



Research article

Consumer's behavior determinants after the electricity market liberalization: the Portuguese case

Débora Maravilha¹, Susana Silva^{2,*} and Erika Laranjeira³

¹ GKN Automotive

² CEF.up and Faculdade de Economia da Universidade do Porto (FEP), Porto, Portugal

³ COMEGI, Centro Universitário Lusíada – Norte, Porto, Portugal and CEF.up

* **Correspondence:** Email: ssilva@up.pt; Tel: +3-5122-5571-100.

Abstract: Electricity markets have been liberalized worldwide, but the success of country specific experiences varied widely. Consumers' behavior is among the key factors for successful liberalization experiences namely regarding the decision to switch operator. This decision has been shown to be influenced by a multiplicity of factors. The goal of this article is to explore the analysis of the drivers for switching operator in a liberalized electricity market. With that purpose, we focused on the residential Portuguese case using a questionnaire. The logit estimation showed that men are more likely to switch supplier than women and that larger families are less likely to do so probably, due to the perception of high information search costs. Other sociodemographic variables were not found to be statistically significant. Regarding specific determinants, our results showed that past experiences with a supplier, dissatisfaction with the current operator, and family and friends' experiences were the most important determining factor for the decision to switch operator. Hence, the price was not the most important determinant. We also explored if different income groups had differentiated responses regarding the main drivers but concluded that there was no evidence that the income group affected the importance given to the price or to the other determinants for the decision.

Keywords: electricity markets; liberalization; consumer behavior; determinants

JEL Codes: D10, D40, L94, Q48

1. Introduction

Electricity plays a key role in societies worldwide. It has been essential for the development of modern societies and even currently, there is an increasing share of electric devices as the electrification process gradually continues. Owing to environmental problems, electrification has been promoted by governments worldwide. This happens due to the easier penetration of renewable energies for electricity generation when compared to other energy sources. With the increasing share of electric vehicles, the importance of electrification is expected to increase further in the retail sector, due to higher demand levels.

Technical aspects, such as, economies of scale in some segments of the electricity sector determine the tendency for a natural monopoly with vertically integrated state-owned firms (Shin and Managi, 2017). For this reason, this type of structure has been the market reality for several decades (Al-Sunaidy and Green, 2006). According to Sioshansi (2006) this has also been the reason why this sector has been regulated all those decades. Notwithstanding, the tendency to market liberalization or deregulation has been felt worldwide (Shin and Managi, 2017). The liberalization process essentially affects the generation and commercialization segments of the market since transmission and distribution remain natural monopolies for technical reasons (Al-Sunaidy and Green, 2006).

Electric market liberalizations started in developed countries, mostly European, such as, Sweden, Germany, Norway and the United Kingdom (UK). In the 90's and early 2000s many other developed European countries followed this tendency, as well as, the United States of America (USA). The UK and Ireland are pointed as successful examples of the deregulation process, with switching rates well above other European Union (EU) countries (Shin and Managi, 2017; Giulietti et al., 2005). For a more detailed description of the electricity market liberalization aspects see Al-Sunaidy and Green (2006).

Market liberalization may be of interest both to the incumbent and new entrants if it allows cost savings, creation of joint-ventures, and management optimization. On the other hand, families may expect price reductions with the added competition. In theory, liberalization aims to improve resource allocation, economic efficiency, security of supply and ultimately, reduce the electricity price (Al-Sunaidy and Green, 2006; Gamble et al., 2009). However, the final effect on price remains a controversial topic in the literature (Shin and Managi, 2017; Newbery, 2002).

In reality, the electric market liberalization does not always have the effects initially desired by the state and regulators. Liberalization experiences worldwide vary from complete successes to failures (Armstrong and Sappington, 2006). At the firm level, evidence shows little efficiency gains from the liberalization process (Pollitt, 2012). The success of a liberalization process can be conditioned by the specific regulations in each country (Armstrong and Sappington, 2006). When harmful regulations do not exist, ultimately, the success of a liberalization process depends on consumers' behavior namely, the decision to switch operator or not. Hence, consumers' behavior is essential for the success of a liberalization process, especially in the electricity market that depends heavily on consumers' own needs and choices (Joskow, 2000).

Electricity is an undifferentiable good, which means that suppliers need to find alternative ways to differentiate themselves to attract new customers. In this way, the role of marketing can be central for decision-making. Customer service and past experiences can be decisive to increase consumer's confidence, safety and reliability (Flores and Waddams Price, 2013). Hence, as pointed out by Hartmann and Ibáñez (2007), nowadays, firms in the electricity sector are focusing on branding and

increased customer satisfaction to prevent consumers from switching and therefore increase loyalty. In addition to this, consumers often do not necessarily choose the supplier with the lowest price (Hartmann and Ibáñez, 2007), which increases the complexity of the analysis.

