Commitment in sequential auctioning: advance listings and threshold prices

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Abstract  This paper models sequential auctioning of two perfect substitutes by a strategic seller, who learns about demand from the first-auction price. The seller holds the second auction only when the remaining demand is strong enough to cover her opportunity cost. Bidding in anticipation of such a contingent future auction is characterized, including a sufficient condition for existence of an invertible (increasing symmetric pure-strategy) bidding equilibrium that facilitates the seller’s learning. A unique invertible bidding equilibrium exists for the Dutch auction format, but only when the second auction is sufficiently discounted by the bidders. In the equilibrium, high-valuation bidders shade their bids down as if the second auction were guaranteed. To counter such strategic bidding, the seller would value ex-ante commitment to hold the second auction less often. Three forms of such commitment are analyzed: commitment to list future auctions in advance, commitment to not hold the second auction unless the first price exceeds a publicly announced threshold, and commitment to a reserve-price in the second auction.

Keywords  Auctions · Game-theory · Optimal selling · Commitment · Non-commitment dynamic pricing

JEL Classification  D44

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1 Introduction

Unit-demand goods are frequently auctioned in a sequence of standard auctions, one unit at a time. On eBay, dealers and individuals sell unit-demand consumer durables, such as cars or electronics, using sequences of English auctions. Flower growers in the Netherlands and elsewhere sell carts of flowers using sequences of Dutch auctions. Finally, governments and large firms use sequences of first-price sealed-bid auctions to sell procurement contracts—unit demand goods to capacity-constrained firms. A seller of such goods facing persistent buyers has the opportunity to learn about demand from the early auctions and adapt her selling strategy going forward. For example, she may be better off not producing additional units when the remaining demand is weak. To accommodate such a selling strategy, most auctioneers give sellers the right to withdraw future lots from the auction. While clearly beneficial, learning more about remaining demand also comes with a cost of lower revenue in the early auctions because high-value bidders reduce their bids in response to a learning seller. They know that losing an early auction to an even higher competitor guarantees a high-demand signal that will entice the seller to offer another unit. Therefore, the high-value bidders can bid conservatively in the early auctions, knowing that there will be another chance to buy the good should they lose. This paper analyzes the resulting tradeoff between benefits and costs of learning, and finds that the seller can profit from various forms of commitment to reduce future supply.

A concrete example is useful to both show an application of the theory, and to illustrate the different commitment strategies under investigation. Consider a flower grower selling carts of the same flowers to florists, with the auction format exogenously fixed to a Dutch auction (as in the world’s largest Aalsmer flower-auction house in the Netherlands). The grower has a cart of flowers to sell today, and she can produce another cart tomorrow at some publicly known cost. When there is a unique increasing symmetric pure-strategy bidding equilibrium in today’s auction, today’s price reveals the valuation of the highest-valuation florist, who subsequently exits the game because each florist only wants to buy one cart (unit-demand). The winner’s revealed valuation is an upper bound on the valuations among the remaining bidders, so a non-commitment grower (who makes decisions one unit at a time) will produce and sell the second cart when her cost of producing it is less than the expected profit implied by the upper bound on valuations. Anticipating that decision in the first auction, florists with high-enough valuations can take the second sale for granted and bid as if there were two carts for sale. In equilibrium, these high-valuation florists therefore bid less aggressively than in an isolated single-cart auction—a phenomenon called bid-shading here.

Subgame perfection may force the non-commitment grower to produce and sell the second cart of flowers even when her bid-shading revenue-loss on the first cart exceeds the expected profits from the second cart. Under those market conditions, the grower would clearly benefit from some form of ex-ante commitment to reduce future production. The simplest such commitment is available to a seller who foregoes learning completely and always lists future auctions in advance: when she does not list a future auction, the bidders believe that there will not be one. Advance listing can be credible when there is a third-party auctioneer who requires advance notice.