Comparing Auction Formats

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Abstract

In many procurement settings a buyer uses auction as a price finding and allocation mechanism. This is convenient because the costs often vary across providers and are unknown to the buyer (are private). In such situation an auction may be used to minimize price a buyer has to pay. On the other hand a buyer often cares about other characteristics of service in addition to price. For example, a buyer may care about the overall level of quality (providers' expertise and diligence). Historically, several ways of addressing such concerns have been developed by procurement markets. In US public procurement, potential providers undergo certification process which ensures satisfactory level of quality for those providers who are allowed to participate in auction. After that the provider is chosen through a standard auction mechanism (a first price or a second-price auction). In contrast, private industry prefers to use so called multi-attribute auctions where a buyer has an opportunity to form an impression about the quality of providers who decided to participate in the auction and and may subsequently freely choose among participants according to his private preference for the combination of quality and price. In this paper we compare performance of these two classes of mechanisms.

We emphasize two important channels through which auction outcome may be affected: (a) the allocation mechanism used to select a winner; (b) determination of the set of auction participants. Our analysis focuses on standard (first price, or second price sealed bid) auctions which are often used in public procurement and multi-attribute auctions which are prevalent in the industry procurement. As for the second channel, we consider several participation scenarios in the case of the standard auction. We consider the case when the sellers freely choose to participate or not in a given auction and as well several cases when an auctioneer has an ability to influence the set of participating sellers (i.e., those who submit bids in an auction).

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We use data from an online procurement market for programming services where the allocations are implemented through multi-attribute auctions. We formalize the features of this market in a model where each project attracts a set of sellers who submit bids for the buyer's consideration. The project is awarded to a seller who delivers the highest value over price only if it exceeds the value of the buyer's outside option. The buyer's valuation of a given seller is a function of the seller's characteristics which are weighted buyer-specifically. These buyer-specific weights are the buyer's private information and thus are not observed by sellers or the researcher. Our model assumes that the buyers are risk neutral and have full information on the sellers' characteristics. This assumption reflects features of many on-line settings such as the one we study. On-line platforms are often designed to minimize buyers' uncertainty about sellers' characteristics and to protect the participants from the ex post risks. In fact, the online platform we study maintains a database of performance-related measures, provides an arbitration service, and administers payments from an escrow account only after the buyer is satisfied with the delivered service. Hence informational concerns do not appear to be of first-order importance in this market: buyers often have access to sufficient information and it is unlikely that their risk aversion affects their decisions to a large degree.

Our estimation strategy exploits the fact that under the multi-attribute auction format buyers' willingness to pay for quality and buyers' outside options are not known to sellers. Thus, the buyers' choice sets (the sets of participating sellers) are exogenous conditional on buyers' and projects' observable characteristics. This allows us to separate estimation into components that deal with buyer's choice conditional on the choice set (the demand side) and seller's optimal participation and pricing strategies (the supply side). To recover the demand side parameters, we employ the estimation approach developed in Krasnokutskaya, Song, and Tang (2014) which overcomes key estimation challenges associated with the presence of a very large number of buyers and sellers (so that the number of distinct buyers' choice sets is comparable to the number of projects); a high turnover of supply side participants; and the lack of full information about sellers' qualities in the data. This estimation recovers the individual sellers' unobserved quality as well as the distribution of buyers' outside options and tastes. Next, we turn to estimation of supply side primitives. We use the estimated demand-side primitives to recover the bidding strategies for every type of seller. Therefore, we are also able to recover the distribution of project cost for every type of seller. Estimates of the bidding functions and the costs distributions allow us to impute ex-ante profit for every type of seller from participation in an auction, given the observed set of potential bidders and for a given set of competitor's participation strategies. Finally, this allows us to recover the distributions of the entry costs for every seller type to rationalize the observed participation behavior.

We used the estimated primitives recovered in this analysis to address the question

posed in this paper. We find that not-surprisingly the multi-attribute auctions are able to deliver better match in terms of quality relative to standard auctions with unrestricted participation. However, the prices paid by buyers are higher under multi-attribute auction mechanism so that the difference in the utility obtained by the buyer is negligible across the two types of auctions. Further, the ranking of the auction mechanisms is reversed once the auctioneer is able to pre-screen the set of participating sellers. Specifically, if the buyer implements a so-called private auction where he chooses the type of potential sellers who are allowed to participate first, and chooses a winner using a standard auction mechanism then such an auction delivers higher utility to the buyer relative to the utility he obtains under the multi-attribute mechanism.

Keywords: quality, services, procurement, multi-attribute auctions, unobserved agent heterogeneity, Internet

JEL Classification: C14, C18, D22, D44, D82, L15, L86.

References

Krasnokutskaya, E., K. Song, and X. Tang (2014): "The Role of Quality in Internet Service Markets," Working paper, University of Pennsylvania.