In addition to these problems, it may also be the case that, contrary to what is expected with liberalization, the competition in the market instead of increase will decrease. According with some studies done in some countries where the energy market was liberalized, it is possible that the participants in such market act like oligopolists for some reasons, engaging in tacit collusive behavior, which puts into question the main purpose of market liberalization (Aliabadi and Chan, 2022).

Consumers' behavior after a market liberalization is not straightforward and is challenging to measure (Borenstein and Bushnell, 2000). This behavior, as well as, consumer satisfaction, can be influenced by several factors, such as: pricing and contract terms, reliability, performance, professionalism, post-sale support, and the handling of customer requests and complaints (Drosos et al., 2020). As referred, consumers may not always respond only and exclusively to price differences. Hence, the study of the determinants of consumers' behavior is key. Moreover, in theory the importance of each determinant can vary according to the income level. For example, consumers with lower income levels may give more importance to price, while consumers with higher income levels can value more other factors, such as, consumer service.

The goal of this article is to explore the determinants of consumers' behavior regarding the decision to switch supplier after the electricity market liberalization process. We conduct a survey to the main determinants or hindering factors for the decisions to switch operator. We focus on the Portuguese residential retail electricity market. We also analyze if the importance of each determinant is influenced by household income, a topic that as far as we know, has never been explored in the literature.

As in most countries, the Portuguese electric market has been characterized by a monopolistic structure for several decades. Energias de Portugal (EDP) dominated all segments (generation, transmission, distribution, and commercialization) of the retail market as the installed incumbent. The share of this company has fallen over time to 84.3% in 2017 to 74.5% in 2021 (ERSE, 2021). Still, despite this decrease and the liberalization process, with the entrance of several other firms in the commercialization stage, the electric market remains very concentrated (Ferreira et al., 2007), and EDP (with the name EDP Comercial) still currently possess a very significant market share (ERSE, 2021), which may reflect a high level of confidence and loyalty from consumers. This firm has high investments in advertising, both on television and in association with events (music festivals, marathons, other sport events, among others).

In Portugal, the electric market liberalization process started in 2000 with the legal unbundling of the electric transmission network. At this stage there was a separation between the high voltage network and the distribution network (Ghazvini et al., 2019). Regarding network ownership, Redes Energéticas Nacionais (REN) is the transmission system operator in Portugal and EDP Distribuição owns approximately 99% of the distribution network in mainland Portugal (Ghazvini et al., 2019) serving, roughly, 10 million consumers.

Regarding the liberalization in the retail sector, in Portugal, the fully regulated retail tariffs ended on July 1, 2012, for normal low voltage consumers with contracted power above or equal to 10.35 kVA, and on January 1, 2013, for normal low voltage consumers with contracted power lower than 10.35 kVA (ERSE, 2013). After January 1, 2013, regulated tariffs were no longer available for new contracts (ERSE, 2013). Hence, consumers had to find energy suppliers in the market (ERSE, 2013).

During the transition period, consumers should compare offers from different energy suppliers and choose their energy supplier. The goal of the phasing-out of regulated tariffs was to encourage end-users to change their retailer and promote the entrance of new companies into the retail market. When moving to the liberalized market consumers could choose among various suppliers, including EDP and other relevant players, such as, Endesa, Iberdrola, Goldenergy and Galp, which is the gas incumbent in Portugal, but still has a relatively modest share in the electricity market of around 5.5% (ERSE, 2021).

The liberalization process was always closely monitored by the Portuguese energy services regulatory authority (ERSE). ERSE is a government-independent entity with administrative and financial independence that ensures the competitive and adequate functioning of the market (Ghazvini et al., 2019). It is also responsible for the establishment of the fixed component of the electricity price tariff (access to the grid) and provides a billing simulator for consumers to compare prices, which has been shown to be a very important tool to promote switching (Six et al., 2017). Additionally, one may refer that in Portugal the electricity price has three components: access to the grid; taxes; and energy and retailer margins. Furthermore, according to ERSE, access to grid tariffs may account for 62%-67% of the electricity price, which is a considerable amount. Hence, despite the liberalization the margin for price reductions remains limited which determined small price variations overtime (Ghazvini et al., 2019) and limited cost gains from switching supplier.

Regarding switching rates, Ghazvini et al. (2019) pointed out that switching rates were relatively high in Portugal, reaching more than 30% in 2014, but their analysis focused on price issues.

Our study showed a high level of inertia in our sample. Furthermore, regarding the determinants for supply switching, price is not the most important factor, being preceded, for example, by operator dissatisfaction and experiences of friends and family. Finally, no significant differences were found among income groups.

The structure of the paper is as follows. After this introduction, section 2 presents some relevant literature on the subject, section 3 depicts the methodology and the data used for the analysis, finally section 4 concludes the paper.

