



Supplier choice and WTP for electricity attributes in an emerging market: The role of perceived past experience, environmental concern and energy saving behavior

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ABSTRACT

This study analyzes customers' preferences and their willingness to pay (WTP) for certain service attributes in an electricity supplier choice context. Specifically, a stated preference choice experiment is conducted in the Canary Islands' residential market where limited competition exists. Preferences for different electricity suppliers and three level-of-service attributes are investigated, namely, supply reliability, share of renewable energies and availability of a complementary energy audit service. The results might be interpreted as an indication of different aspects new firms need to consider if they plan to enter in the market. There is an opportunity for new companies to establish in the market, though evidence of brand loyalty to the current company and/or significant switching costs are also found, especially in the case of older people. Regarding the estimated WTP, several results should be highlighted. First, customers who have experienced more serious outages in the past tend to show a higher WTP to reduce the outage frequency. Second, highly-educated respondents, those who state a great concern for the greenhouse gases (GHG) emissions and those who carry out energy saving actions in their homes exhibit a larger WTP for renewable energies. This empirical evidence provides useful information for authorities responsible for energy policy design.

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1. Introduction

In the last three decades, profound reforms have taken place in the electricity industry in the world. One of the most important features of these reforms has been the unbundling of different industry segments. The main purpose is to introduce competition into electricity generation and retail markets, and improve the efficiency of natural monopoly transmission and distribution stages. Whenever possible, the reforms also broke up the national distribution companies horizontally into several regional monopolies (see Green et al., 2006; Hunt, 2002 among others). At the same time, several governments have started to include renewable energy on their public policy agenda. Recent initiatives, like the EU's 20-20-20 plan, have led many countries, including Spain, to establish as one of their main goals, an increase in the share of renewable energy in electricity generation to reduce greenhouse gases (GHG) emissions.

In Spain, the enactment of Law 54/1997 on the Electricity Sector (LES) initiated a transition from a traditional regulatory regime to one that introduced competition in both generation and supply activities in the retail market. As happened in other countries, however, there has been no significant development of the retail market for residential customers (see Defeuilley, 2009) In December 2010, only 18.1% of domestic supply outlets, representing 27.5% of electricity

consumption, were supplied through the free market. A large majority of users, thus, remain in the regulated market.¹ Since 2010 electricity suppliers have begun to offer a series of complementary services or attributes in the supply of electricity, such as the joint sale of gas, various insurance offers, energy consulting, etc., in an effort to attract new clients or keep existing ones.

The Canary Islands is a Spanish region, where the above mentioned trends have been manifested with certain specific features. On the one hand, the Canary Island electricity market is influenced by its status as a small and isolated electricity system and its emerging market condition, i.e. a market in transition from a traditional integrated and monopolistic one to a competitive deregulated one. There is almost no competition in the wholesale and retail market due to the system size and the vertical integration of the industry.² On the other hand, the environment plays a key role in the region's economic activity, with tourism being the main economic industry (35% of GDP) and over 50% of its territory

¹ From 1st July 2009 consumers connected at low voltage (Voltage <1000 V) with contracted power below 10 kW (almost all household consumers) may contract the electricity consumption on the open market (through a retailer) or from the regulated market (through a regulated tariff set by the Ministry of Industry, Trade and Tourism).

² Most of the residential market (96%) is served by a company that belongs to the monopoly that was in place before deregulation. Until now, only a few companies have begun to compete effectively with the current supplier. For a more detailed analysis of the specific features of the market in the Canary Islands, see Pérez and Ramos-Real (2008).

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protected natural spaces. In fact, in 2006, the regional government approved an energy regulation document named *Plan Energético de Canarias 2006* (PECAN, 2006) with the aim of reducing the archipelago's energy sector's emission levels, and its dependence on oil with the introduction of natural gas and an increased reliance on renewable energy, especially solar and wind power.

In this context, the knowledge of customers' preferences and of their willingness to pay (WTP) for the attributes that characterize the electricity supply can provide information about possible directions the current companies can take or what aspects new companies should consider to enter this emerging market. Likewise, eliciting WTP allows the evaluation of the market sustainability of government's goals in renewable energy generation or energy efficiency improvements, such as the ones contemplated in PECAN-2006.

Residential customers' preferences for electricity suppliers and for several of their level-of-service attributes have already been analyzed in various studies. Stated choice experiments (Louviere et al., 2000) have been a widely used method for this purpose since the contributions by Cai et al. (1998), Goett (1998) and Revelt and Train (1998). Attributes like type of pricing, type of supplier, reliability, amount of renewables, and length of contract, among others have been found to be significant in explaining supplier choice. Nonetheless, there are reasons to suggest that supplier choice, and therefore the implicit WTP for different attributes, can be also influenced by additional factors.

Cameron and Englin (1997) found evidence that WTP for environmental resources is systematically related to respondents' own experience with the good in question, where experience is interpreted as the number of years in which an individual has been a user of that resource. When choosing an electricity supplier, the experience as client of a company and the level of service experienced in the past (e.g. the importance of power outages suffered at home) could be aspects that need to be considered when investigating preferences.

