**ANALYSING THE IMPACT OF ENERGY REGULATION ON ELECTRICITY RETAIL PRICES**

Pablo del Rio, IPP-CSIC, pablo.delrio@csic.es

Pere Mir-Artigues, Universitat de Lleida & Chair of Energy Sustainability, peremir@econap.udl.cat

Elisa Trujillo-Baute, University of Warwick & Barcelona Institute of Economics, Chair of Energy Sustainability, elisatrujillo@ub.edu

## Overview

The fundamental and strategic role that the energy sector plays in the economy has grasped the attention of policy makers all over the world. As a result, energy has become a heavily regulated sector. Regulations aim to meet the different goals of public decision makers and/or to correct different types of market failures. At the EU level, the traditionally mentioned goals of energy sustainability include environmental sustainability (CO2 mitigation and other pollutants), security of energy supply (diversification and reliability of energy sources) and economic sustainability (a competitive energy system, i.e., affordable energy). As it can be expected, the influence of regulations on electricity prices does not only have an impact on the electricity sector, but on the economy as a whole, given the relevance of electricity as an input factor in the production and consumption decisions of households and firms in all production sectors. This has been a concern of policy-makers at both the EU and MS levels.

On the one hand, the impact of energy regulations on the electricity prices may result in less money being available in the pockets of households’ breadwinners for other consumption alternatives. This is obviously negative for the welfare of households, implying a lower consumer surplus for them. The extent to which this is so depends on relevant elasticities of demand which, in turn, are affected by the capacity and decisions of households to adopt energy-efficient equipment and practices. But it also has additional macroeconomic repercussions since a lower capacity to spend on other goods and services could entails detrimental consequences for the whole economy.

On the other hand, the negative impact of higher electricity prices on the competitiveness of firms should definitively be a major source of concern. In Europe, the present economic and financial crisis has highlighted the importance of a strong economy and industry. As the European Commission recognises in various Communications, industry’s interactions with the rest of Europe’s economic fabric extend far beyond the productive processes. Manufacturing activities are integrated in increasingly rich and complex value chains, linking flagship corporations and small or medium enterprises (SMEs) across sectors and countries.

As found in the review of the literature carried out, research on the impact of regulation on electricity prices has been rather scarce. At least to the best of our knowledge, when this issue has been addressed, it has only been analysed with descriptive statistics (see e.g., Eurelectric 2014). The use of econometric models as a methodological tool to identify the relation between variables has been virtually absent. The aim of this research is to cover this gap in the literature. An empirical analysis of the degree of influence of regulations on the retail price of electricity (for households as well as for industry) in the EU countries is provided. This influence is mediated by the impact of different regulations (or regulatory variables) on several types of regulatory costs. Therefore, an econometric model is built to capture the main effects. Our analysis clearly goes beyond an academic exercise, and has an obvious and all-encompassing policy relevance.

## Methods

The econometric specification of the equation which we estimated for both household and industrial consumers can be expressed as follows:

(1)

The influence of regulation on electricity prices has two main dimensions. In other words, electricity prices are affected by several regulations. Here we have considered three as the most relevant: the promotion costs related to the support for electricity from renewable energy sources (RES-E) and network costs. The choice of these two regulatory variables is based on the literature review and consultation with energy experts.

In addition, several control variables which can be expected to influence the evolution of retail electricity prices have been included:

- Energy costs. A main component of final electricity prices, in addition to regulated costs, is the cost of electricity as such, i.e., the wholesale price of electricity after the intraday market plus adjustments.

- Taxes and levies. An additional, well-known component of electricity retail prices is taxes and levies. Therefore, it is crucial to include this component as an additional control variable, which is expected to positively affect retail prices.

- Electricity consumption. The evolution of electricity prices depends on the interaction between supply and demand. Obviously, a greater demand induces a higher level of prices ceteris paribus. However, since our dependent variable is retail prices, we are dealing with an inverse demand function and, thus, the sign of the estimated coefficient can be expected to be negative.

-Lagged electricity prices. The evolution of electricity prices depends on the interaction between supply and demand in each country. Following a hedonic specification of prices to analyse the affecting factors, in this model, the different country characteristics are collected in the parameters of the estimated coefficient. Given that the quantity capture the scale of the market, the sign of the estimated coefficient can be expected to be negative.

The estimation method used in the regression analysis has taken the dynamic panel nature of the model into account (22 countries over the period 2007-2013). The Ordinary Least Square method would lead to biased coefficients due to the underlying endogeneity of the lagged dependent variable. The Arellano-Bond method for dynamic panel data is able to generate consistent estimators in this context and have good small-sample properties as convenient in this case.

## Results

## Overall, results for the average effects of regulatory and control variables on domestic and industrial retail prices are significant and in line with expectations. First, on average, the influence of the renewable energy promotion costs (RPC) on the retail electricity prices faced by both industrial and residential consumers is positive and relatively small. An increase of 1% in RPC costs induces an increase of only 0.023% in the industrial retail prices and of 0.008% in the residential retail price. Second, as in the case of RPCs, the results show the expected sign (positive), are statistically significant and, a priori, their magnitudes seem reasonable. Compared to RPCs, network costs have a greater relative impact on retail prices in the case of households (elasticity of 0.29%), but a lower impact in the case of industrial consumers (elasticity of 0.26%).

Both RES promotion and network costs have a positive impact on retail prices. Discriminating by type of consumers, industrial consumers are more affected by RES policy changes, whereas residential consumers are more influenced by regulatory changes which have an impact on network costs. In any case, when comparing the short- with the long-run elasticities, the results confirm that, for the EU average, the impacts from changes in the regulatory variable – both RES promotion costs and network costs – tend to be mitigated in the long-term.

## Conclusions

These results have clear public policy implications. On the one hand, they suggest that the burden of RES support falls slightly unequally on different types of actors, with a greater impact on the industrial sector than on households. In other words, it negatively affects the competitiveness of industrial firms vis à vis their international counterparts. And it suggests that this impact should be taken into account when proposing RES support mechanisms, introducing cost-containment elements which lead to RES promotion at the lowest possible support costs.

On the other hand, the higher impact of increases in network costs in household costs could be related to industries being charged less for those network costs than households. The explanation might be that industrial consumers face lower network costs than residential consumers for two general reasons. First, the industrial sector uses connections with higher voltage, the charges for which are lower than for the residential consumers. In fact, the weight of those costs in the retail electricity prices are higher for households (32%) than for industrial consumers (22%). Second, according to Ramsey's principle of optimal taxation, the optimal tax rate on an activity should be inversely proportional to the price-elasticity of that activity. In order to reduce the influence on the regulated revenues, costs are charged proportionally more to the more price-inelastic consumers.

## References

Abel AB. Asset prices under habit formation and catching up with the Joneses. The American Economic Review 1990; 80: 38-42

Boldrin M, Christiano LJ, Fisher JDM. Habit persistence and asset returns in an exchange economy. Macroeconomic Dynamics 1997; 1: 312-332

Carrasco R, Labeaga JM, López-Salido JD. Consumption and Habits: Evidence from Panel Data. The Economic Journal 2005; 115:144-165

Eurelectric , 2014. Analysis of European power price increase. Eurelectric studies