2. Literature review

There are several factors determining the success or failure of the liberalization process (Borestein and Bushnell, 2000), namely given the complexity of consumers' behavior (Defeuilley, 2009). Woo et al. (2003) point out, for example, power abuse by incumbents, low price elasticity of demand, and inability to respond when faced with natural disasters (e.g., in California), as some of the reasons for a failure in the liberalization process.

Providers switching is one of the most important aspects of the market liberalization process, since it is what allows consumers to take advantage of the market deregulation reform (Shin and Managi, 2017). For example, in the UK, a few years after the liberalization occurred, nearly 39% of consumers had already changed supplier (Giulietti et al., 2005), which makes this country a successful example. As pointed out by Gamble et al. (2009), if consumers do not switch they are most likely missing out on the opportunity to improve their utility, which is often the case. Hence, switching rates can be an indicator of the market liberalization success (Yang, 2014). Al-Sunaidy and Green (2006) reported that in England, following the first deregulation process, the amount of supplier shifts arose to around two-fifths of the electricity supply volume in the first year, and that the proportion rose

steadily. After some time, some costumers have switched back to the incumbent, but still they were able to take advantages of the higher competition. In Sweden, more than ten years after the liberalization process, initial incumbents remained the dominant firms (Gamble et al., 2009)

Historically, switching rates have been high in countries, such as, the UK, but relatively low in others, such as, Denmark and Japan (Shin and Managi, 2017). For example, Gamble et al. (2009) report an average switching rate of 11% in Sweden by 2007. For the Portuguese case, Ghazvini et al. (2019) report high switching rates, indicating that from 2013 to 2015 the country had one of the highest switching rates of the EU Member States, despite the retail market still being highly concentrated. If there is a high level of inertia incumbents have a competitive advantage.

The determinants for switching supplier have been studied in the literature for several years. For example, Waterson (2003) analyzed the importance of consumers' behavior for industry performance in UK focusing on the topics of information search by consumers and the type of response to price differences. The authors analyzed the information from a previous survey which covered 863 consumers. Giullietti et al. (2005) analyzed these determinants for the UK, focusing on natural gas markets using a sample of 692 consumers interviewed in 1998 and 1999. In a later study, Hartmann and Ibáñez (2007) focused on the Spanish case and used a total of 2,020 valid personal interviews. One year later Garling et al. (2008) published a study of the Swedish case where a sample of 540 electricity consumers was utilized. In the same year, and for Sweden, Gamble et al. (2008) explored the attitudes of consumers regarding switching operator for the electricity markets, telecommunications, and insurance. These authors utilized a sample of 458 households. Also, for Sweden, Ek and Söderholm (2008) studied the determinants for switching using a sample of 536 survey responses. The study showed that perceived cost savings are important determinants for switching. Kaenzig et al. (2013) focused on the determinants for German households, using a sample of 414 German residential consumers. Notwithstanding, this study emphasized the role of the preference for green energy. Shin and Managi (2017) performed the analysis for Japan using national surveys from 2015 and 2016 with a total of 49,805 observations. In the same year, Six et al. (2017) published a study on the determinants that promote and prevent switching for Austrian households using a sample of 302 respondents. More recently, Ndebele et al. (2019) studied non-price determinants for switching in New Zealand using a sample of 224 residential bill-payers. The authors also focused on the willingness to pay for each attribute.

The analysis of previous studies allows a systematization of the most important switching determinants depicted in the literature. As mentioned, the decision to switch electricity supplier after the liberalization process is crucial. However, this decision, as any human behavior, may be influenced by a multiplicity of factors (Hartmann and Ibáñez, 2007). Since electricity is a homogeneous good, it could seem that price would be the most important determinant for the switching decision. Notwithstanding, this is not the case in many of the markets studied worldwide. In fact, consumers often do not choose the supplier with the lowest price (Waterson, 2003; Hartmann and Ibáñez, 2007).

Many studies have shown that, besides the price, other non-monetary attributes can be important for the decision of switching supplier or not (Roe et al., 2001; Hartmann and Ibáñez, 2007; Ndebele et al., 2019). Factors affecting the switching rate include the attitude (loyalty) towards the incumbent due to branding and habituation (Giullietti et al., 2005; Gamble et al., 2009), information search costs, and expected economic benefits (Gamble et al., 2009), among others. For example, psychologically, things that are already known are considered safer than the unknown by the human brain and this is the case for incumbent firms which already proofed their reliability and stability (Newbery, 2002). As pointed

out by Hartmann and Ibáñez (2007) in their study of how customer loyalty is managed in liberalized markets, loyalty can also be influenced by branding, which in itself includes many factors, such as, perceived technical service quality and service process quality, perception of value-added services, environmental and social commitment of the company, brand trust, price perceptions and brand associations related to the corporate attributes of innovation.

