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Resale in second-price auctions with costly participation☆

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ABSTRACT

We study sealed-bid second-price auctions with costly participation and resale. Each bidder chooses to participate in the auction if her valuation is higher than her optimally chosen participation cutoff. If resale is not allowed and the bidder valuations are drawn from a strictly convex distribution function, the symmetric equilibrium (where all bidders use the same cutoff) is less efficient than a class of two-cutoff asymmetric equilibria. Existence of these equilibria without resale is sufficient for existence of similarly constructed two-cutoff equilibria with resale. Moreover, the equilibria with resale are "more asymmetric" and (under a sufficient condition) more efficient than the corresponding equilibria without resale.

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1. Introduction

We study resale in an independent private values auction setting with costly participation, with a particular focus on efficiency. The seller uses a sealed-bid second-price auction. Bidders are ex-ante symmetric: Their (use) values are drawn from the same distribution function. After learning their private valuations, bidders simultaneously decide whether to participate in the auction or not. Bidders who choose to participate incur a common real resource cost.[1,2]

In the absence of resale opportunities, there is a (unique) symmetric equilibrium of the second-price auction where each bidder bids her valuation iff it is larger than a *participation cutoff* that is common to all bidders. However, there may also be asymmetric equilibria with bidder-specific cutoffs.[3] We first show that, when the valuations are distributed according to a strictly convex cumulative distribution function, there are asymmetric equilibria which are ex-ante more efficient than the symmetric equilibrium. Existence of asymmetric equilibria under strict convexity has been established by Tan and Yilankaya (2006): For any arbitrary partition of the bidders into two groups, there exists an equilibrium where the bidders within a group all use the same participation cutoff that is different from the other group's cutoff. We complement this finding by showing that these two-cutoff equilibria provide a higher expected social surplus than the symmetric equilibrium (Proposition 1). The relevance of this result extends beyond second-price auctions, since Stegeman (1996) shows that one of the equilibria of the second-price auction maximizes social surplus within the class of all incentive-compatible allocation rules satisfying the "no passive reassignment" property.[4]

The second-price auction allocates the object to the highest valuation bidder *among participants* in all equilibria where participating bidders bid their values. Yet, when the equilibrium is asymmetric, there is a possibility that a non-participating bidder has a higher valuation than the winner of the auction. This allocative inefficiency implies that there are potential gains from further trade through resale. Hence we incorporate the possibility of resale (assumed to be costless) via an optimal auction maximizing the reseller's revenue, and study its impact on equilibrium behavior and efficiency.

Suppose that there exists a two-cutoff asymmetric equilibrium of the second-price auction without resale, where one group has a low cutoff and the other group has a higher one. We show that there also exists an equilibrium that partitions bidders the same way

[1] Purchasing bid documents, registering or pre-qualifying for the auction, being at the auction site, arranging for financing ahead of time and preparing a bid (which is often a detailed plan with documentation, especially in government procurement) are all costly activities.

[2] This set-up was introduced by Samuelson (1985), and studied by, among others, Stegeman (1996), Campbell (1998), Tan and Yilankaya (2006, 2007), Celik and Yilankaya (2009). Also see Green and Laffont (1984), where costs as well as valuations are private information.

[3] See Stegeman (1996) for an example and Tan and Yilankaya (2006) for necessary and sufficient conditions for existence of asymmetric equilibrium.

[4] An allocation rule satisfies "no passive reassignment" if the object is assigned only to bidders participating in the auction. In Stegeman's (1996) example of a second-price auction with an asymmetric equilibrium, the asymmetric equilibrium is more efficient than the symmetric one. Celik and Yilankaya (2009) provide a characterization result for efficient auctions.