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A ROBUST EQUILIBRIUM MODEL TO COMPUTE MARKET POWER FOR REGULATORY PURPOSES

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Overview

One of the major present concerns about electricity markets is market power, and whether the resulting interaction between agents would reach to an acceptable level of competition or not. Regulators and academics are devoting considerable amounts of work to develop measures to control this market power when it appears, especially considering that divestitures are not often feasible, and equilibrium models are being increasingly used in forecasting the potential impact of these regulatory changes. We present an equilibrium model that is particularly well-suited for these tasks.

Methods and results

The computational tools required for regulatory studies need to be much more robust than standard equilibrium models. For instance, Cournot-based models are widely used in the literature, but their results frequently depend on the demand elasticity parameter, which is a user input. It is difficult to keep any certain regulatory measure if the results that support it vary broadly with some parameters defined by the modeler. Also, conjectural variation models have been proved to be powerful tools from the firms' point of view in the middle-term decision-making process, but they require the expected residual demand slope —also known as conjectural variation, which defines how prices change when one additional megawatt is sold into the market by each of the market players— to be incorporated as an exogenous input data. This slope is usually determined using historical data, but the model is precisely required to asses the impact of regulatory changes which will obviously induce modifications in the firms' strategies, making historical conjectures no longer valid.

Supply function equilibrium models (SFE) seem to be free of these problems. They have been often criticized for their assumptions about extreme uncertainty, which do not always hold in power markets, but this can be considered as a minor problem. However, more relevantly, they are extremely complex in terms of computational requirements, and therefore dramatical modeling simplifications about the economical and technical characteristics of the power generators are required in order to make the model computable. Most supply function models represent the electrical system in such a simplified way that they can hardly be considered to represent the actual characteristics of any real market, so it is very difficult to use them for supporting any regulatory measure.

The model we present here allows both for a detailed representation of the power system and for a parameter-independent computation of the equilibrium —i.e., the information of how prices change with the production of each of the firms does not have to be introduced as an input, but comes out of the calculation process—. The model can be viewed either as a sophisticated version of conjectural variation equilibrium models or as a simplified version of supply function equilibrium models, based on a step-wise supply curve. In this regards, the model compares with previous linear simplified SFE and presents some advantages. We have used these developments to analyze some specific proposals devised to reduce market

power in the Spanish electricity sector, quantifying how much energy from each of the firms in the market should be engaged into those measures.