UNIVERSITÉ DE LORRAINE

BETA
Bureau d'économie théorique et appliquée

Consumer rationality and pricing: an experimental study applied to the water and electricity sectors

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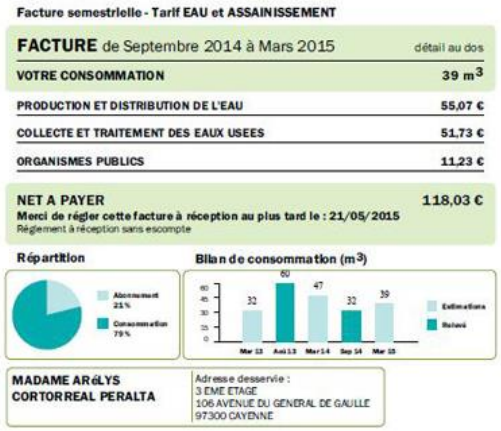
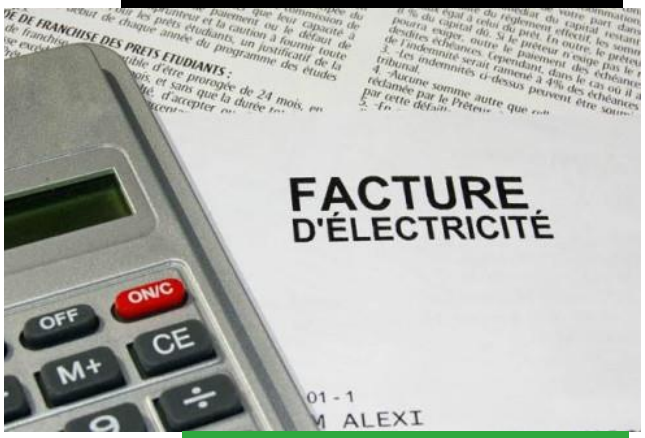
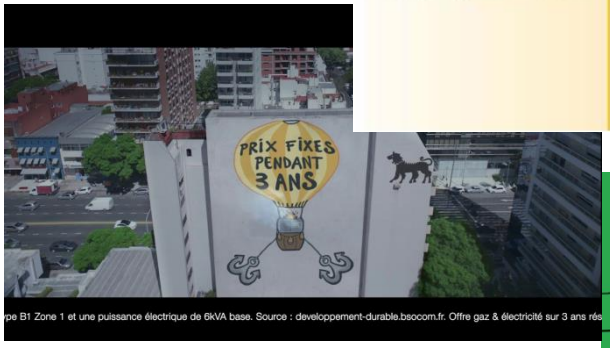
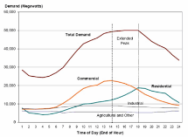
What are we talking about?







Context : multidimentional paradigm shift, *Retail competition, smart meters & climate change*



- **Consume less**
- **Consume « better »** (flexibility, prosumer, renewable sources)

⇨ **Need for new tarif** to send the « right signal » → incite consumer to adopt proper behaviors ↔ « smart consumers »: saving

Diversity of tariffs

Time variant pricing (TVP)

Real-time pricing (RTP)

Time-of-use pricing (TOU)

Variable Peak pricing (VPP)

Critical peak pricing (CPP)

Peak-time rebates (PTR)

Critical Peak Rebate (CPR)

…

Others

Flat tariffs

Two-part tariffs

Tiered Rates

- **Increasing-block rate**
- Declining block rate

Pre-paid tariff

Pay monthly bill with carryover

Pay monthly bill without carryover

Green tariffs

….

Which one to choose ?

