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PRICE FORMATION AND MARKET POWER IN THE GERMAN ELECTRICITY WHOLESALE MARKET – IS BIG REALLY BEAUTIFUL?

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Overview

During 2004 and 2006 German wholesale electricity prices nearly doubled. The purpose of this paper is to estimate the factors for this price increase differentiated by fuel costs, CO₂-permits and market power. We develop a competitive benchmark model, taking into account power plant characteristics, fuel and CO₂-certificate-prices, wind generation, and other market characteristics. Taking into account real load, we estimate the difference between estimated generation costs and observed market prices.

Methods

Even though electricity wholesale markets are contestable in theory, market power issues regularly play a role in the liberalization process. This is also the case in Germany, where the restructuring of the national markets has started from oligopolistic structures. Among the theoretical literature, Stoft (2002) and Twomey et al. (2004) show that electricity wholesale markets are particularly subject to market power problems, due to the technical characteristics of generation technologies and demand behavior; even relatively small market players can have a high market power potential. The oligopolistic structure of most electricity markets lead to additional incentives for strategic company behavior. In addition to Cournot modeling, Green and Newbery (1992) have developed the Supply Function Equilibrium (SFE) to achieve a more realistic representation of reality. The empirical literature has thus far focused on the British market (e.g. Newbery, 1995, Wolfram, 1998 and 1999, Sweeting, 2001) and the US markets, particularly California (e.g. Joskow and Kahn, 2002, Harvey and Hogan, 2002).

The German wholesale electricity market features a structure that is particularly sensitive to market power: two companies hold a dominant duopoly, with about 60% market share of generation, whereas the four largest players have a market share of about 90% (Bundeskartellamt, 2006). The literature on market power in Germany is scarce, but the three studies available thus far all concur that market power does effect the functioning of the German electricity wholesale market (Müsgens 2006, Ellersdorfer, 2005, and Schwarz and Lang, 2006).

This paper provides a model-based assessment of German wholesale electricity prices between 2004 and 2006. We develop a competitive benchmark model (such as provided in Joskow and Kahn, 2002), taking into account power plant characteristics, fuel and CO₂-prices, wind generation, and other market characteristics. Taking into account real load, we estimate the difference between estimated generation costs and observed market prices.

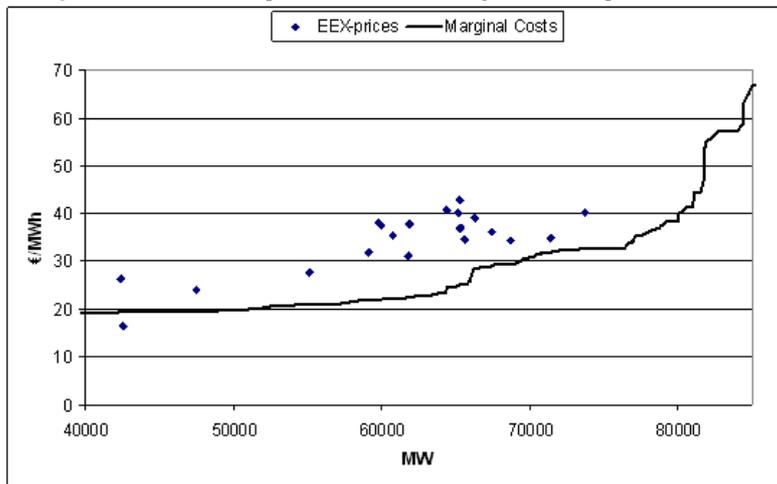
Results

Our results confirm previous research to the extent that a significant difference between marginal generation costs and market prices can be observed. The simulation model shows clear markups on marginal costs in the observed period which are particularly significant during peak times, ranging up to 30% (Figure 1). Fuel costs and CO₂ prices seem to be the main cost drivers, but market power is likely to contribute to the price-cost markups.

Conclusion

The paper analyzed the competitiveness of the German wholesale electricity market during 2004 till summer 2006 using a competitive benchmark model. The results correspond to former studies finding that observed market prices in Germany are above competitive levels. The simulation model shows clear markups on marginal costs in the observed period. The robustness of the obtained conclusion has been verified by carrying out a sensitivity analysis. Thus missing information can not be the only explanation for the observed price differences making market power abuse likely to play a significant role in Germany.

Figure 1: EEX wholesale prices and estimated marginal costs (September 15, 2004)



Source: Own calculation

References

- Bundeskartellamt (2006): Sachstandspapier zur Vorbereitung der mündlichen Verhandlung in Sachen Emissionshandel und Strompreisbildung. Bundeskartellamt, 8. Beschlussabteilung, Bonn.
- Ellersdorfer, Ingo (2005): A Multi-Regional Two-Stage Cournot Model for Analyzing Competition in the German Electricity Market. Proceedings of the 7th European Energy Conference 2005 "European Energy Markets in Transition", Bergen.
- Green, Richard, and David Newbery (1992): Competition in the British Electricity Spot Market. The Journal of Political Economy, Vol. 100, No. 5, S. 929-953.
- Harvey, Scott and William Hogan (2002): Market Power and Market Simulations. Cambridge, Massachusetts.
- Joskow, Paul, and Edward Kahn (2002): A Quantative Analysis of Pricing Behavior in California's Wholesale Electricity Market During Summer 2000. The Energy Journal, Vol. 23, No. 4.
- Müsgens, Felix (2006): Market Power in the German Wholesale Electricity Market. EWI Working Paper, No. 04.03, Energiewirtschaftliches Institut an der Universität zu Köln
- Newbery, David (1995): Power Markets and Market Power. Energy Journal, Vol. 16, No. 3, S. 41-66.
- Schwarz, Hans-Günter and Christoph Lang (2006): The Rise in German Wholesale Electricity Prices: Fundamental Factors, Exercise of Mmarket Power, or Both? IWE Working Paper Nr. 02, Institut für Wirtschaftswissenschaft, Universität Erlangen-Nürnberg.
- Stoft, Steven (2002): Power System Economics: Designing Markets for Electricity. Piscataway, NJ, IEEE Press, Wiley-Interscience.

Sweeting, Andrew (2001): Market Outcomes and Generator Behaviour in the England and Wales Wholesale Electricity Market 1995-2000. Mimeo, MIT.

Twomey, Paul, Green, Richard, Neuhoff, Karsten, and David Newbery (2004): A Review of the Monitoring of Market Power. CWPE 0504, University of Cambridge, Cambridge Working Papers in Economics.