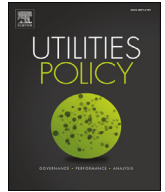


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Alternative policies for the liberalization of retail electricity markets in Chile

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ABSTRACT

This article shows that the liberalization of the residential market for electricity in Chile may achieve important welfare gains. We built a model to assess two policy scenarios: partial and full liberalization. Simulations of the model provide equilibrium prices, the distribution toll, and welfare estimations on factual and counterfactual scenarios. Our policy recommendation is to partially liberalize the residential market for electricity. That is, to allow the entrance into this market but regulate both the incumbent's tariffs for residential customers and the distribution toll. Full liberalization, in which only the distribution toll is regulated, produces a lower increase in welfare.

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1. Introduction

The restructuring process of electricity industries in most countries recognizes the condition of a natural monopoly in transmission and distribution markets, while generation and retail (supply) markets are considered capable of being developed in competition. In this context, the open access to both transmission and distribution networks plays a crucial role in changes made to the architecture of the industry. Thus, competition between the incumbents and new firms entering the newly liberalized markets

depends largely on the rules for access to electricity networks. This issue is of particular interest in developing countries like Chile, where the regulator has timidly advanced in the liberalization of retail electricity markets, in particular the residential one. Currently, the electricity regulation in Chile grants the monopoly activity to distribution companies in the residential market, having liberalized the entrance into the retail market for large consumers.²

The Chilean government is planning to introduce more competition in the electricity industry, and new policies could encompass the liberalization of the retail residential market. This paper contributes to the discussion on the scope of this kind of policy.³ To this end, we propose a methodology to set efficient tariffs to residential consumers and the distribution toll to rivals of the distribution company. We assume that the monopoly in distribution is vertically integrated, so that it also operates as a retailer

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² The rationale of this policy is that generating companies may compete with the distribution company to supply energy to large customers located inside the distribution concession area. That is, all customers whose maximum demand in a year exceed two MW must buy its electricity in a free market. The Electricity Act also allows to any consumer whose peak demand is above 500 KW but below 2 MW to enter into the market voluntarily. We call "residential market" the currently regulated market although some of these consumers might be small business. See [Raineri \(2006\)](#) or [Arellano \(2007\)](#) for a detailed description of the electricity industry design and regulation in Chile.

³ See magazine *Electricidad* September 5, 2016 <http://www.revistaei.cl/2016/09/05/la-propuesta-del-gobierno-para-liberalizar-el-mercado-electrico/> (visited September 18, 2016). This proposal is not new, but the government recently launched an initiative named "The Future of the Electricity Distribution". This initiative indicates that in this opportunity the regulator is finally willing to end the lack of competition in the distribution segment of the electricity sector.

in all markets for electricity. The liberalization policy fosters competition by allowing to a fringe of competitive firms entering the residential market for electricity and, also, by setting an efficient distribution toll that, precisely, helps to such an entry.

There are many countries where retail electricity markets have been liberalized. For instance, UK and Wales since the 80s and all European Union countries since 2005 have free entry into these markets. All deregulatory reforms give rise to benefits and also involve challenges, like creating the institutions to prevent the abuse of monopolistic power in most electricity markets. Green (1996), Green and McDaniel (1998), Newbery (2006), Newbery and Pollit (1997), and Domah and Pollit (2001) assess the UK experience on this regard. Newbery (2000) examines the international experience on restructuring utilities. Joskow (2000), Joskow and Tirole (2006), Littlechild (2002, 2006, and 2009), and Sioshansi and Pfaffenberger (2006) analyze the international evidence focusing on the advantages of having competition on retailing. Most of the literature finds that retailing improves the sale of energy and power according to the needs of customers, improves the provision of complementary products, provides different payment conditions, transfers the benefits of buying electricity in the spot market, and develops a reputation on the quality and information on the operation of the electricity industry as a whole. This evidence also shows that industrial and large residential customers are those that have mostly made use of product differentiation, whereas smaller residential customers have remained subject to the distributor's supply without modifying their consumption habits. In some sense, this evidence indicates that substitution in retailing, and so competition, is far from being perfect.

