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Measuring Switching Costs in the Italian Residential Electricity Market

Marco Magnani,^a Fabio M. Manenti,^b and Paola Valbonesi^c

ABSTRACT

Residential electricity markets in European countries are still characterized by low consumer engagement, especially where regulated and liberalized markets coexist. Using an original dataset on 2015–2018 prices for the Italian electricity market, augmented with the number of residential consumers, we study the presence and magnitude of switching costs—i.e., time-based and cognitive-based costs on consumers changing providers—in the liberalized market. We find that switching from the incumbent involves high costs—almost as high as the yearly energy expenditure—while switching from competitors is less expensive. We also carry out two counterfactual analyses. In the first, we show that consumers would have incurred lower average switching costs over the years had the market been less concentrated. In the second, we simulate how switching costs could evolve once regulated prices are phased out, and the market is fully liberalized.

Keywords: Switching costs, Retail electricity market, Liberalization, Consumer behavior, Firm reputation

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1. INTRODUCTION

The European Union has long advocated full liberalization of retail electricity markets to achieve greater integration in and between national markets. More recently, it has also been deemed a way for consumers to benefit from the energy transition process.¹ The unbundling of vertically integrated electricity utilities at the national level has facilitated entry by firms competing at the generation, wholesale and/or retail levels. Introducing competition in different segments of the electricity chain is to achieve more competitive pricing in the short run and create incentives to provide consumers with novel value-added services in the medium/long run. However, the resulting liberalized retail electricity markets in European countries are almost everywhere characterized by strong frictions and they often coexist with a still significantly large regulated market. One of the main reasons for these frictions is the presence of switching costs, namely the costs a consumer pays due to switching providers. These costs can be monetary, but are often psychological, effort-based and time-based (Burnham et al., 2003) or they might be due to the fear of ending up with an

1. European Commission (2015). *Delivering a New Deal for Energy Consumers*. COM 339; and European Commission (2015). *Best practices on Renewable Energy Self-consumption*. SWD 141.

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unreliable provider or a provider with an unsatisfactory customer service. Faced with such costs, consumers may prefer to stay with their current provider, even though cheaper alternatives are available on the market, thus nullifying the advantages of liberalization.

This paper investigates the existence and magnitude of switching costs in the residential electricity market in Italy. By adapting the theoretical method proposed in Shy (2002) and Krafft and Salies (2008), we use an original dataset provided by the Italian Regulatory Authority for Energy, Networks and the Environment (ARERA, hereafter) on 2015–2018 electricity prices, augmented with the number of residential customers to evaluate consumer switching costs in the liberalized market.

The Italian retail electricity market is suitable for conducting such an investigation. Following the general aims promoted by the European Union in several directives,² the retail electricity market has been gradually opened to competition, starting with business consumers in early 2000 and moving to residential consumers in 2007. In Italy, as well as in other European countries, the liberalization process has created a hybrid system. A regulated market—served by an incumbent operator—and a liberalized market—characterized by a significant degree of competition—coexist. Interestingly for our scopes, the regulated incumbent, via a subsidiary, is also active in the liberalized market, a fact that will play a decisive role in the interpretation of our results. Micro businesses³ and residential consumers can choose a regulated contract with the incumbent supplier (the so-called *Servizio di Maggior Tutela*, i.e., enhanced protection service—SMT hereafter) or switch to the liberalized market. Following Directive (EU) 2019/944, regulated prices have been removed in April 2023 for micro businesses and will end by January 2024 for households.

To a large extent, electricity can be considered a homogeneous or quasi-homogeneous good (Waterson, 2003; Giulietti et al., 2005) with limited potential for product differentiation.⁴ Accordingly, consumption decisions on electricity should be driven by Bertrand-like economic arguments, with consumers choosing the cheapest offer from those available in the market. In Italy, the data show that this is not the case. Using data for the period January 2015—June 2018, Figure 1 shows how the annual expenditure in electricity services of a representative household consuming 2,700 kWh would have evolved if the household had signed the contract with the regulated supplier, comparing it with what he/she would have incurred if signing a contract with the cheapest supplier available on the liberalized market.⁵ Figure 1 shows very neatly how Italian customers of the regulated market could have found cheaper offers in the liberalized market. However, the difference in expenditures is not accompanied by a significant switching rate from the regulated market to the liberalized one. As of March 2021, 43% of residential consumers are still served by the regulated incumbent and the yearly rate by which consumers are migrating to the liberalized market is just around 3–5% in terms of the entire consumer base (ARERA, 2021a). This is not specific to Italy; similar trends occurred in other European countries (CEER, 2019; Martimort et al., 2020).

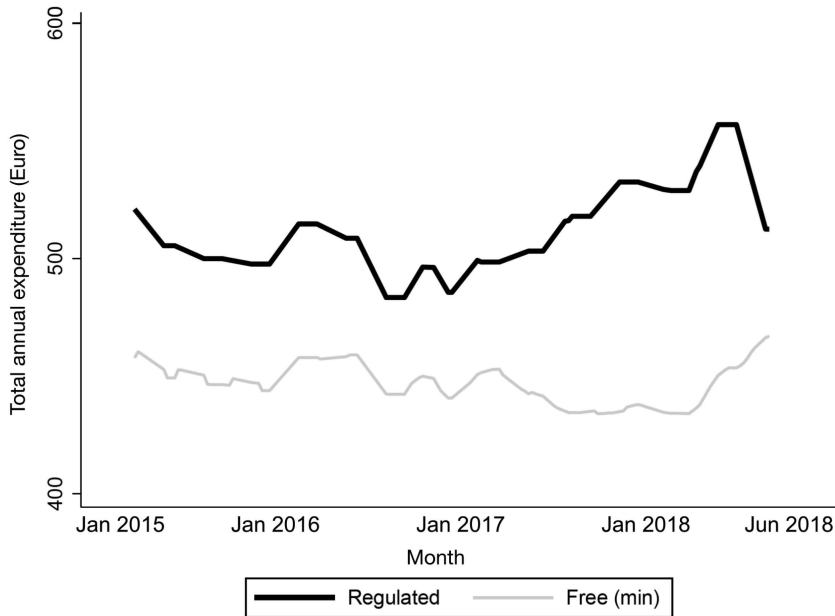
2. See: Directives 96/92/EC, 2003/54/EC, 2009/72/EC and, finally, 2019/944.

3. At the European level, micro businesses are defined as enterprises which employ fewer than 10 persons and whose annual turnover and/or annual balance sheet total does not exceed €2 million. In Italy, however, only micro business with a committed power below 15 kW can maintain the old regulated electricity provider.

4. A way often followed by retailers to differentiate is to offer electricity from renewable sources (green electricity). Unfortunately, our dataset does not allow us to control for the electricity source.

