

THE UK CAPACITY AUCTION DESIGN: AN EXPERIMENTAL STUDY

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Introduction

The UK Government has implemented a Capacity Market with auctions alongside the existing wholesale electricity market, to deliver reliable electricity at an affordable cost to the consumers, while moving towards a low carbon electricity market. Competition between bidders should drive Capacity Market's costs to their minimum. However, policy makers are concerned that the UK Capacity Auction might be vulnerable to market power opportunities resulting in high auction prices and thus, expensive consumer bills. Some specific parameters of the UK Capacity market have been chosen to mitigate market power opportunities and we would like to verify in the lab if those choices were justify and if the chosen design does limit the market power opportunities/exercise.

Methods

The auctions used in the UK capacity market are procurement multi-unit discrete descending clock auctions. The experiments were designed to study the effects of two parameters: the feedback given to participants and the pricing rule of the auction. The auctions implemented in the experiment are discrete clock-auction and at the end of each round, different level of feedback can be given to participants. In some treatments, participants will know how many items are left in the market at the end of each round and in others they will have no feedback at the end of each round. This paper will also test two pricing rules: the last-accepted-bid, LAB, versus the first-rejected-bid, FRB. Under LAB, winning bidders receive the amount of the highest successful bid and under the FRB the winning bidders receive the lowest unsuccessful bid.

Although there is a strong experimental literature on anticompetitive behaviour in ordinary single-unit clock auctions, there is limited material for procurement multi-unit auctions. Kagel and Levin (2001) studied different feedback policies in clock auctions experimentally. However, they studied an ordinary continuous auction where a unique human was competing against computerized rivals who were always bidding their dominant strategy. Cramton et al. (2012) studied different pricing rules in a discrete clock auction experimentally. Nevertheless, they studied an ordinary single-unit auction. Our research attempts to contribute to the market design experimental literature about the importance of the procurement multi-unit clock auction design in preventing or facilitating collusion.

Theoretical predictions were derived for our experiment. They showed that the two alternative feedback policies under FRB pricing rule are indifferent to the auction outcome. So it was decided to run three treatments: LAB with feedback; LAB without feedback and FRB without feedback.

Results

Preliminary results indicate that the clearing price of the auction in LAB with feedback and FRB without feedback is on average higher compared to the clearing price of the auction in LAB without feedback. However, the difference is significant only between FRB and LAB without feedback.

Although theoretical predictions show that under LAB without feedback the price of the auction will fall to the competitive equilibrium, experimental results indicate that bidders are still able to cooperate and engage in tacit collusion, driving up the price of the auction.

For FRB and LAB with feedback, theory predicts a collusive equilibrium at the price cap and at the price of the of round 2 respectively. In the experiments, bidders do exercise some market power as the clearing prices are higher than the competitive equilibrium ones, but they don't exercise full market power opportunities as clearing prices are lower than the predicted ones.

Conclusions

The experimental design yields clear differences in behaviour between the three treatments. It is showed, both theoretically and experimentally, that the combination of the feedback policy with the pricing rules, affects the competitiveness of the auction by providing different opportunities to bidders to engage in cooperative behavior and exercise market power. However, experimental results diverge from the predictions. LAB without feedback on average generated lower clearing prices compared to the two alternative auction designs. This could be an argument for the use of limited feedback and LAB pricing rule in the UK Capacity Auction, to minimize the cost for the consumers. However, LAB without feedback is still susceptible to tacit collusion and market power opportunities, driving the auction price above the predicted price.

References

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