

BARRIERS TO INCREASE RENEWABLE SHARE IN DOMESTIC ELECTRICITY: THE ROLE OF SWITCHING PROVIDERS



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- To achieve the goal of being a climate neutral by 2050, the **use of renewable energy should be increased.**
- The **Spanish Plan on Energy and Climate** established that **42% of the final use of energy** should come from renewable sources by 2030.
- The **household sector** plays an important role, given that **residential electricity** consumption represents **30.6% of Spanish electricity use.**
- It is **crucial to explore** whether **households are willing to pay for the increase of renewable sources** in their mix.

- **Previous empirical studies** indicate that **consumers** have **positive attitudes** towards renewable energy and report **positive willingness to use and to pay** for electricity generate from renewable energy sources.
- Nevertheless, **reported willingness to pay is poorly reflected in actual market** shares of renewable electricity.
- The **reasons of this low use of renewable electricity** are diverse but switching costs could be very relevant as **consumers may be reluctant to change providers** because changing requires physical effort and involves transaction costs.
- To better understand **the role of contract shifting** in the transition towards renewal electricity use is of paramount importance.

- The aim of this paper is to **assess the willingness to pay (WTP)** for **increased renewable** presence in the **electricity** mix in the context of **switching contracts or utility company**.
- Few empirical papers focus on the estimation of WTP for green electricity **taking into account the switching or choice of electricity supplier**.
- The novelty of our paper is the **possibility of switching contracts but remaining with the same company** to explore the potential role of incumbents or new comers in the electricity market.

- **Data** comes from an **online survey** carried out by a **market research company** in **February 2020**.
- **The target population:** people above 18 years old living in Aragon.
- **The sample:** 401 people stratified by age, gender and province of residence.
- The **questionnaire** consists of the **choice experiment** task, questions on **attitudes and perceptions towards renewable electricity** and **socio-demographic characteristics**.
- We use a **choice experiment** with three utility contract characteristics and a cost attribute.

Table 1: Electricity values and levels		
Attribute	LEVEL	Current
Increase in electricity bill (€/month) COST	4 - 8 - 12 - 16	0
Share of renewable electricity (%) RENEWABLE	20 - 30 - 40 - 50	10
Change electricity contract SAME_COMPANY	Yes, with the same company	No changing contract
	Yes, with other company	
Value added services in new contract SERVICES	Free coupon to buy an A+++ electricity device (50 €)	No free coupon and/or electricity audit
	Free coupon to buy an A+++ electricity device (50 €) + Free electricity audit	

- **The choice sets design:** Hole (2016) STATA 16.
- **Three alternatives:** two designed + statu quo.
- **Main effects:** 24 choice tasks.
- **Four blocks** of six choice sets.

	Opción A	Opción B	Opción Actual
Electricidad renovable (%)	 40%	 50%	 10%
Cambio de contrato	 Comp. actual	 Otra compañía	 Ninguno
Servicios añadidos	 Bono	 Auditoría + Bono	 Ninguno
Incremento de factura	 12 €/mes	 16 €/mes	 0 €/mes

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$$U_{njt} = SQ + \beta_1 COST_{njt} + \beta_2 RENEWABLE + \beta_3 SAME_COMPANY_{njt} + \beta_4 SERVICES_{njt} + \varepsilon_{njt}$$

- n = number of respondents
- j = available choosing options (A, B or none)
- t = number of choice sets
- SQ= Statu quo: 1 for A and B options; and 0 statu quo
- COST = cost levels in the choice options (negative impact in utility)
- RENEWABLE = % value in the choice options
- SAME_COMPANY; SERVICES = Effect code: +1 for the same company/free coupon; -1 for the other company/free coupon plus free audit; 0 otherwise
- ε_{njt} = an observed random term distributed following an extreme value type (Gumbel) distribution

An Error Component Random Parameter Logit model (ECRPL) was finally selected (NLOGIT 5.0 Software) - Heterogeneity

