



The development of market power in the Spanish power generation sector: Perspectives after market liberalization



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HIGHLIGHTS

- Competition and regulation in the Spanish electricity market.
- The methodology applied in this study: ex-post structural and behavioral measures.
- Key dominant companies behaved more competitively in recent periods.
- Important structural and regulatory changes in the Spanish electricity market.

ARTICLE INFO

Article history:

Received 5 August 2015

Received in revised form

8 April 2016

Accepted 21 June 2016

Available online 14 July 2016

Jel classification:

L94

D43

Keywords:

Competition

Market power

Spanish electricity market

ABSTRACT

This paper provides a comprehensive analysis of the market power problem in the Spanish power generation sector and examines how and to which extent the market has developed in terms of market power concerns after the market liberalization reforms. The methodology applied in this study includes typical ex-post structural and behavioral measures employed to estimate potential for market power, namely: concentration ratios (CR) (for the largest and the three largest suppliers), the Herfindahl–Hirschman Index (HHI), Entropy, Pivotal Supply Index, the Residual Supply Index and Residual Demand Elasticity (RDE). The results are presented for the two largest Spanish generating companies (Endesa and Iberdrola) acting in the Iberian Electricity Market (MIBEL), and in the Spanish Day-ahead electricity market. The results show evidence that these companies have behaved much more competitively in recent periods than in the beginning of the market liberalization. In addition, the paper discusses important structural and regulatory changes through market liberalization processes in the Spanish Day-ahead electricity market.

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1. Introduction

In the mid-1980s, many electricity systems around the world started liberalization reforms, with the objective of transforming their electricity sector from a vertically-integrated monopoly to a competitive market. The reforms have been characterized by the introduction of competition-based practices in electricity generation while the transmission and distribution networks remained as natural monopolies. The liberalization of the electricity sector in the European Union was launched in 1996 with the Directive 96/92/EC – “concerning common rules for the internal market in electricity”. Later on, the approval of two substantive electricity directives (2003/54/EC and 2009/72/EC), significantly

strengthened the general liberalization trends. Although approximately 20 years passed from the start of the liberalization reforms, there have been limited studies focusing on the effects of these reforms in the European countries. Pollitt (2012) discusses the period of energy privatization and liberalization within a wider historical context. He raises an important issue for liberalization indicating that energy liberalization has become globally widespread but uncertain efficiency gains and a lack of clearly noticeable direct benefits to consumers in many countries. According to Joskow (2008), electricity sector reforms in many European countries are either incomplete or moving forward slowly and facing considerable resistance. After market liberalization, member states have shown horizontal consolidation and vertical integration due to the slow pace of development of transparent wholesale market and the inefficient congestion management, resulting in only a few significant players, increasing market power concerns. According to Borenstein et al. (2002), no market design works well if there is not proper regulation to address the

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concerns over market power from dominant firms. As of today, the market power concerns in electricity markets are of particular interest to policymakers and legislators seeking to protect final consumers from the dominant behavior of producers. Both policymakers and legislators have been very concerned in assessing the competitiveness, the detection of pivotal suppliers, the identification of actual exertions of market power and application of mitigation measures. Like in many European countries, the potential for market power has also been a serious concern in the Spanish electricity market. Although the Spanish Energy Regulatory Office fulfils its obligation as required in the Directive 2003/54/EC (amended by 2009/72/EC) by submitting to the European Commission various reports, in which competition issues are partially discussed, some concerns still exist. In particular, no broad analysis in a longer time-frame is done. This paper aims to cover that gap by analyzing the evaluation of Spanish Electricity Market (SEM) and examining how and to which extent Spanish power generation sector has developed in terms of market power concerns after market liberalization reforms over the last 15 years. Furthermore, the paper also provides the reader with an overview of the outcomes of governmental policies on the mitigation of potential market power concerns in the Spanish market. The rest of paper is structured as follows: [Section 2](#) provides literature review, [Section 3](#) reviews the SEM, [Section 4](#) studies methodology for the extent of competition in SEM using different indicators of market power, [Section 5](#) provides results and [Section 6](#) presents conclusions with some policy remarks on regulation and competition policy.