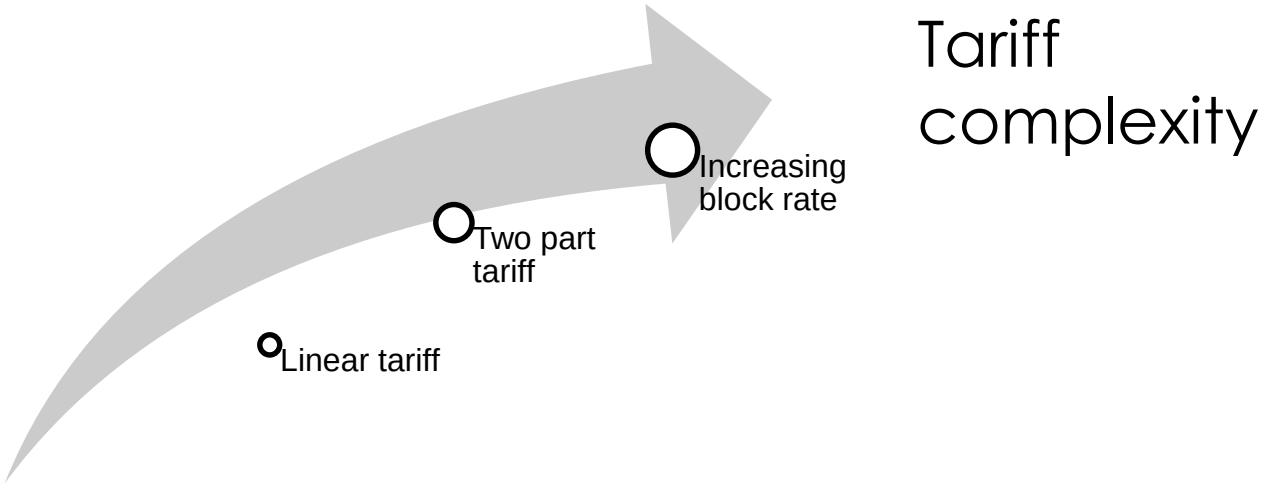
Research questions

1. How do consumers perceive tariff?
2. How do consumers accept tariff (adapt their behaviors accordingly) ?

→ **Methodology :** field experiment

Our experiment in the lab

1. Assess subjects' attitude toward different tariff (+/- complex)
2. Identify specific biases that may hinder comprehension and acceptability by consumers
3. Disentangle the different motivations for the rejection of more complex tariff
4. Identify a "good effect": Water vs. Electricity



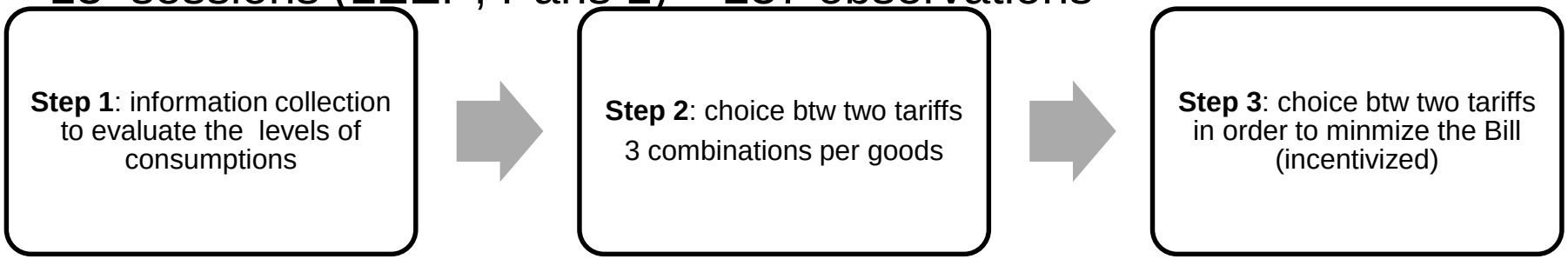
Experimental design

Frame field experiment

- Non standard subjects pool: **representative consumers (electricity & water)**
- Electricity & water framed context of decision with elicitation of subjects' household annual consumptions (KWh/m^3)

237 participants

13 sessions (LEEP, Paris 1) – 237 observations



+ Risk elicitation test (Eckel et al. 2012)
+ Rationality test
+ Final questionnaire (choice (qualitative) explanation…)

Conjectures

1. **Subjects prefer simplest tariff** : Lineartariff < two-parttariff < IncreasingBlocktariff

2. **No good effect**: same tariff choice no matter the good

3. **When we incentivize, higher is the preference for the complex tariffs**

Data

Descriptive statistics about the main control variables :

- N = 237
- 47 % in Paris (53% IDF)
- 32 % women / 68 % men
- 37 % tenant / 63 % property owner
- 13,08 % in house (87 % in appartment)