Information cost has been shown to be a key element to help consumers in the switching process (Shin and Managi, 2017; Six et al., 2017). If this information is insufficient or not available consumers may avoid switching or consider the switch a very hard process, which would harm the potential positive effects of deregulation. Perceived costs of information search (or bureaucracy) can be a factor hindering the switch (Garling et al., 2008; Waterson, 2003; Hartmann and Ibáñez, 2007; Ek and Söderholm, 2008; Six et al., 2017), especially if consumers perceive that the economic benefits of switch are lower than the search costs (either physical time, psychological and monetary). According to Garling et al. (2008) these costs for searching information may be divided into the time it takes to access the necessary information, and the cognitive costs to process the accessed information to understand its relevance for the decision problem. An additional cost would be the risk involved in the uncertainty of dealing with a new service supplier (Hartmann and Ibáñez, 2007). To illustrate the importance of information, we refer to the study of Ariu et al. (2012) which found that 47% of residents in France did not know they could switch electricity providers even several years after the market liberalization. The authors concluded that this fact could explain the low switching rates in France. Gamble et al. (2009) found the same effect of perceived difficulty of information search in Sweden.

As referred, loyalty to the incumbent seems to play a significant role in the decision to not switch (Garling et al., 2008; Ndebele et al., 2019) because this factor has a cognitive and emotional component and can also be associated to the human brain's aversion to the unknown or tendency to remain in the default option (Kaenzig et al., 2013). This emotional component may lead consumers to disregard price (economic) potential benefits from switching. Al-Sunaidy and Green (2006) pointed out that marketing ability and customer familiarity seemed to be more important than price when analyzing the effective switching behavior. However, when analyzing the Pennsylvania case, the authors found that the incumbent with large enough rates for the competitors to decrease the price was the one who lost most consumers. The authors finally concluded that it is hard to establish a correlation between prices and market shares, since many other aspects can play a role in consumers' behavior. In a study for Sweden, Gamble et al. (2009) also found that loyalty to the incumbent was one of the most important factors deterring switching. As referred before, firms are currently focusing on increasing customer satisfaction to prevent switching, which also relates to the fact that acquiring new consumers is relatively more difficult and has higher costs than retaining the existing ones (Shin and Managi, 2017; Hartmann and Ibáñez, 2007).

Customer service quality is also an important determinant for the switching decision (Shin and Managi, 2017). Customers who are satisfied with their provider service, such as, problem solving, are more likely to avoid switching, while unsatisfied customers will likely change provider. Hartmann and Ibáñez (2007) elaborate on the components of customer service, but in general we may highlight the stability of the electricity provision and, especially, the way employers resolve problems (speed, politeness, etc.).

Preference for green energy suppliers has also been a relevant topic discussed in the literature, where green suppliers will likely capture consumers who have a higher environmental awareness

(Gärling et al., 2008; Gamble et al., 2009; Kaenzig et al., 2013; Hartmann and Ibáñez, 2007). Furthermore, if renewable energy integration allows reducing the electricity price (Macedo et al., 2020) it constitutes an added advantage. Notwithstanding, Garling et al. (2008) found no effect of this factor.

Furthermore, there is an interconnection between determinants, since for example, customer satisfaction, brand trust and perceived switching costs can be positively related to customer loyalty to the incumbent (Hartmann and Ibáñez, 2007).

Finally, a very important determinant is the perceived lack of economic benefits for switching (Gamble et al. 2009; Hartmann and Ibáñez, 2007), which can happen when price reductions (or price differences among firms) are not significant (Garling et al., 2008). Additionally, Giuliotti et al. (2005) points out that if switching costs exist, they may hinder the process, which may be the case, for example, in the telecommunication sector. Notwithstanding, these costs do not exist in the Portuguese residential electricity market.

It can also be the case that consumers consider that the benefits are too low for their income level, which raises the question of whether consumers' behavior varies according to their income level. This is a relevant factor that, as far as we know, has never been studied in the literature. For example, for households with higher levels of income, electricity represents a small percentage of income (Juliusson et al., 2007), hence the importance given to price changes can be low.

3. Materials and methods

To perform our analysis, it was used an online survey to understand the possible factors affecting the desire to switch operator. Several possible aspects are explored, namely, price, firm credibility, bureaucracy, information, advertisement, among others. The questionnaire was sent by email to the target group and the final database was obtained until June 2021.

The questionnaire included a general introduction regarding the issue of electricity market liberalization. We then asked respondents about their opinion on the main possible motivators to switch suppliers. We also asked them if they had switched operators after the market liberalization. Finally, we collected sociodemographic data on respondents.

3.1. Data

To perform our survey, we established as the target group the population of the Faculty of Economics of the University of Porto, one of the largest universities in the country, which comprehends a total of around 3800 people. The reasoning for this choice was twofold. First, according to Six et al. (2017) and Ek and Söderholm (2008) consumers with higher education levels are more active switchers. Hence, we decided to focus on respondents with higher education and higher knowledge in economics. Additionally, in practical terms, it was easier to obtain the contacts of this target group.

