

“Competition in the Dutch Electricity Market: an Empirical Analysis over 2006-2011”

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Since the liberalization of electricity wholesale markets in the 1990s, the evolution of competition in these markets has been intensively analyzed. Several authors doubt to what extent competition in electricity market can be really achieved, because of the inherent characteristics of these markets: the demand is highly inelastic and volatile, it is economically impossible to store electricity while transmission constraints may limit the entry of new producers. Because of these concerns, governments in many countries have taken regulatory measures to foster competition, in particular measures to integrate national markets into larger regional markets.

In this paper, we test whether the intensity of competition in the Dutch electricity wholesale market changed over the period 2006-2011 and to what extent that change can be contributed to factors as the integration with neighboring markets. The Dutch wholesale market for electricity is characterized by a mixed portfolio of mainly thermal generation plants, relatively high shares of imports and exports, an increasing share of decentralized production, and a demand mainly coming from industrial users. Table 1 summarizes the key indicators.

Table 1: Key indicators of the Dutch Electricity Market in 2006-2011 (Averages/Aggregates per Year)*

	2006	2007	2008	2009	2010	2011
Day-ahead electricity price (Euro/MWh)	57	40	70	39	45	52
Installed capacity (GW)						
- centralized	67	70	67	72	76	70
- decentralized	32	35	41	41	42	42
Import capacity (GW)	3.6	3.6	4.0	4.3	4.3	5.1
Domestic consumption (TWh)	120	123	124	118	121	122
Import (TWh)	27	23	25	15	16	21
Export (TWh)	6	5	9	11	13	12
Competition indicators during super peak hours:**						
HHI	1574	1710	1784	1829	1700	1447
RSI	1.03	1.08	1.14	1.34	1.28	1.45
Lerner Index	0.23	0.27	0.16	0.20	0.09	0.03
Operational profit (x 1000 Euro/MW)	137	107	127	96	68	67

* All indicators are averages per year except Domestic Consumption, Import, Export and Operational Profit which are aggregates

** 10am to 7 pm during working days.

We measure the intensity of competition by the weighted average Lerner Index. This index is defined as the day-ahead price minus the marginal costs per firm over this price while

the weighing is based on the share of each firm in the total level of generation. The marginal costs per firm are based on actual plant-level data, using engineering-costs estimates. Note that the Lerner Index is close to zero in a competitive market. We calculate this index for every hour in 2006-2011. We find that during super peak hours (defined as 10am to 7pm during working days), the annual average value of this index declined from 0.23 in 2006 to 0.03 in 2011, indicating more fierce competition. From Table 1, we also learn that the operational profit per MW of installed capacity declined strongly during the period of analysis. This decline came partly from the increased competition.

The next question is which factors contributed to the increase in the intensity of competition. In order to answer that question we estimate a time-series model. In that model, the weighted average Lerner Index is the dependent variable while the explanatory variables include the HHI as a measure for market structure, the level of demand, a number of indicators to control for the influence from the German market and a measure for environmental restrictions related to the temperature of river water which is used for cooling purposes. Table 2 shows that the Lerner Index is higher when the market is more concentrated or when the level of domestic demand is higher. We also find that the supply of wind electricity in Germany reduces the Lerner Index in the Dutch market.

Table 2: Effects of Explanatory Variables on the Weighted Average Lerner Index in the Dutch

Electricity

Market in 2006-2011 (R^2 is 0.79)

Explanatory variable	Coefficient	Standard error	Significance
HHI	2.01	0.03	***
Demand	0.06	0.001	***

River temperature	0.02	0.01	
Wind supply Germany	-0.007	0.0003	***
EEX price Germany	0.002	0.00002	***
Import capacity	-0.04	0.003	***
Dummies market coupling:			
Belgium/France	0.006	0.02	
Germany	-0.005	0.01	***

*** refers to significance on 1% level

We find indications that the increase in competition in the Dutch market can partly be contributed to the increased connections with the neighboring countries. In particular the physical extensions of the cross-border capacity with the Scandinavian market and the UK market, as well as the market coupling with Germany fostered competition in the Dutch market.¹ For the trilateral market coupling between the Dutch, Belgian and French market, however, we do not find that this improved competition in the Dutch market, although it resulted in less price differences between these markets. This finding may be related to the fact that the Belgian and French market were far more concentrated than the Dutch market.

We also find indications that the price elasticity of net demand increased. This increase possibly resulted from the relative strong increase in decentralized generation capacity (see Table 1).

The third factor which may have reduced the Lerner Index is that firms moved away from Cournot competition. An indication for more Bertrand-like competition, in which prices

¹ Market coupling means that traders which are active in each of the coupled markets are able to submit orders to the power exchanges without paying attention to the availability of cross-border capacity. The power exchanges set the clearing price given these orders and the available day-ahead transport capacity.

are more strongly related to the marginal costs, is given by the fact that the impact of demand on the Lerner Index decreased during the period 2006-2011.

The lessons learned from the Dutch experience are that increased connection with neighboring countries and enlarged capacity of decentralized generation may foster competition and, hence, result in more competitive prices. These lessons may be valid for other countries, in particular those where supply mainly comes from a limited number of centralized generation firms, while connections with neighboring countries are not yet well-developed.