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Reserve price signaling

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Abstract

In a general auction model in which bidders' signals are affiliated, we characterize the unique separating equilibrium in which the seller can use reserve prices to credibly signal her private information. When the buyers' signals are independent, the optimal reserve price is shown to be increasing in the number of bidders under certain conditions. We also demonstrate that the probability that the item is sold at the reserve price can increase as the number of bidders increases, which indicates a more central role for reserve prices than perceived in the standard auction models.

JEL classification: D44; D80; D82

Keywords: Auctions; Reserve price; Signaling

1. Introduction

In this paper we consider an auction environment in which a seller of a single object has private information about the object's characteristics. These characteristics affect the seller's valuation of the object and the common valuation for a group of potential buyers, each of whom also has a private signal about the object. For example, a seller of an artwork (e.g., an auction house) may know better than potential buyers the conditions (quality, rarity, history, etc.) and the secondary market value of the artwork. Similarly, a government agency auctioning procurement of a public project may have better information than bidding firms about certain factors (e.g., environmental

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impacts and regulations) that affect both its valuation of the project and project costs common to all bidding firms.

If direct verification of the seller's information is costless, it is incentive compatible for the seller to truthfully reveal her information for the following reason. For any subset of types, those sellers with the most favorable estimates of the item's value have an incentive to reveal this information since it raises buyers' valuations and hence their equilibrium bids. Thus there can be no equilibrium pooling of types and so the unique Nash equilibrium involves full revelation of the seller's private information. However, in many auction settings, a costless revelation technology (e.g., a perfectly objective evaluation by a third party) is not available to the seller. In such cases, the seller's announcement of her information to the potential buyers is not credible as she faces the adverse selection problem, that is, she always wants to claim the highest possible value to the buyers. A natural way to credibly reveal the private information is through signaling, and a natural signaling instrument in this environment is the reserve price: a high type seller has an incentive to signal this to the buyers by setting a high reserve price.

In this paper we introduce a reserve price signaling model in which the buyers' private signals are affiliated. The key observation is that a higher reserve price makes it unprofitable for a larger set of buyer types to bid. As the minimum bidder type rises, so does the probability that the item will not be sold. Then the marginal cost of raising the reserve price is lower for a seller with a more favorable signal, since his assessment of the use value of the item is higher. From this observation, we are able to fit the signaling model into the standard signaling framework of Riley [12], and the analysis is greatly simplified. We characterize the unique separating equilibrium in which the lowest type seller sets a reserve price that is optimal under complete information. We then show that when the buyers' signals are independent, the equilibrium reserve price is increasing in the number of bidders under fairly general specifications of buyers' valuations. Thus our results show that a reserve price can play a more central role than perceived by the traditional literature. In the standard private value auction model, the seller's optimal reserve price is set to capture additional revenue when there is only one buyer who has a valuation much higher than her own. This optimal reserve price is independent of the number of bidders. Therefore, unless the number of bidders is small, the probability that the item is sold at the reserve price is small and hence the extra profit captured by setting a reserve price is also low. In contrast, when the reserve price plays a signaling role, our results indicate that the probability that the item is sold at the reserve price need not decrease as the number of bidders becomes large.

After analyzing the general signaling model, we study a linear valuation model in which each buyer's valuation is the sum of his own private signal and a common value component which is the seller's private information. The seller's own valuation for the object is proportional to her private signal. We solve for an analytical solution of the reserve price schedule in the separating equilibrium.

A simultaneous and independent paper by Jullien and Mariotti [6] is closely related to ours. Working on essentially the same model but using somewhat different approaches, their paper and ours arrive at the same characterization of the unique separating equilibrium of the model. [1] The differences between the two papers are as follows. First, the two papers focus on different economic applications of the model. Jullien and Mariotti [6] compare the decentralized signaling equilibrium outcome with the optimal mechanism for a monopoly broker who buys from the seller and sells to the buyers. We focus on the signaling role of the reserve price and study how

[1] Jullien and Mariotti [6] also analyze pooling and partial pooling equilibria, which we do not.