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The Impact of Discrete Bidding and Bidder Aggressiveness on Sellers' Strategies in Open English Auctions: Reserves and Covert Shilling

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Abstract

In practice, the rules in most open English auctions require participants to raise bids by a sizeable, discrete amount. Furthermore, some bidders are typically more aggressive in seeking to become the "current bidder" during competitive bidding. Most auction theory, however, has assumed bidders can place any tiny "continuous" bid increase, and recommend as optimal the tiniest possible increase.

This article examines how incorporating discrete bidding and bidder aggressiveness affect optimal strategies for an important decision for auction sellers, which is setting the lowest acceptable bid at which to sell the property. We investigate two alternative methods sellers often use to enforce this decision. These are setting an irrevocable *reserve* before the auction, and *covert shilling*, where the seller or confederates pose as bona fide bidders and raise bona fide bids, unsuspected by bidders. These optimal strategies interest auction participants, especially sellers who must recognize the bidding rules and bidder aggressiveness they will encounter in actual auctions. We also examine how these strategies change with the auction context, such as the number of bidders, and how they differ from corresponding strategies already identified for continuous bidding. Our model examines open English auctions where bidders have independent, private valuations. We find that discrete bidding does affect these strategies, as does the aggressiveness of the bidder with the highest valuation, *relative* to the average aggressiveness of all other remaining bidders.

We identify the seller's optimal discrete reserve, and show that if the highest valuator is relatively more (less) aggressive, this increases (decreases) from the optimal continuous reserve, and also increases (decreases) as the number of bidders increases. With continuous bidding, by contrast, this reserve is invariant to the number of bidders. As this bidder becomes relatively more aggressive, for a given number of bidders, the optimal discrete reserve increases, while as he or she becomes less aggressive, the seller's expected auction utility increases, which increases the set of auctions where discrete bidding generates higher seller welfare than continuous.

We propose a covert shilling model that requires shilling sellers, and any confederates and auctioneers, to outwardly act no differently than with reserves, to avoid detection. We identify cases where the seller optimally shills once the bona fide bidding has stopped, and identify the corresponding optimal point to stop shilling and accept the next bona fide bid, if offered. This stopping point does not depend on where bona fide bidding stops, or aggressiveness, or the number of bidders, or on whether shill bids alternate with bona fide bids or are consecutively entered. We also find that the optimal lowest acceptable bid with shilling can be higher (lower) than that with reserves if the highest valuator is sufficiently unaggressive (aggressive). By comparison, in continuous bidding shilling and reserves yield identical lowest acceptable bids.

Sometimes the seller using a shilling strategy optimally should not shill at all, and instead accept the bid where bona fide bidding stops. This can occur when that bid, or the number of bidders, is sufficiently high, or when the highest valuator is as, or less, aggressive than other bidders. Optimal shilling can be as practical to implement as reserves, because it does not require sellers to have any information beyond that needed in a reserve auction.

If sellers shill optimally, they can never be worse off compared to using a reserve, and can be better off. Shilling can make bidders worse off, but can also make them better off when the seller using a shilling strategy optimally accepts bids below the optimal reserve. In these latter cases, shilling Pareto dominates reserves, ex ante.

We provide numerical examples to illustrate these results. We discuss how our results might be affected if shilling is not covert, or bidders' valuations have a common value component rather than being independent, or by the rules used in many discrete bid Internet auctions.

(*Auctions*; *Internet Auctions*; *Discrete Bidding*; *Pricing*; *Bidder Behavior*)

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