Set of variables

– **Control variables:**

Table 2 Summary statistics for the control variables

Variable	Mean	Std. Dev.
Owner	0.338	0.474
House	0.131	0.338
Scoreratio	0.671	1.109
Paris	0.473	0.5
nPersons	2.384	1.347
Age	47.245	15.205
Gender	0.321	0.468
Income	4642.308	5121.815

Set of variables

- **Set of variables about the un-incentivised choices :**
  - Score of the number of choices of a type of tariff for water and electricity

Table 3 Summary statistics for the variables of preferences (without incentives)

Variable	Mean	Std. Dev.
pref_progressive_elec	0.219	0.415
pref_two-part_elec	0.232	0.423
pref_linear_elec	0.439	0.497
pref_progressive_water	0.219	0.415
pref_two-part_water	0.346	0.477
pref_linear_water	0.325	0.469
indif_elec	0.042	0.201
indif_water	0.063	0.244

Set of variables

- **Set of variables about the incentivised choices :**
  - Score of the number of choices of a type of tariff for water and electricity

Table 4 Summary statistics for the variables of preferences (with incentives)

Variable	Mean	Std. Dev.
pref_progressive_elec_p2	0.257	0.438
pref_two-part_elec_p2	0.232	0.423
pref_linear_elec_p2	0.422	0.495
pref_progressive_water_p2	0.257	0.438
pref_two-part_water_p2	0.346	0.477
pref_linear_water_p2	0.3	0.459
indif_elec_p2	0.055	0.228
indif_water_p2	0.034	0.181

Set of variables

– Difference between incentivised and un-incentivised choices :

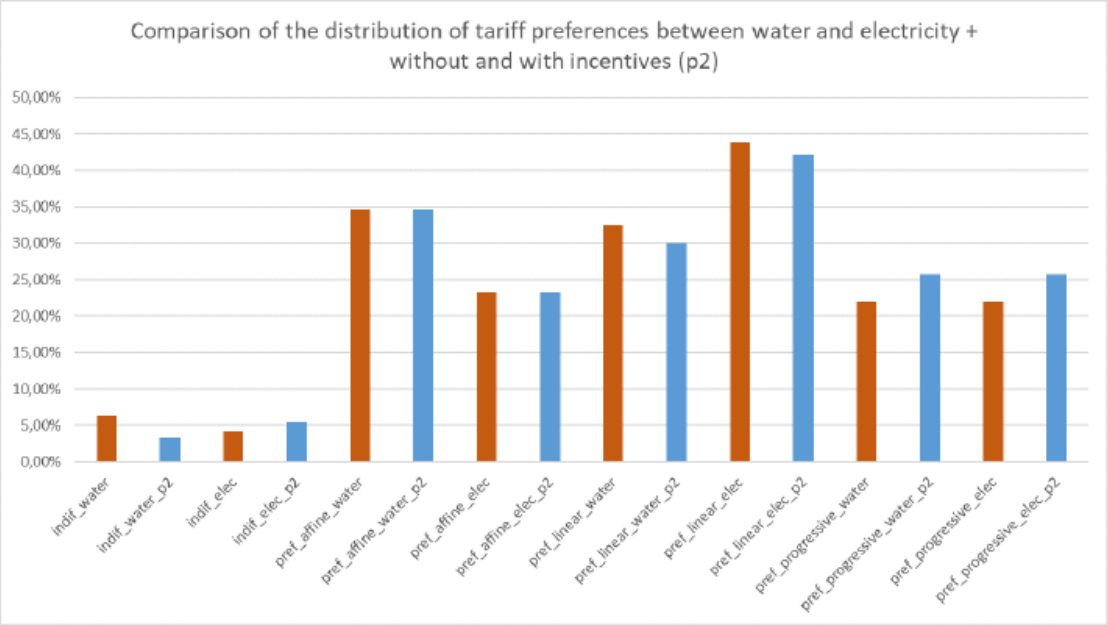


Fig. 3 Number of persons per household.