In contrast, some authors are skeptical regarding the liberalization of retail electricity markets, in particular the residential one. These authors argue that the design of markets, institutions, and the regulatory process on a newly liberalized market, whose technical features are very different to other sectors, such as electricity generation, are complex (Joskow, 2000, 2008; Hogan, 2002). In addition, there are entry barriers to new providers and switching costs to consumers, the latter due to behavioral constraints that encumber the development of a competitive retailing (Defeuilley, 2009). Others authors have expressed distributional concerns on the liberalization of retailing in Chile (Reveco, 2013) and United Kingdom (CMA, 2016). Finally, as in any network industry, vertical integration of the distributor as owner of the network and also as a provider in retailing, produces benefits in terms of higher productive efficiency and concerns in terms of risk of sabotage, access discrimination, and other abuse of dominance issues (Saavedra, 2001; Mandy and Sappington, 2007; Bustos and Galetovic, 2009; Galetovic and Sanhueza, 2009). We do not address any of these potential problems of the liberalization policies that we assess in this article, but they should be taken into account in the case of being implemented in practice.

Among all aspects that we should keep in mind regarding the design of a liberalization policy in retail electricity markets, the setting of an efficient distribution toll to the network is particularly crucial. If this price is too high, the result will be a barrier to entry, reducing the competition and thus harming consumers in the long run. If the distribution toll is too low, the distribution company may have financial sustainability problems, putting at risk future investments and expansions of the services to consumers, thus also harming consumers in the long run. Previous works have estimated the importance of setting efficient access price to electricity distribution, most of them for Europe (Grønli et al., 1999; Filippini and Wild, 2001; Chernyshova, 2001; Strbac, 2002; Sánchez-Macías and Calero, 2003; De Oliveira - de Jesús et al., 2005; Bazán, 2013). In the case of Chile, de la Cruz (2004), Raineri and Giaconi (2005), Escobar (2009), and Palacios (2012) analyze alternatives for either

transmission or distribution tolls considering competition in electricity retail sales. Rámila and Rudnik (2010) and Galetovic and Muñoz (2011) assess other aspects of the necessary liberalization of retail electricity markets in Chile.

Regarding efficient tariffs for electricity, they are clearly related to the regulated efficient distribution toll. If the access to the electricity network increases according to an efficient rule, then regulated tariffs should be reduced in order to maintain the financial constraint of the distribution company. The opposite case is also true. Thus, thanks to this countervailing power, a liberalization policy could induce efficient entry at a minimum cost assuring allocative efficiency in the industry.

This article goes beyond the only estimation of efficient prices. Its main goal is to assess the welfare impacts of liberalizing the distribution segment of the electricity industry in Chile. Since our model that not provide analytical solutions to prices, quantities, and consumers as well as firm's surpluses, we use numerical solutions to compare the welfare impacts of the two liberalization policies considered on this work. It is important to mention that to maintain the model tractable, it does not provide details on electrical industry features. In this context, our model may lose some precision regarding the numerical solutions of the endogenous variables, but we are sure that our results are fairly general since the simplicity of the model may affect both factual and counterfactual scenarios.

By using data from 2009 to 2016 for the main electricity distribution company in Chile, Chilectra (currently, ENEL) that serves more than six million people, this paper finds that both alternative policies for the liberalization of retail electricity markets are welfare improving. Then, on the one hand, when liberalization is partial, that is, when the incumbent's tariff in this market remains regulated, the residential consumer surplus increases in average between 36% and 144% and the large consumers surplus shrinks in less than 1%. This result in an increase ranging from 26% to 77% in total welfare, being higher as the competition becomes stronger. On the other hand, under full liberalization all consumers are also better off, but the impacts on residential consumers and welfare are smaller than under partial liberalization. In fact, when comparing full with partial liberalization, the latter generates higher surplus on residential consumers (4%–11%) and in total welfare (2%–5%), but large consumers would prefer full liberalization. Consequently, as a policy implication, the government should implement a partial deregulation of the residential electricity market in Chile.

We conclude that partial liberalization is better than full liberalization because under the former scenario we assume that a benevolent regulator maximizes total welfare with respect to the distributor's residential tariff and the distribution toll, subject to the budget constraint of this firm; whereas under full liberalization total welfare is not maximized because the regulator has only one instrument (the distribution toll) to fulfill the budget constraint of the distribution company. Nonetheless, it is interesting to notice that welfare effects of these alternative policies are statistically equal at a 95% of confidence level. Then, why should we prefer partial liberalization? Two explanations are not in the model but they are simple to understand. The first one is practical economic policy: full liberalization relies on the feasibility that the incumbent directly subsidizes the entrance of rivals in both retailing markets, which is difficult to implement and subject to an enormous rent seeking behavior. The second reason is that our model assumes no friction in the regulatory process, so having less instruments to curve the market power of the distribution company under full liberalization do not produce any important depart from optimal regulation. Contrary to this, if we assume an increasing welfare loss in the case that a regulatory instrument is set beyond the optimal value, we should expect a higher welfare loss under full

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