



Electricity regulation and economic growth[☆]



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ABSTRACT

The main objective of this paper is to analyse the effect of electricity regulation on economic growth. Although the relationship between electricity consumption and economic growth has been extensively analysed in the empirical literature, this framework has not been used to estimate the effect of electricity regulation on economic growth. Understanding this effect is essential for the assessment of regulatory policy. Specifically, we assess the effects of two major areas of regulation, renewable energy promotion costs and network costs, on electricity consumption and growth. A dataset for the period 2007–2013 and 22 European countries was compiled based on CEER reports and EUROSTAT databases. The results of the empirical analysis show that the two regulation instruments have a negative effect on electricity consumption and economic growth and provide estimates of their effects on growth in quantitative terms.

1. Introduction

In the last decade it has become evident that the energy sector is at a turning point, a new model is required to face the challenges of the upcoming years. The required transformation of the traditional energy model, especially with regard to environmental effects, has led to an inevitable and profound regulatory reform. From a regulatory perspective, the energy sector has witnessed a high level of activity at the European level. Three consecutive packages were adopted aiming at harmonising and liberalising the European Union (EU) internal energy market. In addition, the climate and energy package set ambitious targets for 2020 in terms of emissions reduction, penetration of renewables and energy efficiency. Climate and energy as an integrated policy within the EU has led to the trilemma of targets: competitiveness, sustainability, and security of supply. More recently, the European Commission has defined the 2050 roadmap and the 2030 targets as an intermediate step in energy and climate policy to achieve sustainable economic growth.

Unfortunately, the objectives pursued by the climate and energy policy of the EU –environmental sustainability, security of supply and competitiveness– are difficult to achieve simultaneously and even more if they are supported by market forces only. Therefore, priorities need to be set. When the energy policy objectives are analysed in detail, it becomes apparent that the environmental dimension has played an important role. Nevertheless, the economic crisis and its undesirable effects on the capacity of European economies to grow and create wealth, has increased the attention on competitiveness as one of the

main concerns in policy agenda. It is fundamental for industrial development and economic growth that European firms preserve or improve their competitiveness. Within this context –and keeping in mind the other energy policy objectives, since firms must compete in difficult environments–, the basic question is on the role of energy in operating costs and competitiveness.

The increasing concern in Europe about the recent evolution of energy costs and prices and its impact on industrial competitiveness is evident in the 2014 EU Communication 'For a European Industrial Renaissance' (European Commission, 2014). Every day there is greater need to secure an affordable access to energy and raw materials, since these are an important part of the costs in many industries. As the evolution of energy costs negatively influences the competitiveness of energy intensive industries, it is fundamental to avoid disproportionate increases of those costs as a consequence of taxes, levies or other instruments introduced by Member States to enforce various policies. This is essential to guarantee a cost-effective relationship and contributes to an improvement in EU competitiveness. Therefore, the assumption of the upcoming objectives must follow a cost effective approach –affordable and competitive–, ensuring security of supply and sustainability, while taking into account the current economic and political context.

The main objective of this paper is to analyse the effect of electricity regulation on economic growth. Understanding this effect is deemed essential for the assessment of regulatory policy. Specifically, we assess the effects of two major regulations, renewable energy promotion costs and industrial network cost, on electricity consumption and gross

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domestic product (GDP). In this analysis we assume that this impact takes place through the influence of regulation on electricity consumption.

To carry out the empirical estimation, a database for the period 2007–2013 and 22 European countries has been compiled based on the EUROSTAT database and Council of European Energy Regulators (CEER) reports. The information for 22 countries and over 7 years allows us to have an appropriate panel of data. The contributions of this paper to the literature are as follows. First, instead of analysing the effects of regulation on economic growth directly, we use a system of two equations to take into account the fact that electricity regulation potentially affects economic growth through its impact on electricity consumption. This procedure helps to improve our understanding of the mechanisms regarding the effects of electricity regulation on growth. Second, many papers focus on only one specific instrument. Instead, we consider the two main regulatory instruments, renewable energy promotion costs and network costs so their effects can be compared. Third, to include both instruments has required the construction of a novel and comparable measure of renewable promotion costs for 22 European countries.

The rest of the paper is organised as follows. Section 2 provides the background on the link we explore later in the empirical exercise between regulation, electricity consumption and economic growth. In Section 3 the model, variables and methods are described in detail. Section 4 details and discusses the results of the empirical analysis. Finally, Section 5 provides the conclusions and policy implications derived from the analysis performed.