Potential respondents were contacted via email. Since the Faculty has both students and workers, we explicitly asked only bill payers or decision makers of the household to answer the survey which implies that our target group is lower than 3800 people, but we cannot know for sure of how many people. We obtained a total of 273 valid responses. From this sample, only 38 respondents switched operators. Our sample is characterized by having mostly female people (69.23%), falling into an age group mostly between 18–24 years, with a high prevalence of the sample in the Region of Porto (more

than 50% living in this district). Of the 273 respondents, 215 have bachelor's degrees/master's degrees. In terms of income, 33.3% have a monthly income of more than €2,000 per month and 19.78% of respondents have an income of less than €999.

To perform the quantitative analysis, we transform the variables according to described in Table 1.

Table 1. Variables used.

Variable	Description	Category
Gen	Gender	1 = Male; 0 = Female.
Age	Age	1 = [18–24]; 2 = [25–31] and 3 = 32 or +
Resi	Residency District	1 = Porto; 0 = Outside Porto.
Sit_prof	Professional Situation	1 = Full employed, Part-time or Self-employed; 0 = Unemployed, Student or Retired.
Educ	Education	1 = Bachelor's degree or higher; 0 = 1 st , 2 nd , 3 rd and Secondary Cycles
House	Household	1 = [1, 2]; 2 = 3; 3 = 4 or +
Prop	Type of Property	1 = Tenant; 0 = Owner.
Income	Household Income	1 = [€0 – €999]; 2 = [€1,000 – €1,499]; 3 = [€1,500 – €1,999] and 4 = €2,000 or +

3.2. Results

3.2.1. Sociodemographic determinants

We start by analyzing the sociodemographic factors that increase/influence the probability to switch operator. A Binary Logit Model was used where the explained variable (Y) is a binary variable which corresponds to the answer to the question: “Did you change operators after market liberalization?” and takes the valor 1 if the answer is positive and 0 otherwise. This model can be expressed as follows:

$$\text{Logit}(Y_i) = \beta_0 + \sum_{j=1}^8 \beta_j X_{ij} + e_i,$$

where, β_0 is the constant term; β_j represent the natural logarithm of the odd ratio of the j-variable; X_{ji} represents the j-sociodemographic variables considered relevant for the decision to change operator for each individual i in the sample and e_i is the error term of the equation. Table 2 summarizes the results.

The model has a low explanatory power despite being globally significant. This is likely since the majority of respondents declared that they had not changed operator, leading to a high concentration of observations. This behavior demonstrates a very high level of inertia among respondents, which can indicate loyalty towards the incumbent, as referred by Gamble et al. (2009) and Giullietti et al. (2005).

It is possible to conclude that gender and family size are the only statistically significant variables in the estimation, assuming a significance level of 10%. Men are more likely to change operator, while larger families are less likely to do so. This last result can possibly be explained by the fact that larger families have less time available for the bureaucratic process.

Table 2. Results of the Binary Logit model.

Variable	Coefficients (Log Odd-ratio)	Std. Err.
Constant	-0.356	(0.943)
Gen	0.706*	(0.374)
Age	-0.149	(0.268)
Resi	0.078	(0.401)
Sit_prof	0.500	(0.440)
Educ	-0.524	(0.488)
House	-0.593**	(0.262)
Prop	-0.050	(0.382)
Income	-0.128	(0.276)
LR statistic	13.12	
R ²	0.1080	
Pseudo R ²	0.0595	

Notes: Std. Err.: Standard Error; ** and * represent significant at 5% and 10%.

3.2.2. Specific determinants

Now we focus on specific determinants for the decision to switch operator. We asked the respondent whether they considered each determinant to be important or not for the decision to switch. The determinants included were: the price, strong advertisement, past experiences, experience of family and friends, dissatisfaction with the current operator, and perception of excessive costs for information search and for switch (bureaucracy).

Figure 1 illustrates the most important factors affecting the decision to change electricity supplier according to our respondents. The percentages indicate the share of respondents who chose the determinant to be relevant for the switching decision. Interestingly, the price is not the most important factor, being less relevant than past experiences, dissatisfaction with the current operator and experience of family and friends. This can partially be explained by the relatively low potential monetary savings that can come from switching in the Portuguese market (Ariu et al., 2012). On the contrary, bureaucratic difficulties appear as an important factor preventing supplier switch (68%).