5. Data are provided by ARERA through the public comparison website *TrovaOfferte*, on which retailers' offers were updated on a weekly basis. To eliminate short-term distortions, 8-week moving averages have been computed. As for the liberalized market, for each week the cheapest offer available on the market is considered.

Figure 1: Annual expenditure (€) in the Italian liberalized and regulated markets, January 2015–June 2018 (representative household consuming 2,700 kWh/year; annual expenditure in the liberalized market as the cheapest offers available from each provider).



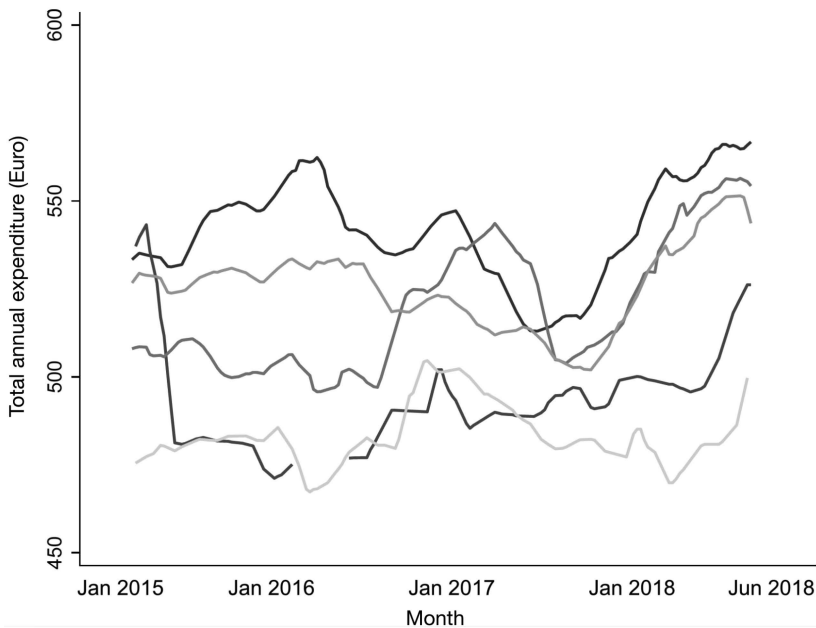
Source: Public price comparison website, *TrovaOfferte*, ARERA.

Additionally, consumers who have switched to the liberalized electricity market do not actively participate in market dynamics. According to ARERA, in 2019, only 1% of monthly residential consumers in the liberalized market made a further switch (ARERA, 2021a). These numbers are quite surprising if one looks at the potential savings from switching. Figure 2 shows, in the period January 2015–June 2018, the annual expenditure on electricity services of a 2,700 kWh/year representative household when subscribing to a sample of five retailers: what immediately catches the attention is the presence of a significant and persistent difference between offers. One would expect these differences to translate into high switching rates since it is always possible for a consumer to find better offers on the market. Switching data, however, tell us that this is not the case.

It is important to stress that in Italy, as in other EU countries, it is forbidden for energy providers to charge early termination fees (see EC, 2018), i.e., monetary penalties for the consumer if the switch occurs before the expiry of his/her current contract.⁶ There are, therefore, no monetary obstacles to switching. Despite this, our empirical findings reveal that switching costs are extremely important and persistent in the liberalized market, and they particularly affect the customers of the national incumbent. Conversely, they appear to be less significant for the customers of the other retailers. This is likely due to the different characteristics of the consumers of the national incumbent versus other firms. As mentioned above, the national incumbent serves both the regulated market and, via a separated subsidiary, the liberalized market segment in competition with other suppliers. A significant portion of the subscribers of the national incumbent in the liberalized market is former customers of the same firm in the regulated market. As highlighted in ARERA (2021b), the national incumbent has exploited its position in the regulated market to “shuttle” its customers towards the

6. ARERA Resolution no. 302/2016/R/COM.

Figure 2: Annual expenditure (€) in the Italian liberalized market across five selected retailers, January 2015–June 2018 (representative household consuming 2,700 kWh/year; annual expenditure in the liberalized market as the cheapest offers available from each provider).



Source: Public price comparison website, *TrovaOfferte*, ARERA.

liberalized market (see also Section 3). Consequently, unlike the customers of new entrant suppliers, those of the incumbent may not have made a rational switch to the liberalized market. They are not engaged with market dynamics and therefore are less likely to switch, i.e., they face high switching costs.

We use our methodology to carry out two counterfactuals. First, we measure switching costs if the market structure is more balanced. In Italy, as in many other European countries, the process of liberalizing electricity markets has resulted in the entry of many small operators with little brand recognition and lower perceived reliability. The liberalization process has led to the creation of a market characterized by one or a few dominant firms (the subsidiary of the national incumbent in the liberalized market) and a fringe of medium, small and very small operators. Hence, we assume the presence of a tight duopoly, with the incumbent firm competing with a rival firm with a similar market share. Our exercise reveals that a more balanced market structure could have led to an overall reduction in switching costs. In the second counterfactual, we measure switching costs when the market is fully liberalized and the SMT ceases to exist, as planned for 2024. Interestingly, we find that full liberalization will reduce customers switching costs.

The remaining sections are organized as follows: Section 2 discusses the literature this paper contributes to. Section 3 illustrates the evolution of the Italian electricity sector. Section 4 presents the theoretical setting. Section 5 describes the data used in our empirical analysis. Section 6 describes and discusses the resulting measures of switching costs, while in Section 7 we carry out the counterfactual analyses. Finally, Section 8 concludes and indicates directions for future research.

2. LITERATURE REVIEW

This paper mainly contributes to two main strands of the literature. The first investigates the competitiveness of retail electricity markets, focusing on how this competitiveness relates to consumer switching behavior. Hortaçsu et al. (2017) studied the determinants of consumer choice for electricity contracts in Texas. Giulietti et al. (2014) developed a sequential search cost model and estimate predictions looking at the British domestic electricity market following its opening up to the competition in 1999. Their results show that estimated search costs match observed consumer switching behavior well. Airolidi and Polo (2017) present a sequential search cost model which they applied to Italian electricity prices in the first quarter of 2017: they found that consumers could make gains by switching to the best offer in the liberalized market.

