

# MARKET POWER AND TRANSMISSION CONGESTION IN THE ITALIAN ELECTRICITY MARKET

## NON-TECHNICAL EXECUTIVE SUMMARY

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In this paper, we set forth a novel approach to empirically measuring market power by explicitly disentangling this from the impact of network congestion on market structure and equilibrium prices.

We start our work recognizing that the analysis of market power in electricity markets is relevant for understanding the competitive development of the industry's restructuring and liberalization process, but that there is not in the existing literature adequate consideration of the effect of line transmission congestion.

Our approach follows the literature of the analysis of market power by considering the standard textbook model of oligopolistic behavior, where market power is understood as the behavior of firms who are able to raise price above the marginal cost as a function of the elasticity of the demand that they face. In the oligopolistic model, each firm faces the so-called residual demand, which is the difference between the total market demand and the supply of all other oligopolistic competitors in the market. Thus, the residual demand for each firm is dependent on all others' behavior. The Lerner index (inverse of the elasticity of residual demand) is an empirical measure of the market power.

The peculiarity of the electric market is that there may occur transmission line congestion, which limits the physical capacity to supply electricity in the market in every hour. Consequently, this constraint alters the possibility of supplying electricity and hence modifies the residual demand for each firm. The logic conclusion is that this alters as well the measured market power for each firm. In other words, usage of residual demand in presence of congestion may result in a distorted measure of market power.

Operationally, line congestion has the following effect on the market. When line congestion occurs in an hour, too much export from one zone cannot satisfy the demand in the importing zone. There is market segmentation between two zones, which means that in the two zones the equilibrium market price is computed separately. The result is that the equilibrium price is higher in the importing zone because, to satisfy local demand, some additional local plants must be accepted in the merit order instead of less expensive plants from the neighbor exporting zone. Hence, it is difficult to recognize and disentangle market power effect from congestion effect on the increase in the electricity prices.

In this work we construct a new measure of the residual demand curve to disentangle unilateral market power from congestion rent in the Italian Power Exchange market during the period April 2004 - December 2007. In Italy, this was a period of stable transmission network structure at the beginning of the liberalization.

In detail, we provide the correct formula for calculating the zonal Lerner index by explicitly considering the transmission congestion problem, taking explicitly into account line congestion and consequently two different kinds of offer bids. The first is the offer bids refused by TSO even if they are more competitive than the marginal bid. The second is the offer bids accepted by TSO even if they are more expensive than the marginal bid. This allows us to compute a correct measure of zonal market power.

Our results show that various generators exercise market power in only some zones, which provides deeper understanding of the Italian Power Exchange market and better support for designing appropriate market surveillance and competition regulation. ENEL, the former monopolist, shows a sizable market power when the Italian market is not segmented and a mark-up of price over marginal cost of about 32%, but this decreases over the period considered.

Considering market segmentation, new results emerge from our analysis. When the national market is segmented into Mainland, Sicily and Sardinia, we observe that ENEL, Edison and Endesa retain appreciable market power, one in each zone: Enel 40% in Mainland, Edison 11% in Sicily, Endesa 6% in Sardinia. Notice that this market segmentation frequency showed a dramatic four-fold increase in the period analyzed. Overall, these results reveal the inadequacy of the transmission network development in this period. We can conclude our analysis by stating that competition works when the market is unique but that the hours in which segmentation favors market power have increased due to structural line congestion. There has been a sort of “live-and-let live” combined behavior of the generators and transmission network, which has certainly delayed the competitive development of the Italian electric market at the initial stage of its liberalization.