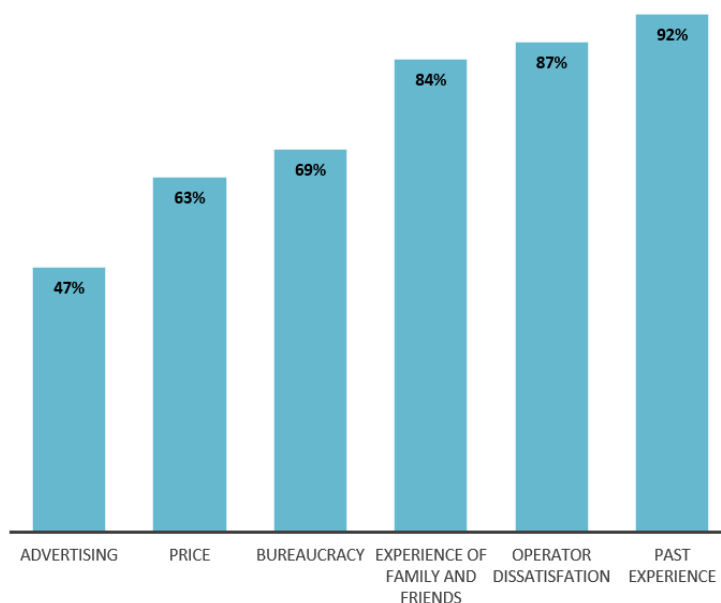


Figure 1. Factors influencing operator switching (percentage of respondents who consider the factor to be important)

3.2.3. Influence of income levels for the importance of specific determinants

Once analyzed the main reasons that can lead consumers to change electrical operator, it was analyzed if the level of household income influences the importance given to each of these factors.

After verifying that the collected sample does not respect the assumptions of normal distribution and the presence of homoscedasticity, we used the Kruskal-Wallis Test, a non-parametric test, to verify if there is, at least, one income group ([€0 – €999]; [€1,000 – €1,499]; [€1,500 – €1,999] and €2,000 or +), where the distribution of the variable is different from the others. The variables considered are the same that are presented in Figure 1.

Table 3 shows the percentage distributions of the responses, according to income groups, for each factor considered important to switch electric operator.

Table 3. Distribution of responses according to income.

Income group	Advertising		Price		Bureaucracy		Experience of family and friends		Operator dissatisfaction		Past experience	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
[€0–€999]	15.8%	10.5%	18.4%	7.9%	5.2%	21.1%	26.3%	0%	23.7%	2.6%	26.3%	0%
[€1,000–€1,499]	13.2%	13.2%	13.2%	13.2%	13.2%	13.2%	15.8%	10.6%	15.8%	10.5%	21.1%	5.3%
[€1,500–€1,999]	7.9%	10.5%	13.2%	5.2%	2.6%	15.8%	15.8%	2.6%	18.4%	0%	18.4%	0%
€2,000+	10.5%	18.4%	18.4%	10.5%	10.5%	18.4%	26.3%	2.6%	29.0%	0%	26.3%	2.6%
Total	47.4%	52.6%	63.2%	36.8%	31.5%	68.5%	84.2%	15.8%	86.9%	13.1%	92.1%	7.9%

Within the variables considered, and assuming a significance level of 10%, it is possible to conclude that, only for the experience of family and friends (p -value = 0.09) and the operator dissatisfaction (p -value = 0.031) there is not equality of distribution between household income groups.

When exploring these results in detail, it was found that the 2nd income group (€1,000–€1,499) is the one that stands out from the rest. That is, for consumers who earn average income (€1,000–€1,499), the importance given to experience of friends and family and operator dissatisfaction is lower than the importance that consumers from another groups attribute. These results are difficult to interpret economically since they are not on any extreme level (high or low) of income, and the literature on such topic is scarce, or even non-existent, according to our knowledge. What may also justify such results is the specificity of the sample collected, as mentioned above. Therefore, it was not possible to verify a different behavior between the groups with the lowest income and the groups with the highest income.

4. Discussion

Electricity markets are facing liberalization processes worldwide. The relative success of these processes varies widely and can be linked to factors such as effective price decreases, efficiency gains and supplier switching rates. In fact, switching rates and price decreases can be related since high switching rates are necessary to effectively increase competition, which in turn will incentivize firms to compete through prices (keeping in mind that electricity is an homogeneous good). Notwithstanding, it is often verified that consumers do not always choose the supplier with the lowest price. There are other psychological, physical or social factors that condition the decision to switch supplier or not. Hence, the study of these determinants is key.

The goal of this article was to explore the analysis on the drivers for switching operator in a liberalized electricity market. With that purpose, we focused on the residential Portuguese case using a questionnaire. Regarding the sociodemographic determinants, our sample showed that men are more likely to switch supplier than women and that larger families are less likely to do so, probably due to the perception of high information search costs. The other variables considered were not found to be statistically significant.

