Auction Design with Non-Convex Costs: An Experimental Approach

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Auctions are increasingly becoming standard instruments for procurement. However, the performance of procurement auctions when suppliers have non-convex costs, are poorly understood. Because many industries are characterized by some variant of a fixed plus variable cost structure, improving our understanding of how auctions perform in this context is of practical importance.

We present results from a series of experiments with human subjects at the University of Maryland. Subjects participated as suppliers in an auction, each with the capacity to supply up to two units of a good, and bid to supply a portion of the buyer's fixed demand of 3 units. We study the performance of 3 different auction formats: (1) uniform-price one-part bid, (2) uniform-price two-part bid, (3) discriminatory-price two-part bid.

We find that the largest determinant of the efficiency of the auction is the bid structure: The bid expressivity/flexibility provided under two-part bids does not lead to increased 'strategic' bidding behavior, and greatly improves the efficiency of the auction. Interestingly, the pricing rule has minimal effect on the efficiency of the auction, while it greatly affects the buyer's procurement costs.