Set of variables

- **Set of variables about the individual preferences to explain the different choices**

Question	Name of the variable
1. When choosing my prices, I have given priority to...	
1.1. ...the simplicity of the tariff	pref11
1.2. ...predictability of the invoice	pref12
1.3. ...the most financially advantageous.	pref13
2. On a daily basis, you seek to reduce your electricity consumption.	pref2
3. On a daily basis, you want to reduce your water consumption.	pref3
4. What is your motivation to reduce your electricity consumption?	
4.1. Reduce your bill	pref41
4.2 Avoiding waste	pref42
4.3. Participating in the fight against global warming	pref43
4.4. Other...	pref44
5. What is your motivation for reducing your water consumption?	pref5
5.1. Reduce your bill	pref51
5.2 Avoiding waste	pref52
5.3. Participating in the fight against drought	pref53
5.4. Other...	
6. You are willing to accept a decrease in comfort or a change of habit to reduce your water consumption.	pref6
7. You are willing to accept a decrease in comfort or a change of habit to reduce your electricity consumption.	pref7
8. Your effort should result in savings on your bill.	pref8

Table 5 Questions explaining consumer choices and the names of the variables.

Probit models

1. **Model 1** : probit model to explain the main parameters of the un-incentivised choice

2. **Model 2** : probit model to explain the incentivised choice (by including the answers from the part 1)

Results

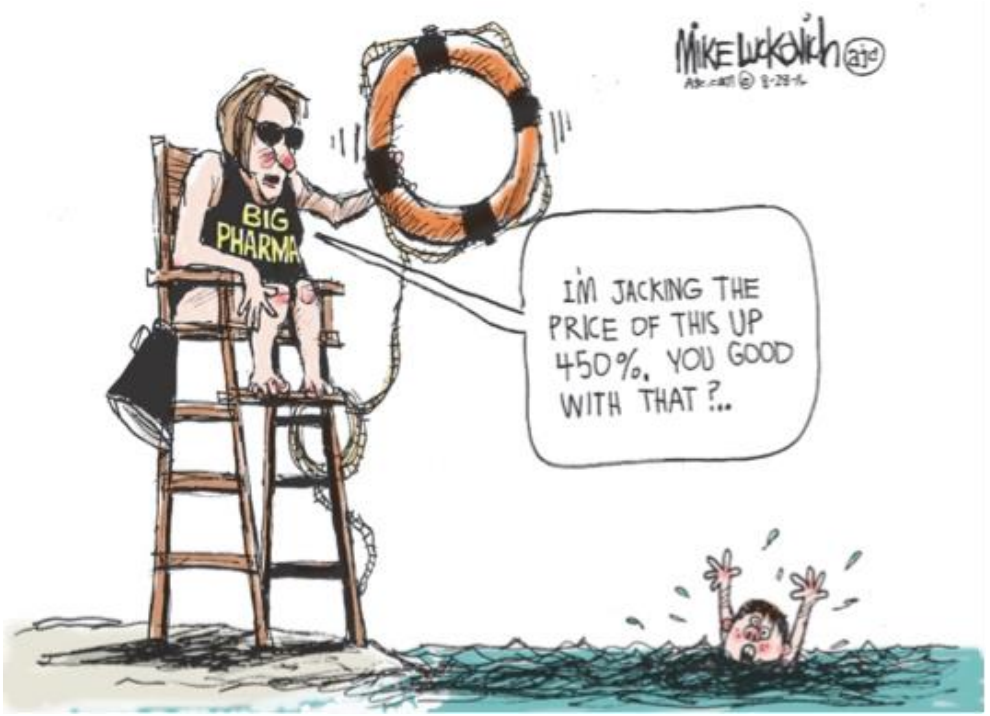
- **Without incentives** :
  - Good effect (electricity =/= water)
  - Less rationality and strong preference for easiest tariffs
  - The socio-demographic factors are more significant

- **With incentives** :
  - better understanding of the tariffs
  - More rational choices to minize the bill
  - Decreasing of the « good effect »
  - …but the easiest tariffs always are dominant

Conclusion

- When we encourage the consumer, she improves her rationality
- Tariff design seems like a tool for changing behavior
- The effect diminishes when we help the decision (nudge effect?)
- **But, this effect is partial !**
- **Morality : a “false good idea” ?**

Conclusion



Thanks for your attention !