

Predicting market power in wholesale electricity markets

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Electricity wholesale markets in Europe are typically very concentrated, and in most Continental countries the two largest generation companies provide more than 50% of domestic supply. Where internal transmission constraints restrict the number of generators that can compete to supply consumers in a particular area, levels of concentration can be even higher. Thus in each of the two separated parts of Denmark the Herfindahl Hirshman Index (HHI) exceeded 5,000 in 2004. Electricity has a very low elasticity of demand, particularly in the short time periods over which spot markets clear. The standard Cournot oligopoly model that might seem suitable for describing electricity wholesale market equilibria when markets are tight has the well-known property that the Lerner Index (the proportional price-cost margin for a firm) is directly proportional to the market share of that firm and inversely proportional to the elasticity of demand. High market shares and low elasticities should therefore lead to very high price-cost mark-ups – considerably higher than are observed. We therefore have an apparent inconsistency between theory and evidence.

Recently, the Residual Supply Index (RSI) has been proposed as a better measure of market power in electricity markets than the HHI, as it captures the extent to which firms are pivotal (i.e. essential for meeting demand given the supply of other firms), and hence in a position to exercise market power. The RSI also measures the extent of uncommitted (uncontracted) potential supply that a generator might offer to the spot market, and hence recognises that contract cover can reduce the incentive to manipulate the spot market. The EU Sector Inquiry into market power in the energy markets collected an extremely large amount of company level hourly output, contract and price data to explore the exercise of market power in six EU electricity markets, and found a linear

relationship between the Lerner Index and the RSI, although without any clear theoretical reason for expecting such a relationship.

This paper first endogenises the extent of contract cover, which significantly reduces market power (increasing the effective number of competing firms to the square of the actual number), and then finds conditions under which the relationship between the RSI and the Lerner Index will be linear or approximately linear. In very simple models, the Lerner index is negatively linearly related to the RSI with equal and opposite coefficients, as widely observed in the econometric estimations in the Sector Inquiry. For more complex market structures it seems desirable to define the RSI over flexible output if one is to derive linear relationships between the Lerner Index and the RSI. One final point to note (and discussed in the Sector Inquiry) is that the Lerner Index and the analysis here relates to short-run marginal costs (SRMC), ignoring the long-run marginal cost (LRMC) that included the cost of capacity, which must be covered if the firms are to make positive profits. A full analysis would need to take account of stochastic features of electricity markets (that determine the reserve margin) and investment decisions, which would determine the level of capacity relative to demand at various periods, and hence the equilibrium Lerner Index (measured on the SRMC) needed to cover the LRMC.

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