In the same strand of literature, recent studies on switching costs in energy markets have also been carried out using survey data. In a large Internet survey of the Japanese electricity market, conducted six months before and after the full retail liberalization in the country, Shin and Managi (2017) investigated consumer satisfaction concerning the reform process and the determinants of consumer switching behavior. Using a logistic regression and a non-parametric testing approach, they found that large consumers are more likely to switch. Still, households with all-electricity systems are 90% less likely to switch than households that use both electricity and gas. Exploiting a Danish online survey comprising self-administered questionnaires in 2011, Yang (2014) investigates barriers/incentives to switching (i.e., consumer loyalty; the perceived benefit of switching; the perceived consequences of switching; and the perceived complexity of switching) in the retail electricity market. He finds that greater consumer loyalty and lower economic benefits contribute to higher inertia preventing consumers from switching; moreover, the “non-switching” group consumed more than the uncertain group, and the “switching” group consumed less. Fontana et al. (2019) investigated barriers to switching based on a large Italian survey: they found that consumer awareness is positively affected by the level of education, frequent use of the Internet, number of household components, age, and area of residence. Moreover, price comparisons difficulties seem to be positively impacted by the number of household members and the frequency of Internet use. He and Reiner (2017)—exploiting an online survey on 1,942 subjects representative of British adults—examined the relationship between psychological factors and switching and found a role for attitudes towards energy issues and perceptions of costs and benefits of switching. Analyzing individual decisions in a collective switching auction, Deller et al. (2021) found that non-price factors affect consumer behavior—uncertainty, time pressure, and behavioral biases such as the difficulty in comparing two offers all negatively affect switching probability. Focusing on the residential Italian electricity market, Dragotto et al. (2021) show that regions recording stronger firm incumbency are subject to larger consumer inertia in leaving the regulated market, and this effect is reinforced by the number of active liberalized market retailers. On the other hand, switching by consumers already in the liberalized market is positively affected by firm incumbency. Gugler et al. (2018) also explored the role of incumbency considering the German electricity market. They found that the incumbent has an incentive to increase the price of its baseline offer when consumers search more while decreasing the price of its market offer. This way, the firm can price discriminate and cover consumers with different search costs. Using data on Belgian consumers, Dressler and Weiergraber (2022) demonstrate that even a perfectly informed consumer—i.e., a consumer who is aware of market offers—sustains sizable switching costs when making a choice in terms of electricity providers, up to 80% of the monthly energy bill. This is in line with Gugler et al. (2018), where the incumbent is able to retain consumers even if its offer is more expensive with respect to

the competitors' offers, signalling the presence of status quo bias. Giuletta et al. (2005)—from a dataset of about 700 interviews of British consumers—investigate the determinants of search and switching costs in the UK energy markets. They found that consumers who view supplier reputation as important are significantly less likely to switch. Note this result is in line with the differences we find in consumer switching costs between the incumbent and rival firms. All in all, we add to this empirical literature on switching costs developed on large dataset and on survey data by studying frictions on the consumer side in a setting where a regulated and liberalized market coexist.

The second strand of literature refers to the empirical estimation of switching costs using the approach developed by Shy (2002). In his paper, Shy empirically applies his approach to the mobile phone market in Israel and to the Finnish demand deposit banking industry. Using the same theoretical framework, Carlsson and Löfgren (2006) estimate switching costs for the airline industry—a market where repeated purchases are common. Both Leibbrandt (2010) and Egarius and Weill (2016) investigate the role of switching costs in the banking industry: the former analyzing the banks' decision to make payment networks compatible and the latter comparing cooperative banks with commercial banks. Salies (2005) measures the value of switching costs in Great Britain's deregulated retail electricity market.⁷ More recently, Björkman (2021) analyses switching costs in the Swedish electricity market and found that, for some firms, these costs amount to almost 100% of energy bills. We contribute to this literature with novel results for switching costs gleaned from an original dataset for the retail electricity market in Italy—a setting where consumer inertia is widespread and where the transition to a fully liberalized market is ongoing.

3. THE ELECTRICITY MARKET IN ITALY

Since the early 1990s, the Italian electricity market has been undergoing profound changes as policymakers worked to improve market efficiency and promote the creation of an internal electricity market. The national public institution entrusted, as a vertical monopoly, with the activities of production, import/export, transmission, distribution, and sale of electricity, *Ente nazionale per l'energia elettrica (ENEL)*, was gradually dismembered and separate entities were created at each phase of the value chain. At the same time, production and sale were open to competition, and network activities were assigned to either national (i.e., transmission) or local (i.e., distribution) monopolies. Finally, company unbundling—the separation of energy supply and generation from the operation of networks—was introduced in both the electricity and gas markets to ensure ownership and management independence of firms operating at different phases of the value chain. Nowadays, those incumbents that took the role of suppliers are separate entities from network operators and are competing in the retail market with new entrants under equal conditions.

Concerning the wholesale market, electricity is bought by wholesalers either through the Italian Power Exchange (IPEX) or through bilateral contracts with producers.⁸ Both systems are managed by a publicly owned company, *Gestore del Mercato Elettrico (GME)*, which, however, does not regulate price formation at the wholesale level. Around 70% of total energy volume trade in the wholesale market goes through the IPEX.⁹ At the national level, the reference price in the

7. As far as we know, this is the only paper that uses the approach in Shy (2002) to measure switching costs in the early reformed electricity market in the United Kingdom.

8. On the former, the price emerges as the equilibrium price between demand and supply in two spot markets: Day Ahead and Intra Day. On the latter, the price is negotiated between parties.

9. Data are provided by GME on a daily basis: <https://www.mercatoelettrico.org/it/>

wholesale market is the so-called *Prezzo Unico Nazionale* (PUN), which is formed as the average of locational marginal prices set hourly on the IPEX.

Electricity then flows from production sites through the networks to consumers. Transmission and distribution system operators take care of the quality of energy supply (e.g., frequency of electricity) and other issues related to the stability and the maintenance of the grid. The interface between consumers and the value chain is finally represented by retailers, who are responsible for the retail contract and billing. Unbundling ensures equal and non-discriminatory access to energy traded in the wholesale market. This regulation goes as far as imposing a separation between the company acting in the regulated market and that acting in the liberalized market where the same holding company (i.e., the incumbent) operates in both markets, as is typically the case.

Indeed, as mentioned in Section 1, the two markets coexist in Italy, and consumers can freely choose where to be served. In the liberalized market, any firm can sell contracts without geographical restrictions. In the regulated market only one contract is offered by a single retailer, the incumbent. In 90% of the Italian municipalities, the regulated incumbent is *ENEL*, the national historic operator (see, Dragotto et al., 2021). In the remaining municipalities, the incumbent is a local company. Typically, in these municipalities, this company was active as a monopolist in place of the national historic operator before liberalization and inherited the incumbency position after market liberalization. Regulated incumbents offer the SMT contract, whose price and conditions are set by ARERA. SMT is the *de facto* default contract for consumers who have not switched to a firm in the liberalized market. According to ARERA (2021a), as of January 2022, around 2 million micro businesses with committed power below 15kW (about 25% of the business market) and around 12 million households (38% of the residential market) are still customers of the incumbent operator in the regulated market.

In the next few years, the SMT will be completely phased out, and consumers will have to choose their electricity service contract in the fully liberalized market. Following Directive (EU) 2019/944, regulated prices have been removed in the micro business sector in April 2023, and will end by January 2024 for households.

