How to design reserve markets? The case of the demand function in capacity markets

This paper studies reserve markets' design, aiming to provide producers with sufficient incentives to invest in production capacities. For some essential goods such as electricity or medical supplies, wholesale markets' private incentives are sometimes not adequate to ensure that producers make enough investments. While the supply function emerges naturally from producers on those markets, the demand function is not always spontaneous. The public-good nature of investment during high demand periods implies that consumers are unwilling to buy capacities in reserve markets. Hence the regulator must administratively create the demand function, so the market clears and provides producers' capacity prices. To overcome this issue, regulators have proposed different options to create an ad hoc demand in the reserves market. One of the ongoing central debates amongst economists and policymakers is to know if those capacities should be bought by a single entity (the centralized design) or by each retailer (the decentralized design). This paper provides discussions on the economic impacts those two designs can have and their policy implications.

We address this question by building a benchmark model with upstream and downstream agents. Producers make long-run investments in a single technology in the upstream market to produce a homogeneous good. Then, the downstream retailers aggregate and resale the electricity at no cost to the final consumers. The regulator can use an instrument, the capacity market, where upstream producers sell an availability for future transaction periods to restore the right level of investment.

Our main result lies in representing the different market design options for the demand specification in capacity markets. We analyze how each design affects retailers' demand on the energy market, given the degree of competition in the retail market. For the centralized case, we find that if the regulator decides to allocate the costs onto the retailers on an ex-ante basis with a pro-rata unrelated to the strategies on the retail market, then the capacity market is neutral for the energy demand function. On the other hand, if the regulator chose to allocate the cost on actual market shares, this allocation forces retailers to consider capacity prices in their strategies on the retail market. Thus, as they are marginally affected by the capacity market, retailers tend to lower their demand on the energy market. For the decentralized case, we need to analyze how individual strategies can form an aggregated demand functions in the capacity market when the regulator forces retailers to cover their quantity sold on the retail market given a penalty system. To do so, we focus on the symmetric equilibrium, and we analyze the optimal capacity asked by retailers in the capacity market. We find that decentralizing the demand function can restore the market efficiency if an additional investment has a positive value for retailers or if they cannot fully control their consumers' consumption. Finally, we provide a numerical illustration of the model with data from the French power system.

#market design #investment decisions #imperfect competition #regulation