2. Literature review

As most literature confirms, market power is difficult to define explicitly. Following [Stoft \(2002\)](#), often cited in this context, market power is typically defined as “the ability to profitably alter prices away from competitive levels”. A firm usually has market power by virtue of controlling a large portion of the market. Then, it becomes a profit-maximizer on a downward-sloping residual demand. If the market consists of a few large generators, profit-maximization leads to oligopolistic behavior, setting the price above the marginal cost. The European Union proposes another definition for market power including the provision that if a generator, alone or jointly with others, has “the power to behave to an appreciable extent independently of competitors, customers and ultimately consumers”. In the view of the U.S Department of Justice (DOJ) and Federal Trade Commission (FTC), “market power is defined as the ability to withhold capacity or services, to foreclose input markets, or to raise rival firms’ costs in order to increase prices to consumers on a sustained basis without related increases in cost or value” ([Reitzes et al., 2007](#)). As seen from above definitions of market power, there are a number of implications and distinctive approaches. However, high prices alone, often recognized as a symptom of market power, do not prove that such market power exists. The literature also identifies the primary methods to exercise market power ([Stoft, 2002](#); [Helman, 2006](#)):

- Physical or quantity withholding, - when a generator deliberately reduces the output that could be bidding into the market, resulting in an increase in the market price.
- Financial or economic withholding, - when a generator offers bidding in prices higher than the competitive level for the particular unit, leading to surplus transfer from consumers to producers.
- Transmission related strategies (usually arise in vertically integrated systems) - when a generator creates or aggravates transmission congestion in order to raise prices in a particular zone or node.

There are several empirical and theoretical models studied by [Borenstein et al. \(1999\)](#) [Wolfram \(1999\)](#) and [Wolak \(2000\)](#) showing how market power can be exercised in electricity generation. Early experiences in UK regarding the liberalization process verified that weak competition arises due to high concentration in the wholesale market, while more intense competition had taken place in less concentrated markets such as the Nordic Pool and Germany. Moreover, the liberalization process in some markets such as England and Wales has failed due to market power abuse ([Newbery, 1995](#)). [Wolak \(2000\)](#) argues that the two largest generating companies in the early England and Wales markets were dominant and they were able to put prices substantially above their marginal cost of generation. [Borenstein et al. \(2002\)](#) have also examined that market power played a very significant role in the California electricity crisis. A complete review of methods for detecting the potential for market power was examined by [Twomey et al. \(2005\)](#) where authors studied structural and behavioral indices, simulation models and transmission issues. [Asgari and Monsef \(2010\)](#) investigated the Iranian power sector with the application of structural index-based analysis indices as the concentration ratio, the Herfindahl–Hirschman Index (HHI), Residual Supply Index (RSI), Supply Marginal Assessment (SMA) and the Lerner Index. The indices were measured under two scenarios, one assuming the current situation and the other based on a probable future configuration of the generation sector. [Kaminski \(2012\)](#) examined how and to which extent consolidation in the Polish power generation sector has affected the potential for market power. The author applied similar typical ex-post structural and behavioral measures employed to estimate potential for market power. The analysis shows that there was a significant increase in the potential to exercise market power held by key power generation companies. There has been also a significant number of works, which utilize computational models to analyze market power issues in various electricity markets. Some achievements in market power studies applying mathematical models are presented in [Table 1](#).

3. The Spanish power sector: an overview

Like other member states, following EU Directive 96/92/EC, the Spanish government introduced the Electricity Sector Act (ESA) 54/1997, aiming at introducing competition in the electricity sector. The Spanish liberalization was a distinctive model by permitting vertical integration between the generation and distribution, which had not been allowed in many other deregulation experiences. As a result, Spanish major electricity companies within the same corporate group play several roles, selling electricity as generators and buying it from the spot market as distributors. At present, the electricity generation market in Spain is dominated by Endesa (24%) and Iberdrola (21%), followed by Gas Natural Fenosa (15%), EDP - Hidrocantábrico (6%) and E.ON (3%) (See [Table 2](#)).

[Fig. 1](#) shows evaluation of spot prices in Spain between 1998 and 2013 years. Spot prices in Spain showed signs of decline in 2013 compared to the previous year. On the supply side, the rise in the share of wind power generation and nuclear energy technology with low marginal generation costs pushed the electricity mix towards less costly forms of power generation. On the demand side, economic downturn also resulted in decreasing industrial and residential demand for energy, providing for a support for the downward price trend of the wholesale market in Spain.

Market structure of Spanish system consists of a centralized section that includes a spot market (a daily and an intra-daily market) and market for ancillary services, and a non-centralized section to carry out bilateral transactions. The management of Day-ahead market is the responsibility of the market operator

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