4. THE THEORY OF SWITCHING COSTS

Our study aims is to quantify the magnitude of the switching costs in the liberalized market. We do so by adapting the original theory of Shy (2002), as proposed in Krafft and Salies (2008). What makes our analysis novel and different from the original model is that, in our setting, firms compete not only for their respective customers but also to attract consumers from the regulated market segment. However, we do not specifically model the switching process from the regulated to the liberalized market. As clarified below, we assume that only a given share of customers of the regulated firm switches to the liberalized market. Quite reasonably, we assume that these customers move to the firm in the liberalized market charging the lowest price.

In the setting we investigate, firms compete in prices. At the equilibrium, prices must satisfy the so-called *Undercut-proof property*: according to this equilibrium concept, each firm charges the highest possible price such that rival firms do not find an undercutting strategy profitable, i.e., charging a price that, by subsidizing switching costs, induces all consumers to switch. We assume that each firm considers whether to undercut one and only one competing firm at a time. This means that with n active firms, there are n pairs of competing firms. The main difference with Krafft and Salies (2008) is that in our setting, we must consider that the firm charging the lowest price attracts consumers who move away from the regulated market.

Suppose that firm 1 is the firm charging the lowest price, and firm i is any of the other $n - 1$ firms: $p_1 < \min\{p_2, \dots, p_n\}$. Let us indicate with N_1 the number of firm 1 customers in the liberalized market, with N_i , $i = 2, \dots, n$, those of firm i , and with N_R the number of customers in the regulated segment of the market. We assume that a share $\alpha \in [0, 1]$ of the consumers of the regulated firm is considering moving to the liberalized market. We define these customers as “active customers” in the regulated market. According to our assumption, at the equilibrium they switch to firm 1, the firm charging the lowest price. This fact implies that there are two different types of pairs of firms in the undercutting relationship: pairs that include firm 1, and pairs that do not involve firm 1.

For this second type of firms, the calculation of switching costs is as in Krafft and Salies (2008). Consider the competition between firm i and firm j , with $i \neq j = 2, \dots, n$. Indicating with S_{ij} the cost incurred by the consumers of firm i when they switch to firm j , firm i charges the highest possible price such that firm j does not find it optimal to undercut by charging $p_i - S_{ij}$. Formally:

$$p_j N_j \geq (p_i - S_{ij})(N_i + N_j). \quad (1)$$

The left-hand side in (1) indicates firm j 's profits without consumer switching, while the right-hand side the profits when firm j undercuts firm i and attracts its customers.¹⁰ Similarly, firm j sets the highest possible price such that it is not undercut by firm i , that is:

$$p_i N_i \geq (p_j - S_{ji})(N_i + N_j). \quad (2)$$

Conditions (1) and (2) are the Undercut-proof properties for the two firms. As firms charge the highest admissible prices, these conditions hold as equalities. Solving for S_{ij} and S_{ji} , we can find the switching costs occurring between these firms:

$$S_{ij} = p_i - p_j \frac{N_j}{N_i + N_j}, \quad \text{and} \quad S_{ji} = p_j - p_i \frac{N_i}{N_i + N_j}. \quad (3)$$

Consider now the competition between firm 1—the firm charging the lowest price—and any firm $i = 2, \dots, n$. In order to determine the switching costs incurred by consumers switching between these two firms we follow the same logic as above, with the only difference that firms now compete to attract also the active customers from the regulated market. Specifically, at the Undercut-proof equilibrium: *a*) firm 1 charges the highest possible price such that for firm i it is not worth following an undercutting strategy, i.e., charging a price lower than $p_1 - S_{i1}$ to attract all the consumers of firm 1, and *b*) firm i charges the highest possible price such that for firm 1 it is not worth following an undercutting strategy, i.e., charging a price lower than $p_i - S_{1i}$.

Formally, these two conditions imply that equilibrium prices satisfy the following inequalities:

$$p_1(N_1 + \alpha N_R) \geq (p_i - S_{i1})(N_1 + N_2 + \alpha N_R), \quad \text{and} \quad p_i N_i \geq (p_1 - S_{1i})(N_1 + N_2 + \alpha N_R),$$

where αN_R is the number of active customers, namely the customers of the regulated incumbent who switch to the low-price firm in the liberalized market. Again, as firms charge the highest possible price, at the equilibrium these conditions hold as equality, hence the following switching costs:

$$S_{i1} = p_i - p_1 \frac{N_1 + \alpha N_R}{N_1 + N_i + \alpha N_R}, \quad \text{and} \quad S_{1i} = p_1 - p_i \frac{N_i}{N_1 + N_i + \alpha N_R}. \quad (4)$$

10. Marginal costs are normalized to zero, for simplicity.

As we empirically observe prices—which, as explained below, we express in terms of total annual spending associated with the contract offered by each retailer—and the number of consumers of the various electricity retailers, we can use these expressions to calculate the switching costs incurred by consumers when changing provider.

5. THE DATA

In order to measure switching costs using expressions (3) and (4) we collect information on prices and each provider's number of consumers; we present them in subsections 5.1 and 5.2, respectively. Note that instead of marginal prices, we use average prices in the form of total annual spending (€/year). This choice has a practical justification. On the one hand, marginal prices are only partially informative of the total cost of service incurred by customers, as providers use to charge yearly fixed fees that account for a sizable portion of the energy bill. On the other hand, price schedules are usually multi-layered and, therefore, very complex to understand. For all these reasons, total annual spending better conveys the information about the cost of the electricity service and, indeed, it is used to evaluate/compare offers by consumers.¹¹ To corroborate this, in Italy, both price comparison services and retailers on their websites use total annual spending as an informational tool. At the same time, ARERA requires firms, before the conclusion of the contract, to provide consumers with an estimation of their annual spending associated with the chosen contract.¹²

5.1 Annual spending

We retrieve information about annual spending from *TrovaOfferte*, the ARERA public price comparison website. It is a very comprehensive website covering over 90% of the retailers active on the Italian electricity market.¹³ The website asks the user to reveal his/her annual consumption and then computes total annual spending. Offers are shown from the cheapest to the most expensive one.¹⁴ For our study, we only consider fixed price offers without differentiation in terms of hours of the day, as they represent the most popular contractual solution (see ARERA, 2020), and which do not provide for the bundle with other products or services.¹⁵ Total annual spending also includes any possible discount in the offer. Finally, and very much relevantly for our scopes, no contract provides for early termination fees as, in the period we investigate, these fees were unlawful.

