

A Measure of Market Power in the German Electricity Market

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After many years of liberalization of the electricity markets in Europe and a massive development of renewable energy, there are still unresolved issues that continue to stimulate research and flourishing literature. We do not even attempt here to bother the reader with a literature review. As a background example, it suffices to recall the Special Issue of the Energy Journal, entitled: "High Shares of Renewable Energy Sources and Electricity Market Reform" Vol. 37, SI 2, 2016. The main issue is quite simple, according to our view: the supply of electricity from high shares of renewable energy sources (RES) and the actual market design are conflicting. This is very easy to prove in abstract terms. Given that power supply dispatching is on a merit order basis and that RES have priority of dispatching and (virtually) zero marginal cost, in case of 100% RES the equilibrium price is zero.

However, zero price cannot provide a sufficient signal to the market for strategic future investment, let alone the issue of missing money for generation units already in use.

This background introduction motivates the analysis of the market outcomes, to investigate whether this state of the matter has some implication on the correct functioning of the market. In non-technical words, we think that the conjecture that an exposure to bacteria brings infection is a valid reason to use the thermometer to check whether there is fever.

In this context, we focus on the analysis of market power, which is an important tool of the regulator in the electricity market. Market power is the ability of the economic agent (supplier or buyer) to act as a price-setter, rather than price-taker as in competition, by enacting some pricing strategy. The existence of exercise of market power reduces welfare. It a case of market failure.

This paper contributes to the literature proposing a new methodology to measure market power in the electricity market. We apply this method to the German market. We assume that profit maximization can be described for suppliers and in the framework of the conjectural variation. We estimate the aggregate supply and demand elasticities for every hour and use it to estimate the Lerner index for the main four suppliers in every hour: RWE, EON, EnBW, Vattenfall. We find some empirical evidence of market power.

In detail, we assume profit maximization for each big supplier in an oligopolistic framework and we derive the classic Lerner Index, which is the markup over marginal cost and which can be interpreted as a measure of market power $(p-MC)/p$ for each supplier. This expression can be written mathematically in two ways, under given assumptions. First, it can be seen as the ratio of the market share of each supplier to the elasticity of the market demand. Second, it can be expressed as the inverse of the elasticity of the residual demand, faced by each supplier.

This theoretical background allows us to construct some empirical measures of the Lerner index, which can be used to perform some econometric estimation of its structural determinants. The idea is to estimate the Lerner index as a function of some structural variables, such as the seasonality, the temperature variation, the peak and off-peak hours, the generation mix variation of the main operators. This estimation can help to test several hypotheses, which may be useful for the policy maker. For instance, is there a specific time of the day

in which the increase in RES is associated with an increase of the exercise of market power? In other European markets (i.e. Italy) there has been evidence that market power is concentrated in the evening hours. This can be understood as a reaction to the massive injection of solar during the sunny hours of the day, which forces low prices. At dawn and during the evening hours, gas-fired plants become necessary and this results in some exercise of market power (i.e., higher mark up over marginal cost).

Another hypothesis to test is whether the overall size of the market affects the exercise of market power. On the one hand, the intuition is that a larger market may be characterized by more competition; on the other hand, a larger market size may render some supplier pivotal or crucial for dispatching, thus increasing the possibility to exercise market power.

In our empirical analysis we compute the hourly market shares for the main generators, ENBW, EON, RWE, Vattenfall and an aggregate Others in the EPEX, in the period January – March 2017.

The average market shares in the period are ENBW 7.29%, EON 10.39%, RWE 33.03%, Vattenfall 21.81% and Others 27.49%. The market shares do not vary much in the hourly averages.

We also analyze the individual bid data in the market for the main generators.

Preliminary results show that Vattenfall has the highest market power but has the second highest market share. RWE has the second highest market power with the largest share. EON and ENBW have smaller market shares and also smaller market power.

In general, our preliminary results show that there is some evidence of market power in the German market. The measures of Lerner index are mildly increasing with the total equilibrium market quantity (i.e. the measure is higher in those hours when the market equilibrium quantity is higher. This seem to suggest that the intensity of the market power seems to be somehow positively correlated with market size.

Our findings may have some policy implications for the efficient functioning of the German Power Exchange. In any case, the empirical finding that there is evidence of some exercise of market power is a challenge for the policy maker, because it is a signal of failure of competition.

Further analysis of the nexus between RES injection and market functioning can be also useful to the policy maker. If market power exercised by conventional fueled plants is a sort of a survival strategy, albeit distorted, enacted by these operators in order to recover their investments in gas fired plants, this should be properly understood and addressed.

The correction of one distortion (the missing money issue) with another distortion (letting suppliers exercise market power) is not a first-best solution. In conclusion, there is need at the European level to discuss a new market design, which includes RES and conventional generation to compete for the consumer, but also to efficiently cooperate for the system security.

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