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The Shill Bidding Effect versus the Linkage Principle

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Abstract

The analysis of second price auctions with externalities is utterly modified if the seller is unable to commit not to participate in the mechanism. For the General Symmetric Model introduced by Milgrom and Weber [P. Milgrom, R. Weber, A theory of auctions and competitive bidding, Econometrica 50 (1982) 1089–1122] we characterize the full set of separating equilibria that are symmetric among buyers and with a strategic seller being able to bid in the same way as any buyer through a so-called shill bidding activity. The revenue ranking between first and second price auctions is different from the one arising in Milgrom and Weber: the benefits from the highlighted 'Linkage Principle' are counterbalanced by the 'Shill Bidding Effect.'

JEL classification: D44; D80; D82

Keywords: Auctions; Externalities; Linkage Principle; Shill bidding

1. Introduction

In their General Symmetric Model where private signals are positively correlated through affiliation and where a single item is auctioned, Milgrom and Weber [27] (hereafter MW) derived the so-called 'Linkage Principle,' one of the most influential results in the auction literature. A first aspect of this principle is the benefit for the seller ex ante to commit to a policy of publicly revealing her signal. A second aspect is that, due to their relative ability to convey information, the English auction[2] raises a higher revenue than the second price auction which outperforms the

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[2] More precisely the English button auction introduced by MW as a model of the traditional English open auction used in auction rooms but which could be a poor description of real-life auctions without any activity rules.

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first price auction. Ausubel [2] extends MW's results in a multi-unit framework with flat multi-unit demands[3]: Ausubel's dynamic auction for homogeneous objects outperforms the (static) Vickrey auction.

However, the Linkage Principle is based on an assumption which goes without saying in the auction and more generally mechanism design literature: the seller (or the designer) is able to commit not to participate secretly, under a false name bid for example, in the mechanism. This assumption may be less plausible in some contexts, notably in online electronic auctions, even if shill bidding is prohibited as on eBay.[4] Dobrzynski [10] tells how a fraudulent seller manages to sell a daub, attempting to copy the style of some Diebenkorn's masterpieces, for over 135,000 $ without pretending any certification. Her investigation brings her to 'a list of 33 Internet names that repeatedly bid on one another's offerings' and that is suspected to have formed a ring that raises bids in order to make potential real buyers believe that it was a masterpiece. These last were unaware of the extent of the shill bidding activity involving so many different identities who were supposed to be art experts by eBay's reputation mechanism. Shill bidding is a pervasive phenomenon in online auctions and is very difficult to detect in practice. How is it possible to prevent the formation of rings of sellers which have no formal acquaintance and whose objective is to shill bid under each other sales? Ockenfels et al. [30] report that, in Germany, a commercial company provides a service that automates the process of shill bidding.

The aim of the present paper is to delimit the degree of validity of the aforementioned revenue ranking in the light of the ability for the auctioneer to commit not to participate in the mechanism. Various formats are not altered in the same way by the shill bidding activity. On the one hand, first price auctions are immune to shill bidding provided that the reserve price is higher than the seller's reservation value: the seller does not find profitable to raise a shill bid since it can only lower her payoff by lowering the probability of sale without modifying the payment of the winner. On the other hand, in the second price auction, to submit a shill bid can possibly raise the revenue of the seller insofar as a shill bid can set the winning price. Furthermore, we show that in this format and with strict interdependent values, any equilibrium contains a shill bidding activity in mixed strategy. Such an equilibrium is shown to raise a smaller revenue than the one without shill bids and the reserve price being fixed to the lower bound of the support of the above mixed strategy: if the seller can commit to this reserve price, she induces the same set of participants which are also bidding more aggressively since they are not fearing to pay a second highest bid coming from the seller. Combining the above observations, we obtain what we call the 'Shill Bidding Effect': a countervailing force to the Linkage Principle in favor of first price auctions.

In MW's framework, we derive the whole set of buyer-symmetric separating equilibria in the second price auction when the commitment ability not to use shill bids is relaxed. In general, the characterization of an equilibrium of such a Bayesian game between the seller and the buyers is not tractable. That is the reason why Vincent [33] and Chakraborty and Kosmopoulou [8], the only two papers that analyse shill bidding with interdependent valuations to the best of our knowledge, respectively analyse an example with a specific distribution of valuations and

[3] Perry and Reny [31] display an example where the first aspect of the principle fails in a multi-unit auction without flat demand.

[4] Family members, roommates and employees of the seller are enclosed in this prohibition (for more details see http://pages.ebay.com/help/policies/seller-shill-bidding.html).