Firms posted their offers every week and, on average, each firm posted five offers. Although data on offers were every week, the data on the number of consumers of each operator is only annual. In order to match the data on offers with those for the number of consumers, we had to build an indicator representative of each firm's offers throughout the year. For this purpose, we computed the average yearly spending associated with each provider's cheapest weekly offer. Our observations cover the period 2015–2018. Table 1 shows the values of the yearly spending associated with the

11. Research in the energy sector seems to confirm the tendency of consumers to focus on average, rather than marginal, prices. According to Ito (2014), the cognitive cost of understanding marginal energy prices is high because of nonlinear pricing schedules. Henceforth, when forming a decision, consumers tend to use total spending so they “do not have to understand the actual shape of their price schedule” (Ito, 2014, p. 561).

12. See ARERA Resolution no. 366/2018/R/COM.

13. See the press release by ARERA (in Italian) available at https://www.arera.it/it/com_stamp/15/150212cs.htm

14. As a reference contract, we considered a representative household living in Rome, consuming 2,700 kWh/year with 3 kW committed power.

15. As of 2018, such contracts were still quite rare. According to surveys conducted by ARERA, less than 4% of contracts in the market included bundled products/services such as heating systems maintenance and air conditioning.

contracts offered by firms for which we have information on the number of consumers. Overall, the firms in our dataset serve over 90% of all consumers and are therefore extremely representative of the liberalized electricity market in Italy. Each firm included in our dataset has a market share above 1% and offers are ordered in terms of firms' market share, from the largest to the smallest.¹⁶ Further, in the last row of Table 1, the regulated offer associated with the regulated SMT contract (as an average over the year) is also shown.¹⁷

Table 1: Annual spending in €, 2015–2018, different firms (ordered by market shares).

2015		2016		2017		2018	
Firm	Spending	Firm	Spending	Firm	Spending	Firm	Spending
1	477.9	1	480.0	1	473.8	1	509.2
2	474.3	2	486.1	2	489.4	2	499.0
3	476.9	3	474.5	3	467.2	3	512.6
4	480.9	4	487.1	4	487.1	4	505.6
5	479.7	5	454.5	5	476.6	5	542.6
6	508.0	6	504.2	6	448.9	6	472.8
7	476.5	7	469.7	7	449.7	7	460.8
		8	452.7	8	448.2	8	490.6
		9	481.9	9	473.1	9	481.3
		10	477.0	10	449.1	10	479.9
				11	473.1	11	501.8
Mean	482.0		476.8		467.0		496.0
SMT	504.4	SMT	495.3	SMT	521.2	SMT	537.3

Source: Public price comparison website, *TrovaOfferte*, ARERA.

Notes: For each year, firms with a market share larger than 1 percent are ordered in terms of their market shares, from the largest to the smallest. In the last row, SMT is the annual spending referring to a regulated contract with the incumbent supplier.

The data shown in Table 1 confirm that *i*) the liberalized market offers are significantly cheaper than the regulated offer and *ii*) the liberalized market is characterized by persistent dispersion. Regarding this second point, the difference between the lowest and the highest offers exceeded 80€ in 2018, a value close to 15% of the average estimated expenditure of a representative household.

In light of this evidence, and given the quasi-homogeneity of the services offered, one would expect to observe sizable switching rates. Such a high dispersion in yearly spending means that individuals can always find significant savings opportunities by changing electricity providers. On the contrary, switching rates within the liberalized market were relatively low in the period under consideration. We believe that the combination of high dispersion and low switching rates indicates the presence of significant switching costs.

5.2 Number of consumers

The number of consumers was retrieved from the ARERA database (*Registro Centrale Ufficiale*), which tracks each Points of Delivery (hereafter, PODs) in the Italian territory. A POD is an alphanumeric code uniquely identifying the physical point where the energy provider delivers

16. Our dataset includes the following providers: Acea, Dolomiti Energia (only from 2016), Edison, Enel Energia, Engie Italia (only from 2016), Eni Gas e Luce, E.On Energia, Green Network, Illumia (only from 2017), Iren Mercato, Sorgania (only from 2016).

17. To allow consumers to compare the commercial offers available on the liberalized market with the regulated price, ARERA published the regulated price on *TrovaOfferte*. This information was updated every three months.

electricity to consumers. Each POD can be identified by the electricity meter—a tool measuring the amount of electric energy consumed by an end user.

The information about the number of users for each firm is confidential and cannot be published even anonymously. For this reason, in Table 2, we limit ourselves to showing the summary statistics of our sample of firms. The sample is highly representative of the liberalized market: for example, in 2018, it recorded close to 10 million residential consumers out of a population of around 11 million consumers, hence 90% of the liberalized market (ARERA, 2021a). Overall, in line with ARERA data (ARERA, 2021b), our sample shows that the market is highly concentrated, focused on one large provider (in 2018, the largest firm serves nearly 7 million consumers), but also extremely splintered, with many small and even tiny outliers with less than one hundred thousand consumers.

Table 2: Summary statistics on consumers in the liberalized market, 2015–2018.

	2015	2016	2017	2018
# consumers	7,031,059	7,877,477	8,773,629	9,859,967
Per-firm average number of consumers	1,004,437	721,272	787,748	896,361
# consumers of the smallest firm	69,244	62,990	51,781	69,447
# consumers of the largest firm	4,956,307	5,576,256	6,205,457	6,825,367
Standard deviation	1,775,430	1,638,024	1,710,917	1,993,034
# active consumers (αN_R)	2,926,240	2,782,717	2,976,283	2,712,243

More specifically, the market comprises two large firms covering around 80% of the market, with a sizable presence across the country. The national incumbent in the electricity sector (close to 70% of market share) and the national incumbent in gas services (close to 15% of market share) compete with few mid-sized firms (covering around 12–15% of the market),¹⁸ and a handful of smaller firms that might have either a scattered or a concentrated presence in the country. It is important to stress that although firms can often be concentrated in specific areas of the country, the market occurs nationwide. Firms' offers are valid throughout the national territory, and even small firms compete directly with larger firms even though their customers are in fewer regions of the country.

In the last line of Table 2, we show the number of so-called *active consumers*, i.e., users who switched from the regulated to the liberalized market. As discussed in Section 4, this is relevant information for calculating switching costs—see expression (4). To estimate how many active consumers there are each year, we resort to the surveys conducted by ARERA where the regulator asked each consumer of the regulated firm if, in the presence of a better offer, he/she would be willing to switch to a firm in the liberalized market. According to these surveys, 10%–30% of consumers of the regulated firm declared their intention to switch to the liberalized market in the few months following the interview. In line with these surveys, we calibrate parameter α to the intermediate value of 0.2.¹⁹

18. Typically, these firms have a sizable presence in one or two regions or are local incumbents in bigger municipalities (e.g., Milan, Rome, Reggio Emilia).

19. As evident from expressions (4), the values of switching costs increase with α . Nonetheless, for values around $\alpha = 0.2$, our measures of switching costs change only marginally.