Socioeconomic variables of the sample (401, Aragon and Spanish population)

Variable	Definition	Sample	Aragon	Spain
Gender	Men (dummy) (%)	49.4	49.3	49
Age (sample average)	Age (continuous)	46.4	44.8	43.9
Household size (average)	Number of people	2.8	2.4	2.5
Net monthly personal income	Income (above sample average, %)	37.9	n.a.	n.a.
Highest level of education achieved	Primary studies (%)	13.2	25.2	25.5
	Secondary studies (%)	63.3	46.1	46.3
	University degree (%)	23.4	28.7	28.1

The sample is close to **Aragon** and to Spanish population, implying that the results are able to be inferred to **Spanish population**

Estimates for the Error Component Random Parameters Logit model with correlated			
Attributes	Mean estimation	Standard deviation of coefficient	WTP
	(t-value)		
SQ	-2.150*** (-6.74)	---	---
COST	-0.178*** (-17.87)	---	---
RENEWABLE	0.037*** (-5.58)	0.077*** (-9.93)	0.42*** (-5.66)
SAME_COMPANY	0.117*** (-2.64)	0.402*** (-6.14)	1.31*** (-2.66)
SERVICES	-0.027 (-0.7)	0.234*** (-2.43)	ns ns
σ	4.85*** (-11.72)		

- ✓ All estimated coefficient for the **standard deviation** were **positive and statistically significant** different from zero at the 1% significance level. **HETEROGENEITY.**
- ✓ The coefficient for **SQ and COST** were **negative and statistically significant.**
- ✓ The coefficient for the **RENEWABLE** was **positive** and statistically **significant.**
- ✓ The coefficient of **SAME_COMPANY** was **positive** and statistically **significant.**
- ✓ The coefficient of **SERVICES** was **not statistically significant.**

- ✓ **SQ negative:** Households prefer the alternatives offered to their current contract (no change in cost, 10% renewable and no additional services).
- ✓ **COST negative:** higher monthly bill decreases consumer's utility.
- ✓ **RENEWABLE positive:** higher percentage of renewable origin increases the consumer's utility. **WTP=0.42.**
- ✓ **SAME_COMPANY positive:** the utility of switching the contract but keeping the same company was higher than switching the contract to other company. **WTP=1.31.**
- ✓ Households **did not value to receive additional services** for switching the contract.

Simulate market shares for different electricity contract: three potential markets

Company	Renewable share	Price increase	Associated services	Market 1	Market 2	Market 3
Incumbent	10	0	None	9.4	8.8	9.9
Incumbent	20	4	None	34.1		
Incumbent	30	8	None	19.8		
Incumbent	40	12	None	16.6		
Incumbent	50	16	None	20		
Incumbent	20	4	None		35.2	
Incumbent	30	8	None		21.6	
New entrant	40	12	None		15.6	
New entrant	50	16	None		18.8	
Incumbent	40	12	None			18.8
Incumbent	50	16	None			21.4
New entrant	20	4	coupon + electricity audit			31.4
New entrant	30	8	coupon + electricity audit			18.5

Best strategy:

Low increases in renewables
Low cost.

Assuming a homogeneous distribution of consumption across households, the estimation of the average increase in the monthly electricity bill is:

	Market 1	Market 2	Market 3
Renewable share (%)	30.34	30.04	31.04
Average increased cost (€/month)	8.14	8.01	8.42

The increase of renewable share in total consumption in all markets is about 30%.

Households are willing to pay 8 € more in their monthly bill for an increase in the share of renewable origin.

- ✓ Households are willing to pay a premium for renewable electricity.
- ✓ However, if this implies a change in electricity supplier, it does not compensate for the negative WTP associate with that change.
- ✓ Services associated to utility contracts that providers can offer to make the change more attractive do not seem to help overcoming this reluctance to change.
- ✓ The best strategy to gain market share for renewable electricity for both, incumbents but even more important for new entrants, is low increases in renewable share at a low cost.



¡Muchas gracias por su atención!

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