Additionally, contrarily to the results in Ghazvini et al. (2019) our sample demonstrated a relatively high level of inertia regarding switching, with a very high percentage remaining with the same electricity supplier. According to Armstrong and Sappington (2006) a substantial inertia in consumers' behavior can relate to a lack of knowledge concerning price differences among firms. It can also relate to other factors, such as loyalty to the incumbent, perceived costs of information search, and perceived lack of economic benefits (Hartmann and Ibáñez, 2007). In this regard, we inquired respondents on whether they considered specific determinants to be important for the decision or not. Those determinants were: the price, strong advertisement, past experiences, experience of family and friends, dissatisfaction with the current operator, and perception of excessive information costs. Past experiences, dissatisfaction with the current operator, and family and friends' experiences were the most important determinants for the decision to switch operator. Hence, the price was not the most important determinant despite the fact that electricity is an homogeneous good. These results are in line with the ones provided by Roe et al. (2001) and Hartmann and Ibanez (2007). On the other hand, bureaucracy was shown to be a relevant factor preventing the decision to change, which is in line with

the results provided by Gamble et al. (2009) concerning the impacts of the information search costs. Our results can be explained by the fact that firms have been developing strong efforts to differentiate through other aspects (generally called consumer services), and by the fact that the decision is not always rational in a strict sense (responding only to the price) and rather it is often an emotional decision.

Another relevant aspect that could potentially help to explain the results would be the low weight of the electricity bill on the consumers' income. If that weight is too low, consumers may not bother to switch operator. To explore this topic, we performed a comparison between the responses among different income groups. In theory, low-income groups would give a higher importance to the price than high-income groups. However, in our sample, we did not find clear evidence of differentiated responses between the lower income groups and the higher income groups. Hence, we may conclude that, for our sample, there is no evidence that the income group affects the importance given to the price (or the other determinants).

We acknowledge that the low number of respondents that switched operator, and the small size of our sample is an important shortcoming of our work. In future research, we intend to alter the questionnaire and implement it again to a larger sample since the COVID restrictions are now gradually lifting. In particular, we would like to directly ask respondents the reasons for not switching operator. Furthermore, as in Shin and Managi (2017), we did not explore the possible renegotiations of consumers and the incumbent firm, which could have been of interest since most respondents did not switch provider. Hence, it is something we would like to do in future research.

It is worth noting that the electric market liberalization in Portugal is a relatively new phenomenon and that Borestein and Bushnell (2000) already referred that short-term benefits of deregulation are likely small due to the low elasticity of demand. Hence, our results are, to a certain extent, in line with this literature. Furthermore, even in liberalized markets a specific level of market power is still expected to exist (Borestein and Bushnell, 2000).

Acknowledgments

This research was financed by Portuguese public funds through Fundação para a Ciência e a Tecnologia (FCT), I.P., in the framework of the project with reference numbers UIDB/04105/2020, UIDB/04005/2020, and UIDP/04005/2020.

Conflict of interest

All authors declare no conflicts of interest in this paper.

References

- Aliabadi DE, Chan K (2022) The emerging threat of artificial intelligence on competition in liberalized electricity markets: A deep Q-network approach. *Appl Energy* 32: 119813. <https://doi.org/10.1016/j.apenergy.2022.119813>
- Al-Sunaidy A, Green R (2006) Electricity deregulation in OECD countries. *Energy* 31: 769–787. <https://doi.org/10.1016/j.energy.2005.02.017>