6. EMPIRICAL RESULTS

Using as the price variable the annual spending associated with the various operators' offers in our sample, Table 3 shows our measure of switching costs in 2018 (years from 2015 to 2017 are shown in the Appendix), based on expressions (3) and (4). These figures indicate the cost (measured in €) a subscriber of each firm in the sample incurs when switching to each target firm. Firms are ordered according to market shares, from the largest to the smallest. Reading by rows, firm i 's switching cost must be interpreted as the cost of switching from firm i to the target firm (firms in the column of the table). In 2018, Firm 7 is the firm offering the cheapest contract and, according to our assumption about consumers switching from the regulated to the liberalized market, attracts all active customers.

Consider, for example, firm 1: our estimation suggests that customers of this firm face a cost of €435 when switching to firm 2, €475 to firm 3, €494 to firm 4, and so on. In the table, a bold number indicates switching cost higher than 85% of the current yearly bill.

Table 3: Switching costs (€) from firm i to target firm in 2018.

Firm i	Target firm										
	1	2	3	4	5	6	7	8	9	10	11
1	—	435	475	478	494	498	373	499	502	503	504
2	65	—	350	361	422	439	173	443	461	467	471
3	37	158	—	271	357	390	118	396	431	442	450
4	27	143	238	—	340	375	107	381	418	429	438
5	47	114	177	191	—	322	111	329	380	398	411
6	-24	37	93	107	183	—	38	242	295	314	327
7	102	315	387	393	426	434	—	436	445	447	449
8	-8	48	99	113	184	240	53	—	300	319	332
9	-21	21	56	68	122	183	36	185	—	262	274
10	-23	14	43	54	100	163	32	165	219	—	252
11	-2	31	53	65	102	166	52	166	219	240	—

Source: Authors' own elaboration.

Notes: Bold numbers are switching costs (€) corresponding to a value $\geq 85\%$ of the annual bill. Results for years 2015, 2016 and 2017 are shown in the Appendix.

Overall, consumers of firm 1—the national incumbent in the electricity market—seem to be the most affected by switching costs: except in one case, if these consumers switch, they incur a cost larger than 85% of their yearly bill regardless of which company they switch to. Moreover, except for firm 2—the national incumbent in the gas market—and firm 7—the low-price firm benefiting from consumers migrating from the regulated market—whose consumers may in certain cases incur relatively high switching costs, consumers of the other firms appear to bear a much lower switching cost. In particular, customers of the smaller firms incur small or negative switching costs, that is they suffer very little harm from switching or they even benefit.²⁰

These results reveal the existence of a clear fragmentation of consumers in the liberalized market: on the one hand, customers of firm 1, the national incumbent in the electricity market plus, to a lesser extent, customers of firm 2, the national incumbent in the gas market and, on

20. Our findings only partially confirm the findings of Björkman (2021) in the Swedish market, where switching costs range, on average, from 70%–95% of yearly electricity spending for virtually all firms. The difference is probably due to the different structure of the electricity market in Italy and Sweden. Unlike Italy, in Sweden the market is far less concentrated and without a predominant role of the incumbent operator which, in Italy, has a strong position both in the regulated sector and in the liberalized market.

the other hand, all the others, i.e., customers of small firms. The incumbents' customers face high switching costs; they are rather inert with a very low tendency to switch. This is particularly true concerning firm 1, the national incumbent in the electricity market. In fact, as discussed in Section 3, this provider is also active as a regulated firm in a large part of the country and over the years has operated to allow a smooth transition of its customer base from the regulated to the liberalized market—although companies operating in the two markets are separate entities. This occurs because the same brand is used for both companies to trigger brand recognition by consumers, easing the switching process. The fact that incumbents can use their position in the regulated market to induce consumers to switch from the regulated branch to the subsidiary on the liberalized market, is also corroborated by the antitrust case raised by the Italian Competition and Market Authority which, in 2019, sanctioned the national incumbent operator for unlawful exchange of consumers information between the regulated and the liberalized market branches.²¹

For all these reasons, customers of the incumbents' firms are typically less engaged with market dynamics. They have waited years to enter the liberalized market and in any case they did so not so much out of conviction but because their supplier induced them. Further, they might perceived other sellers as more unreliable (both financially and in terms of quality of the customer service).²² Therefore, they are characterized by higher search and cognitive costs and after changing providers are locked-in by the incumbent, with further switching becoming too expensive. It is therefore not surprising that these consumers are essentially inert and very unwilling to change operator because of the high switching costs. Very similar arguments apply to customers of firm 2, the national incumbent in the gas market. Most of these customers switch to this provider because it also supplies them with gas. Firm 2 has a very recognizable brand and, like firm 1, has adopted strategies aimed at facilitating the switch to its electricity services by its consumers in the gas market. As above, these customers tend to be rather inert and probably unwilling to switch again.

Conversely, the switching costs faced by consumers of smaller operators are much lower or actually negative. The magnitude of switching costs depends on psychological, time- and effort-based components (Burnham et al., 2003). Consumers who search for alternatives are less intimidated by the switching process, have lower switching costs and can find cheaper offers. Our findings suggest that consumers of small firms fall in this category. Indeed, they are much more engaged in market dynamics than the previous type of consumers as their choice was not primed by the incumbent, but was more deliberate. In the end, they opted for an operator with which they had no experience. These individuals are very familiar with offers and for them switching to a new operator is painless if not profitable. At the same time, consumers of the firm posting the lowest price—i.e., firm 7—though smaller, have higher switching costs than those of similar firms, as this operator attracts customers from the regulated market who are, by their nature, more inert.

A similar discussion applies to the years 2015, 2016 and 2017 for which measures of switching costs can be found in the Appendix.

21. See the antitrust case no. 27494, "ENEL/Condote Anticoncorrenziali nel Mercato della Vendita di Energia Elettrica".

22. Among the reasons for explaining the lack of involvement in the liberalized market of incumbent customers, ARERA (2019) mentions a poor understanding of market functioning, distrust of liberalized market providers and status quo bias, i.e., belief that the default option is the best despite better alternatives.

7. COUNTERFACTUAL ANALYSES

7.1 Switching costs in a more balanced market

Our findings reveal the existence of consumer fragmentation in the liberalized market: on the one hand, the customers of the national incumbents face high switching costs and, on the other hand, subscribers to the other firms face lower, or even negative, switching costs. These results raise an interesting question related to the effects of the electricity market liberalization. In Italy, as in many other European countries, the liberalization process has resulted in the entry of many operators who have struggled to acquire significant market shares. A possible alternative for the policymaker could have been to promote a smaller number of competitors but be able to take over larger market shares. One wonders what would happen to switching costs if market shares were more balanced. Answering this question is not easy as it requires thinking about market conditions that have not occurred in reality. However, we can try to answer using our method for calculating switching costs. We recomputed such costs in a simulated duopoly comprising the largest firm and a hypothetical competitor such that:

- its consumer base is given by the sum of the number of consumers of all firms (except the largest) in a given year,
- and the annual expenditure associated to its contract is given by the average annual expenditure of all firms (except the largest) in a given year.