Other factors, such as lifestyle and awareness of environmental problems, have also shown to influence the criteria for energy consumption and result in greater WTP (see, for example, Brandon and Lewis, 1999). In particular, Seligman et al. (1979) and Uusitalo (1989) have argued that people's perceptions of their own contribution to energy problems is predictive of household energy conservation and that information designed to promote energy consciousness should emphasize such values. Analyzing this line of argument in greater depth raises the question of whether the value given to renewable energies is also related to household characteristics that are easily observable, such as energy-saving habits (e.g. the use of low energy consumption bulbs and domestic appliances, etc.), or to the level of concern about the environment. Knowing the influence of these factors on WTP will enable the assessment of the potential impact that fine-tuning policies related to the use of renewable energies, such as environmental awareness campaigns, might have.

This study analyzes residential customers' preferences and their WTP for certain service attributes in an electricity supplier choice context in the retail market of the Canary Islands. In particular, preferences for the type of supplier and for three level-of-service attributes are investigated, namely, supply reliability, share of renewable energies and availability of a complementary energy audit service. Unlike previous studies on this subject, preferences for the electricity supplier are examined considering, on the one hand, how customers rate their current company to continue providing their electricity supply and, on the other hand, how customers rate the service provided by new companies. Furthermore, the paper studies to what extent WTP to improve supply reliability depends on the customers' perceived past experience and, more precisely, on the importance they give to the last outage they experienced in their homes. Finally, it investigates whether the WTP for renewable energy is related to energy-saving habits or to the level of concern about the GHG emissions stated by households.

To achieve the objectives proposed in the previous paragraph, a stated preference choice experiment (CE) was conducted. In the CE,

customers were asked to choose between two hypothetical companies that differed in terms of their attributes, or they had the option to stay with their current supplier. To reflect real-world choice situations, the current supplier is taken as a reference alternative, so hypothetical scenarios consisted of an upgrade in some attributes and/or a downgrade in other attributes as, for instance, in Banfi et al. (2008) or Longo et al. (2008). Nonetheless, and differing from previous studies in the electricity sector, labels are also used to characterize each of the alternative hypothetical suppliers rather than generic titles in order to increase experimental realism (Louviere et al., 2000). In addition, though the vast majority of past research has been based on fractional factorial designs, here the choice scenarios were generated using an efficient design (Huber and Zwerina, 1996), a novel technique which has been rarely applied in this area. To the authors' knowledge, this is the first time that an experimental design combining a reference alternative, labeled alternatives and efficient design is employed to analyze energy demand.

The econometric model used is a mixed logit panel with error components with a focus on capturing systematic heterogeneity in the preferences. This model takes into account the panel correlation inherent in the data, the correlation between the experiment's hypothetical alternatives and the presence of random heterogeneity in the preferences. The effect of some specific factors analyzed in this work (e.g. environmental concern) is considered by introducing interactive covariates with rating-scale variables into the specification for the deterministic component of utility.

The results help to predict the willingness of consumers to switch supplier in a market where few have exercised this option. This information might be useful for similar emerging markets and to compare with those territories where competition is at a more advanced stage. Furthermore, the results provide the first WTP estimates based on choice experiments in the context of the Spanish energy sector and highlight the importance of accounting for customers' perceived past experience, their electricity consumption patterns and their awareness of environmental issues when attempting to more accurately characterize the distribution of the population's WTP.

The rest of the paper is structured as follows. In the next section, we describe the experiment of stated preferences. In Section 3, we present the microeconomic bases and the econometric formulations, while in Section 4 we provide a brief, descriptive analysis of the data used. Section 5 shows the results of the different models estimated and discusses the results. In Section 6, we present the estimated willingness to pay for the attributes analyzed in the context of existing empirical evidence for other markets. Finally, we offer the main conclusions drawn from this study.

2. The choice experiment

A common practice for determining WTP is to use *contingent valuation* methods. However, there is some controversy regarding the use of this method and its ability to find a reliable WTP, especially when applied to situations where multiple options and attributes are considered (Diamond and Hausman, 1994). *Choice experiments* (CE) also rely on stated preferences and involve hypothetical choice contexts in which survey respondents implicitly reveal their valuations of different attributes. This method offers certain advantages over contingent valuation, particularly when it is necessary to obtain the values of the characteristics that describe a resource or service, rather than valuing the overall resource or service (Hanley et al., 1998). In this study, we opted to design a CE in which residential customers must choose an electricity supplier.³ This approach has been used in

³ In this case, revealed preference data was not useful to achieve the same objectives for several reasons. First, the level of service attributes does not vary among suppliers, so we have to considerer hypothetical scenarios in order to have enough data variability. Second, we want to evaluate the preference for attributes that were not offered at the time of the survey, like energy audits. Thus, we opted to design a stated choice experiment based on hypothetical scenarios.

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