- Ariu T, Lewis PE, Goto H, et al. (2012) Impacts and Lessons from the Fully Liberalized European Electricity Market - Residential Customer Price, Switching and Services. *Central Research Institute of Electric Power Industry Report*, No. Y11018.
- Armstrong M, Sappington D (2006) Regulation, Competition, and Liberalization. *J Econ Lit* 44: 325–366. <https://doi.org/10.1257/jel.44.2.325>
- Borenstein S, Bushnell J (2000) Electricity restructuring: deregulation or reregulation. *Regulation* 23: 46–52.
- Defeuilley C (2009) Retail competition in electricity markets. *Energy Policy* 37: 377–386. <https://doi.org/10.1016/j.enpol.2008.07.025>.
- Drosos D, Grigorios LK, Arabatzis G, et al. (2020) Evaluating Customer Satisfaction in Energy Markets Using a Multicriteria Method: The Case of Electricity Market in Greece. *Sustainability* 12: 3862. <https://doi.org/10.3390/su12093862>
- ERSE (2013) Extinction of regulated tariffs for electricity and natural gas. Available from: <http://www.erse.pt/eng/Paginas/extinctiontariffs.aspx>.
- ERSE (2021) Tarifas e preços para a energia elétrica e outros serviços em 2022 e parâmetros para o período de regulação 2022–2025.
- ERSE (2021) Relatório sobre os mercados retalhistas de eletricidade e de gás natural em Portugal.
- Entidade Reguladora dos Serviços Energético (ERSE) (2021) Síntese Mensal, November 2021.
- Ek K, Söderholm P (2008) Households' switching behavior between electricity suppliers in Sweden. *Util Policy* 16: 254–261. <https://doi.org/10.1016/j.jup.2008.04.005>.
- Ferreira P, Araújo M, O'Kelly MEJ (2006) An overview of the portuguese electricity market. *Energy Policy* 35: 1967–1977. <https://doi.org/10.1016/j.enpol.2006.06.003>
- Flores M, Waddams PC (2013) *Consumer behaviour in the British retail electricity market*. Centre for Competition Policy Working Paper, University of East Anglia, Norwich (UK). <https://ueaeco.github.io/working-papers/papers/ccp/CCP-13-10.pdf>
- Gamble A, Juliusson E, Gärling T (2009) Consumer attitudes towards switching supplier in three deregulated markets. *J Socio Econ* 38: 814–819. <https://doi.org/10.1016/j.socec.2009.05.002>.
- Gärling T, Gamble A, Juliusson E (2008) Consumers' switching inertia in a fictitious electricity market. *Int J Consum Stud* 32: 613–618. <https://doi.org/10.1111/j.1470-6431.2008.00728.x>
- Ghazvini M, Ramos S, Soares J, et al. (2019) Liberalization and customer behavior in the Portuguese residential retail electricity market. *Util Policy* 59: 100919. <https://doi.org/10.1016/j.jup.2019.05.005>
- Giulietti M, Price C, Waterson M (2005) Consumer choice and competition policy: a study of UK energy markets. *Econ J* 115: 949–968. <https://doi.org/10.1111/j.1468-0297.2005.01026.x>
- Hartmann P, Ibáñez VA (2007) Managing customer loyalty in liberalized residential energy markets: The impact of energy branding. *Energy Policy* 35: 2661–2672. <https://doi.org/10.1016/j.enpol.2006.09.016>
- Joskow PL (2011) *Deregulation and regulatory reform*. In *Deregulation of Network Industries: What's Next?* Sam Peltzman and Clifford Winston (Eds.). Washington D.C, USA, 113–188.
- Juliusson EA, Gamble A, Gärling T (2007) Loss aversion and price volatility as determinants of attitude towards variable price agreements in the Swedish electricity market. *Energy Policy* 35: 5953–5957. <https://doi.org/10.1016/j.enpol.2007.06.019>
- Kaenzig J, Heinzle SL, Wüstenhagen R (2013) Whatever the customer wants, the customer gets? Exploring the gap between consumer preferences and default electricity products in Germany. *Energy Policy* 53: 311–322. <https://doi.org/10.1016/j.enpol.2012.10.061>

- Littlechild SC (2000) *Why do we need electricity retailers: A reply to Joskow on wholesale spot price pass-through*. University of Cambridge, Cambridge (UK).
- Macedo DP, Marques AC, Damette O (2020) The impact of the integration of renewable energy sources in the electricity price formation: is the Merit-Order Effect occurring in Portugal? *Util Policy* 101080. <https://doi.org/10.1016/j.jup.2020.101080>
- Morey MJ, Kirsch LD (2016) Retail choice in electricity: What have we learned in 20 years? Electric Markets Research Foundation report.
- Pollitt M (2012) The role of policy in energy transitions: Lessons from the energy liberalisation era. *Energy Policy* 50: 128–137. <https://doi.org/10.1016/j.enpol.2012.03.004>
- Roe B, Teisl M, Levy A, et al. (2001) US consumers' willingness to pay for green electricity. *Energy policy* 29: 917–925. [https://doi.org/10.1016/S0301-4215\(01\)00006-4](https://doi.org/10.1016/S0301-4215(01)00006-4)
- Shin KJ, Managi S (2017) Liberalization of a retail electricity market: Consumer satisfaction and household switching behavior in Japan. *Energy Policy* 110: 675–685. <https://doi.org/10.1016/j.enpol.2017.07.048>
- Sioshansi F (2006) Electricity Market Reform: What has the Experience taught us thus far? *Util Policy* 14: 63–75. <https://doi.org/10.1016/j.jup.2005.12.002>
- Six M, Wirl F, Wolf J (2017) Information as potential key determinant in switching electricity suppliers. *J Bus Econ* 87: 263–290. <https://doi.org/10.1007/s11573-016-0821-9>
- Vihalemm T, Keller M (2016) Consumers, citizens or citizen-consumers? Domestic users in the process of Estonian electricity market liberalization. *Energy Res Soc Sci* 13: 38–48. <https://doi.org/10.1016/j.erss.2015.12.004>
- Waterson M (2003) The role of consumer in competition and competition policy. *Ind J Ind Organ* 21: 129–150. [https://doi.org/10.1016/S0167-7187\(02\)00054-1](https://doi.org/10.1016/S0167-7187(02)00054-1)
- Woo CK, Lloyd D, Tishler A (2003) Electricity Market Reform Failures: UK, Norway, Alberta and California. *Energy Policy* 31: 1103–1115. [https://doi.org/10.1016/S0301-4215\(02\)00211-2](https://doi.org/10.1016/S0301-4215(02)00211-2)
- Yang Y (2014) Understanding household switching behavior in the retail electricity market. *Energy Policy* 69: 406–414. <https://doi.org/10.1016/j.enpol.2014.03.009>



AIMS Press

© 2022 the Author(s), licensee AIMS Press. This is an open access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>)