In 2015 the lowest annual spending was from firm 1, while from 2016 to 2018, the lowest annual spending is given by the average spending of the competitive fringe. Using our methodology, Table 4 shows switching costs in this simulated duopoly. When the incumbent competes with a larger firm, the former's switching cost becomes smaller while the latter increases. As the incumbent's competitor grows, switching costs are shared more evenly by the two firms.

Table 4: Simulated duopoly: measures of switching costs (€) between 2015 and 2018.

Firm	2015	2016	2017	2018
1	235	253	254	283
2	245	225	216	218

Source: Authors' own elaboration.

What is the overall effect on consumers of a duopoly rather than a large incumbent and a fringe of small competitors? To answer this, we would need to measure the costs incurred at the industry level and compare them in the two scenarios. Unfortunately, we do not have detailed information regarding the number of switches from one firm to another. Therefore we cannot derive a precise measure of the costs incurred globally in a given year. However, it is reasonable to assume that switching rates are related to the market share of each firm. Based on this, we compute average switching costs by weighting each firm's switching costs with its market share. More specifically, we calculate for each firm i the average switching costs—the sum of the costs of switching from firm i to all other firms weighted by the (relative) market share of the target firm—and then calculate the weighted average of these values, where weights correspond to the market share of each firm i .

Formally, in the observed scenario, given the switching costs from firm i to firm j computed using the observed market data (what we call the "Full sample"), the average industry switching cost S is given by:

$$S = \sum_{i=1}^n \frac{N_i}{N} \sum_{j=1, j \neq i}^n \frac{N_j}{N - N_i} S_{ij}. \tag{5}$$

In the case of the simulated duopoly the average switching cost in a given year is simply the weighted average based on the market share of each firm.

Table 5 shows average industry switching costs, both for the case of the Full sample and the Simulated duopoly. From the results, two interesting considerations emerge. The first one is that in average terms the switching costs are higher in the Full sample than in the case of the simulated duopoly, suggesting that the presence of large incumbents and a fringe of small, competitive firms is inefficient in terms of switching costs. The second one is that the difference in aggregate switching costs between the Full sample and the Simulated duopoly sample grows over time, suggesting an overall deterioration in the switching conditions of the market.

Table 5: Average industry switching costs (€), between 2015 and 2018.

	2015	2016	2017	2018
Full sample	298	331	331	349
Simulated duopoly	238	245	243	263

Source: Authors' own elaboration.

This counterfactual suggests that had the incumbent faced a more solid and entrenched rival—rather than scattered and fragmented competition—average switching costs would have been less severe. As previously mentioned, one of the reasons for the strong inertia of consumers in electricity markets is the reputation of firms (Giulietti et al., 2005). Small firms, either new to the market or historically present only at the local level, do not have established reputations and might therefore be perceived as unreliable by consumers, who tend not to choose them as energy suppliers even where they provide cheaper contracts.

This exercise has a notable limitation. Indeed, in our counterfactual, we assume that the firm's annual spending and market shares do not change with the market structure. In reality, equilibrium prices and firms' market shares may change in a less competitive market, and so may switching costs. Therefore, it is important to stress that with this counterfactual we are not advocating a mere decrease in the number of firms; rather, we aim to stress that in designing the liberalization process, Italian policymakers should have taken into more account the role of market structure in facilitating consumers switching.

7.1.1 Switching costs in a fully liberalized market

Our setting can also be fruitfully used to evaluate how switching costs might evolve once the electricity market in Italy is fully liberalized. As mentioned in Section 1, as of March 2021, 43% of households were still served by the regulated incumbent. However, following Directive (EU) 2019/944, all consumers (except for energy poor and vulnerable households) must enter the liberalized market by 2024. Regulated prices had already been phased out for most of the business sector in 2021.²³ Business customers who were yet to switch to the liberalized market by July 2021 were assigned to liberalized market providers by an auction mechanism. Four providers won the auction to serve about 200,000 business consumers previously served by the regulated incumbent. ARERA is actually working on a similar mechanism to phase out regulated prices for the remaining business customers in 2023 and for households in 2024.

23. Including small-and-medium enterprises and micro-businesses with a committed power above 15 kW.

Table 6: Switching costs (€) with full liberalization and the largest 4 firms attracting regulated consumers.

	Target firm										
	1	2	3	4	5	6	7	8	9	10	11
1	—	357	432	438	475	483	501	485	493	509	497
2	22	—	239	422	346	379	390	385	419	430	437
3	17	84	—	357	248	298	314	304	355	373	385
4	9	71	130	—	229	281	297	287	339	357	369
5	39	75	101	112	—	224	242	225	279	300	312
6	-31	1	23	34	76	—	158	140	193	214	225
7	-44	-13	6	17	54	119	—	118	170	191	201
8	-14	16	34	45	81	146	164	—	197	217	228
9	-25	-1	7	17	34	102	118	97	—	161	168
10	-27	-5	0	9	20	88	105	82	125	—	147
11	-5	15	17	26	30	99	114	91	130	146	—

Source: Authors' own elaboration.

Table 7: Switching costs (€) with full liberalization and all firms attracting regulated consumers.

	Target firm										
	1	2	3	4	5	6	7	8	9	10	11
1	—	357	459	438	494	498	499	499	502	503	504
2	22	—	301	254	422	439	173	443	461	467	471
3	37	158	—	271	357	390	118	396	431	442	450
4	27	143	238	—	340	375	107	381	418	429	438
5	47	114	177	191	—	322	111	329	380	398	411
6	-24	37	93	107	183	—	38	242	295	314	327
7	102	315	387	393	426	434	—	436	445	447	449
8	-8	48	99	113	184	240	53	—	300	319	332
9	-21	21	56	68	122	183	36	185	—	262	274
10	-23	14	43	54	100	163	32	165	219	—	252
11	-2	31	53	65	102	166	52	166	219	240	—

Source: Authors' own elaboration.

A crucial decision that will have to be made is how to allocate consumers who have not yet changed operators at the time of liberalization. Using data from 2018 as a starting base, we compare two alternatives: in the first, we assume that, as for the business sector, the largest four firms operating in the liberalized market will be assigned the household consumers still with a regulated contract. Second, we assume that consumers still in the regulated market are assigned to each firm in our sample according to their market share. In both cases, we assume that consumers from the regulated market are assigned to the firm in the liberalized market based on its market share.