2. Background: regulation, electricity consumption and economic growth

Notwithstanding its relevance for the analysis of regulatory policies, the academic literature has devoted, with very few exceptions (Hudson and Jorgenson, 1974), little attention to the relationship between electricity regulation and economic growth. This is mainly attributable to the fact that this relationship is not a direct one, but rather it is mediated through the effect that regulation has on the consumption of electricity. The mechanism at work in this relationship is the following: electricity is an economic factor of great relevance since it is a key input in the modern production process, its consumption having a significant impact on a company's production costs and, hence, on economic growth. Next, we provide background and fundamentals for our model based, first, on the link between regulation and electricity consumption, and second, on the relationship between electricity consumption and economic growth.

2.1. Regulation and electricity consumption

This research starts from the assumption that the price system is a useful mechanism to transmit relevant information which has an impact on consumer behaviour, within the European context. Whether a depletion of an existing resource, an increasing scarcity of a non-renewable energy or an arbitrage opportunity in a particular market, all the relevant information is usually transmitted through the price, through variations in price levels that make agents react to the fluctuations by changing, for instance, their consumption.

The electricity sector is characterised by being one of the most highly regulated sectors. In the framework of liberalisation, being pushed forward in January 1997 with the publication of EC Directive 96/92/EC of 19 December, the regulatory changes affecting the electricity sector have been especially intense and have had an enormous impact on the structure of the sector and its business agents, as well as on the functioning of the electricity market itself.

Within this process, the regulatory function appears as a key element, being responsible for the definition of the framework that guarantees the correct technical management of the power system, the

coordination of the networks and the transparency of access conditions for all the agents participating in the power market. In other words, in this process of liberalisation, competition and regulation represent two sides of the same coin. Real competition in power markets cannot be fully achieved without ensuring non-discriminatory network access and market functioning at the wholesale and retail levels. Economic regulation must guarantee the recovery of all regulated costs in order to ensure the economic viability of the power system. In this context, energy regulation has a significant economic impact, which has to be considered ex-ante when designing energy policy initiatives.

Evaluating the economic impact of the regulation of the electricity sector and of the changes in these regulations is a complex task. The assessment and measurement of the impact of the reform processes and regulatory changes have been analysed in the relevant literature through various general approaches.

The first is a macroeconomic approach focusing on the analysis of regulatory policies and their impact within the framework of general equilibrium theory (Chisari and Estache, 1999). Contributors using this approach constructed general equilibrium models in an attempt to capture first- and second-order effects to establish, identify and quantify transmission mechanisms and the overall effects of a specific regulatory policy or measure on economic growth, through the modelling of the behaviour of economic agents. The analysis of the impact of regulatory policies with general equilibrium models is intuitively attractive as it allows the quantification of both direct and indirect economic effects. However, these models are characterised by enormous complexity and the constraints placed on any formulation, implementation and description, given the need to simplify the hypotheses governing transmission mechanisms. This limitation undermines their use when the aim is to analyse the impact of specific actions in the regulatory domain.

The second approach has involved the quantitative evaluation of a country's regulatory framework. This provides a better understanding of the risks, particularly the regulatory ones. Such an evaluation of the regulatory framework is useful in a number of ways: it enables comparisons to be made; it identifies possible improvements; and it facilitates the evaluation of the impact of implementing new measures. The evaluation is not without its difficulties, however (Becker, 2009) since it requires access to measurable parameters that allow for an analysis of their evolution over time as well as a comparative analysis of regulatory frameworks.

Given that all regulatory actions seek to achieve a significant improvement in the provision of an electric power supply, a third set of studies has attempted to assess the effects of regulatory changes based on the measurement and evaluation of outcomes – the so-called performance metrics approach – in terms of price, accessibility, quality and efficiency in the provision of the service (Cubbin and Stern, 2006; Pollitt, 2009). This approach has been widely used in academic studies to evaluate the impact of regulatory changes based on the results obtained in terms of pricing, consumption, investment, service quality or the evolution in greenhouse gas emissions, among others. The simplicity of this approach is both its main limitation and advantage. The main limitation is that, being essentially an approach to evaluate ceteris paribus- direct effects on output metrics, it does not allow for the evaluation of multiple indirect effects. At the same time, the simplicity of this approach is its main advantage over the first two approaches. Unlike the quantitative evaluation of a country's regulatory framework, the performance-metric approach does not require access to the countries detailed regulatory frameworks and their evolution. The greatest advantage of the performance-metric over the general equilibrium models is that it does not require detailed hypotheses on all the transmission mechanisms mediating the effects that have been analysed. Therefore, the results of the total effects on performance metrics are not dependent on those hypotheses.

Taking into account the limitations of the first two approaches, the general framework provided by the third approach has been used in this

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