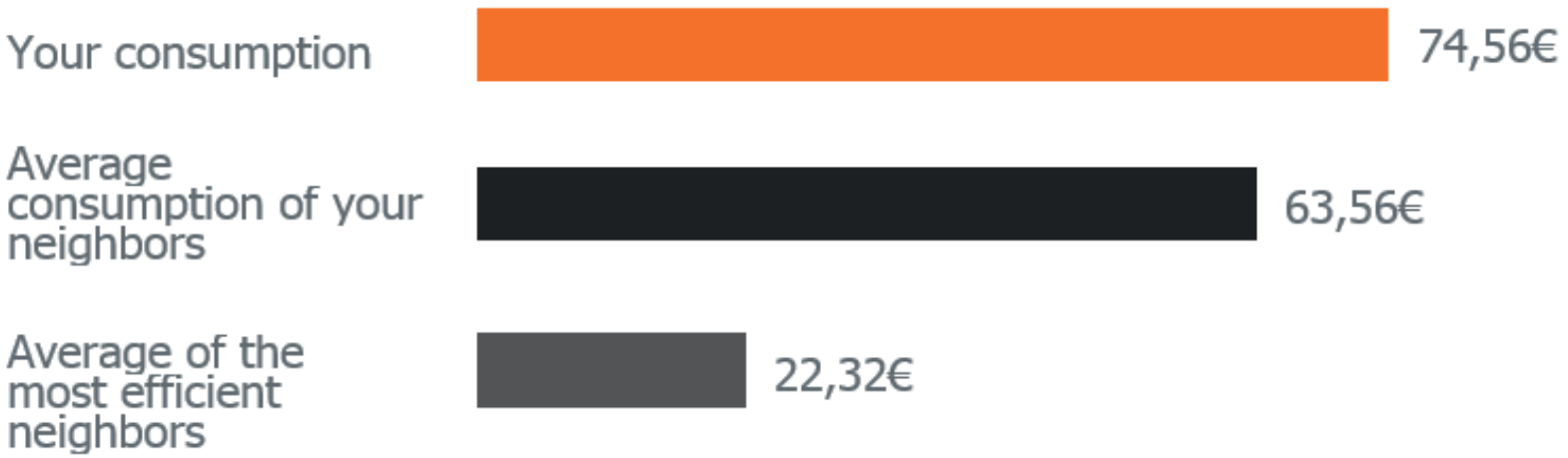
Using real-time measurement from Smart Meters, the results were the following:

II. DATA AND METHODOLOGY

TREATMENT

Descriptive Norm

In March, your energy expense was 17% higher than your neighbors'.



Injunctive Norm

Your consumption performance:

II. DATA AND METHODOLOGY

TREATMENT

In a second page, the report had information regarding **energy conservation and efficiency tips**, aiming to guide customer action by providing some easy-to-read advices and highlighting the energy and financial savings achieved by adopting those practices

Lighting and heating:

- Use natural light as long as possible and always prefer tubular or fluorescent bulbs that consume up to 80% less electricity than conventional bulbs and last 8 to 10 times longer.

II. DATA AND METHODOLOGY

DATA

To estimate the incentive impact on energy consumption, the performance of the dwellings submitted to treatment was compared to the performance of a control group, in the **pre and post-treatment periods**. Customers who received the incentive represent the treated group.

II. DATA AND METHODOLOGY

DIFFERENCES-IN-DIFFERENCES METHOD (DID)

Estimation Model:

$$\gamma_{it} = \beta_0 + \beta_1 T_i + \beta_2 A_t + \beta_3 T_i A_t + \varepsilon_{it}$$

g_{it} = outcome variable of interest

b_0 = constant

T_i = independent variable (dummy)

b_1 = captures the differences between the treated dwellings and the dwellings in the control group prior to the treatment

A_t = another independent variable (dummy)

b_2 = captures the factors that would cause changes in energy consumption in the absence of treatment)

b_3 = Interaction term, coefficient of interest that allows observing the "treatment effect"

III. RESULTS

Analysis of the treatment effect on gas and electricity consumption:

Analysis 1: Pre and post-treatment = *average* consumption in March, April and May		
Sample	P> |t| = 0,576 > 0,1	Treatment Variable (T_i) is not statistically significant, for both gas and electricity consumption
Each comparison group	Group 2: P> |t| = 0,037 < 0,1 Coefficient > 0	Treatment Variable (T_i) is statistically significant, causing an **electricity consumption increase**
	Group 4: P> |t| = 0,048 < 0,1 Coefficient < 0	Treatment Variable (T_i) is statistically significant, causing a **gas consumption reduction**
	Group 6: P> |t| = 0,007 < 0,1 Coefficient > 0	Treatment Variable (T_i) is statistically significant, causing a **gas consumption increase**
	Other groups: P> |t| > 0,1	Treatment Variable (T_i) is not statistically significant for both gas and electricity consumption

III. RESULTS

Analysis of the treatment effect on gas and electricity consumption:

Analysis 2: Pre and post-treatment = consumption *variation* between March and May		
Sample	P> |t| = 0,241 > 0,1	Treatment Variable (T_i) is not statistically significant, for both gas and electricity consumption
Each comparison group	Group 1: P> |t| = 0,045 < 0,1 Coefficient > 0	Treatment Variable (T_i) is statistically significant, causing an **electricity consumption increase**
	Other groups: P> |t| > 0,1	Treatment Variable (T_i) is not statistically significant for both gas and electricity consumption

III. RESULTS

Additionally, some of the treatment group subjects were then asked some questions to gather more conclusive elements about the efficacy of this incentive:

Questions		Yes	No	Other answers
1	Did you receive and read the letter sent by Galp Energia, comparing your energy consumption with that of your neighbors and also the energy efficiency tips?	17	15	
2	Do you consider this information useful for a better energy consumption management?	10	3	
3	Did your perception of your consumption match with the results?	7	1	4 didn't answer or said that do not make comparisons
4	Has the information you received had any impact on your consumption routine or energy efficiency?	5	5	2 do not intend to change their routine
5	Would you like to continue receiving the energy efficiency tips and the monthly comparison with your invoice?	11	1	

IV. DISCUSSION AND CONCLUSION

- The social comparison and the energy saving tips **seem not to have had a significant impact** in the decisions of the consumers' sample.

- These results can be explained by several factors:
  - The treatment period was short (3 months)
  - How the treatment reached the subjects (post mail)
  - Social comparison characteristics (differences between subjects, the relation with the group and the difficulty in measuring their influence)

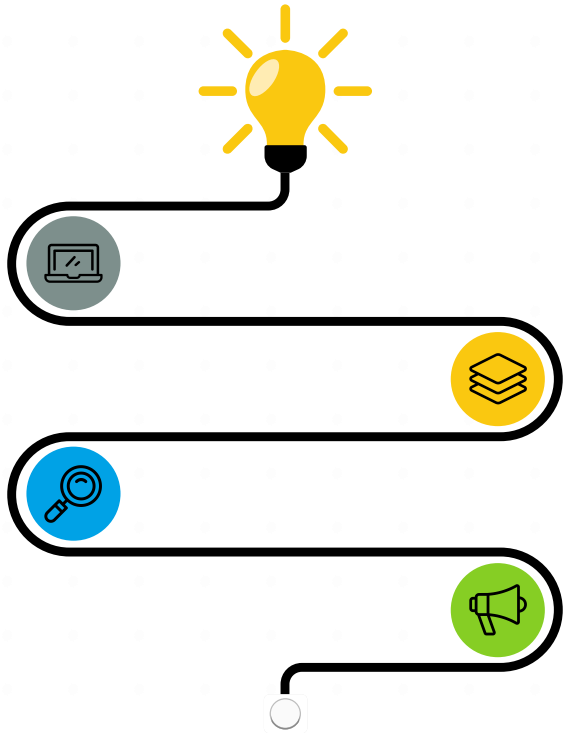
- Two participants mentioned that they already had good pre-treatment habits, regardless of the subsequent social comparison, which supports the idea that some people do not seem to be affected by the group behavior (**potential "fixed agents"**).

IV. DISCUSSION AND CONCLUSION

- While most people devalue the influence of others' actions on their own behaviour, it may have a far greater **unperceived impact**.

- One of the clients refused to receive the report in the future, supporting the theory that **some people prefer not to be informed**, even if the information helps them making optimized decisions

Future research advices: Increasing the sample number and extending the study to a national level would allow to generalize results and provide more valuable insights, which should be taken into account by energy policy makers and would reinforce a more consciousness, by consumers behaviour in the future.



Thank You