Inevitably, the assumption alters our switching cost formula and, consequently, the measures of switching costs. Using the by now well-known Shy formula, the costs of switching from firm i to firm j , where firm j also obtains a share of regulated customers based on its market share γ_j , are the following:

$$S_{ij} = p_i - p_j \frac{N_j + \gamma_j N_R}{N_i + N_j + \gamma_j N_R}. \quad (6)$$

Table 6 shows the estimated switching costs in the first scenario, and Table 7 shows the switching costs in the second. Using the same methodology as above, we compute our measure of average switching costs in Table 8. From our exercises it emerges that full liberalization may

positively impact switching costs, leading to their reduction compared to the pre-liberalization situation. The message is clear: eliminating the regulated market can stimulate consumer mobility. More specifically, Table 8 seems to suggest that it is preferable as far as possible to extend the allocation of consumers with a regulated contract. Average switching costs are equal to €316 when the customers in the regulated market are assigned to the four largest firms in the liberalized market and are equal to €311 when these customers are assigned to all the firms in our sample.

Again, we are aware of the limitations of this exercise. Computations are based on market shares and prices in 2018 and take them as given. Not only have these changed since then, but, more importantly, at the time of liberalization, companies will inevitably react by changing their pricing strategies. Market shares will change as well and, as a result, switching costs will change.²⁴ It will be interesting to check our predictions using real data, once the regulated market is effectively phased out.

Table 8: Average switching costs (€) with full liberalization.

	2018
Full sample	349
Full liberalization (4 firms)	316
Full liberalization (all firms)	311

Source: Authors' own elaboration.

8. CONCLUSION AND POLICY IMPLICATIONS

Our results show that in the free retail energy market switching costs can be substantial, which may explain why Italy and, similarly, many other European countries are experiencing inertia in consumer choice of energy providers, and the development of effective competition is particularly slow. We have also found evidence of a clear segmentation between the subscribers of incumbent firms and those of new entrants: while the latter seems to be less affected by switching costs, the former appears to bear high switching costs.

In light of this market segmentation, we conducted an initial counterfactual analysis in which, instead of a concentrated market characterized by a national incumbent and a fringe of small new entrants, we calculated how switching costs might have been if the market had been more balanced. This counterfactual shows that switching costs at the market level could have been lower. Due to the extreme flexibility of the methodology used for calculating switching costs, based on Shy (2002), we could also conduct a second counterfactual to simulate the impact of full market liberalization, as planned in the European Union for 2024. Interestingly, we find that full liberalization will have the effect of reducing customers switching costs.

Our findings might help regulators to face the challenges posed by the full liberalization of the residential energy market. In particular, our analysis highlights the impact on switching costs of the market structure following liberalization. Our counterfactual reveals, in fact, that if the market had developed in a more balanced way, with fewer but more solid and reliable rival firms,

24. We also recognize that a complete analysis of the impact on market efficiency of both counterfactuals would require the estimation of the effects of switching costs on consumer welfare. Unfortunately, we do not have information on consumer preferences that allow us to quantify the effects of a change in switching costs on total consumer surplus (i.e., the sum of the effects on switching and non-switching customers). Our analysis rests on the reasonable assumption that switching costs typically reduce social surplus and represents a reasonable approximation of market inefficiency (Farrell and Klemperer, 2007).

consumers would have benefited in terms of lower switching costs. There are various ways in which a regulator can influence the market structure, favoring the entry of the best equipped, most reliable and financially stable operators, for example, by requiring them to fulfill more stringent capital requirements to enter the market or by introducing a transparent qualification system for providers entering the retail electricity market. As an alternative, the regulator could require retailers to enter into long-term contracts with distributors and/or transmission operators. Indeed, these contracts should be provided only by firms with adequate financial and operational means. These regulatory policies have a cost in terms of the lower degree of competition that develops in the market. Still they have the benefit of stimulating the entry and the development of more solid energy firms, capable of operating in the market and providing better services to consumers, ultimately favoring switching behavior. Finally, considering auctions adopted by 2024 to assign consumers who haven't yet switched to the liberalized market,²⁵ we suggest including qualification rules to screen firms allowed to enter such competition. These qualification rules need to select providers bidding for consumers to be solid enough to increase consumers trust and to support their switching in the energy market.

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25. In 2021, by auction, ARERA assigned small-and-medium enterprises and micro-businesses with a committed power of over 15 kW to liberalized market providers. A similar mechanism will be applied in 2023 to the remaining micro-businesses and in 2024 to residential consumers.

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APPENDIX

Table I1: Switching costs (€) from firm *i* to target firms in 2015.

	Target firm						
	1	2	3	4	5	6	7
1	—	267	435	454	467	467	471
2	209	—	421	445	461	461	466
3	40	46	—	311	389	388	418
4	27	36	169	—	338	335	381
5	12	18	90	142	—	232	296
6	40	46	115	165	262	—	319
7	5	10	58	96	181	232	—

Source: Authors' own elaboration.

Notes: Bold numbers are switching costs (€) corresponding to a value $\geq 85\%$ of the annual bill. Firm 2 charges lowest price.

Table I2: Switching costs (€) from firm *i* to target firms in 2016.

	Target firm									
	1	2	3	4	5	6	7	8	9	10
1	—	402	445	455	471	472	473	326	474	475
2	83	—	346	380	441	445	451	156	459	459
3	30	132	—	280	381	387	398	83	414	415
4	31	107	202	—	359	366	380	77	401	403
5	-16	16	78	105	—	229	253	19	283	286
6	32	57	112	134	253	—	278	66	308	312
7	-3	20	73	93	210	208	—	30	265	269
8	135	321	389	407	435	437	439	—	442	442
9	7	24	67	82	189	183	212	39	—	246
10	2	18	61	76	183	176	205	34	234	—

Source: Authors' own elaboration.

Notes: Bold numbers are switching costs (€) corresponding to a value $\geq 85\%$ of the annual bill. Firm 8 charges lowest price.

Table I3: Switching costs (€) from firm *i* to target firm in 2017.

	Target firm										
	1	2	3	4	5	6	7	8	9	10	11
1	—	401	443	449	460	464	466	326	468	469	470
2	87	—	355	377	420	437	450	159	459	461	468
3	25	119	—	260	326	357	381	76	399	406	418
4	37	110	219	—	314	349	378	82	399	408	422
5	17	59	148	166	—	281	315	54	341	354	374
6	-14	17	97	111	180	—	260	21	288	302	324
7	-16	3	72	81	145	190	—	16	253	270	293
8	131	319	389	401	421	428	433	—	437	438	440
9	5	15	73	77	133	177	210	36	—	256	279
10	-19	-11	46	48	103	147	179	11	288	—	248
11	3	6	55	53	100	143	172	32	194	215	—

Source: Authors' own elaboration.

Notes: Bold numbers are switching costs (€) corresponding to a value $\geq 85\%$ of the annual bill. Firm 8 charges lowest price.