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Bidding in private-value auctions with uncertain values

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ABSTRACT

Auctions are often used to sell idiosyncratic goods difficult for potential bidders to value ex ante. Laboratory auctions with uncertainty over final values in this experiment resulted in 18% and 27% of bids above the expected value of the item in private-value first-price and English auctions, respectively. Risk-seeking preferences as measured on an individual decision task cannot explain overbidding and the first-price auction results suggest that risk aversion may not be a good explanation for bidding behavior observed with certain values. Several candidate explanations fail to explain overbidding, rather it appears to stem from some bidders who are prone to overbidding. Relative to first-price auctions, the size and frequency of overbids are significantly larger in English auctions, while more English auctions are won by overbidders. Differences between the formats appear to be driven by the dynamic nature of English auctions which is consistent with popular notions of "auction fever."

1. Introduction

Consumers do not always know exactly how much they value a good. Economists have investigated markets in which the value of the good is unknown to consumers prior to purchase—so-called "experience" goods (Nelson, 1970)—while psychologists have studied the factors that influence a consumer's estimate of the uncertain value such as context, task, anchors, choice sets, and menu order (e.g., Payne et al., 1992; Ariely et al., 2003; DellaVigna, 2009). Uncertainty over values may be quite common in auctions which are often used to sell rare or idiosyncratic goods. For example, how much is a prop used in an episode of the original *Star Trek* series worth to a given consumer, or a set of golf clubs used by John F. Kennedy?

The voluminous research on auctions has established a few key stylized facts about bidding behavior in standard settings. First, bidders in the laboratory have been found to bid above their value in sealed-bid, second-price auctions when bidding one's value is a dominant strategy. Second, bidders in English auctions in the lab conform to the dominant strategy by dropping out at their values. Third, in the strategically equivalent first-price and Dutch auctions bidders in the lab bid more than the risk-neutral Nash equilibrium strategy but less than their values.[2] While the bidding in English auctions with certain values is consistent with the dominant strategy, the search for an explanation of the bidding behavior in strategically equivalent second-price auctions has generated a cottage industry of explanations, such as spite (Cason et al., 2011), joy-of-winning (Cooper and Fang, 2008), learning and feedback effects (Harstad, 2000), and the shape of the expected payoff function (Georganas et al., 2012). The bidding in first-price auctions (FPAs), however, can seemingly be explained by

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[2] Although the first-price and Dutch auctions are strategically equivalent and this pattern holds true for both formats, these auctions are not necessarily isomorphic. Cox et al. (1982), for instance, found average prices in Dutch auctions to be significantly lower than those in first-price auctions.

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modeling risk-averse bidders (Harris and Raviv, 1981). Using risk-aversion to explain overbidding has been criticized both on the grounds that payoffs were not sufficiently salient (Harrison, 1989) and that an individual's risk preferences may not be stable across different tasks (Isaac and James, 2000; Berg et al., 2005), but risk preferences remain a convenient way to explain these lab findings.

I run a laboratory experiment in which subjects' valuations for the item are a random variable rather than a certain value in either first-price or English auctions. Uncertainty in FPAs introduces an additional role for risk preferences to influence bidding behavior, which can shed some light on the issue of whether risk aversion drives bidding. Even though a bidder with a certain value is willing to trade off some profit for a higher probability of winning, the uncertainty over values will ensure that a risk-averse bidder should never bid above the expected value of the item. With certain values, risk preferences play no part in the dominant strategy in an English auction, but uncertain values will cause a risk-averse bidder to bid less than the expected value of the item, introducing a channel for risk preferences to affect bidding where none existed before.

I find that 18% and 27% of the highest bids submitted by bidders in FPAs and English auctions, respectively, are greater than the expected value of the item—bids that are at odds with either risk-neutral or risk-averse preferences. For convenience, I refer to bidding above the expected value of the item as overbidding. I elicit risk preferences using the low-stakes, paired-lottery questionnaire introduced in Holt and Laury (2002) as a generic measure of risk preferences, but overbids submitted by subjects with risk-seeking preferences on the Holt and Laury measure account for only one in ten overbids in FPAs, and three in ten overbids in English auctions. Moreover, this overbidding cannot be explained by several other possible factors put forth in the literature to explain bidding phenomena: failure to understand the experimental environment, non-serious bidding by low-value bidders, regret aversion, loss aversion, or eagerness. There is evidence that overbidding can be attributed to certain bidders who are simply prone to overbidding.

Overbidding is more pronounced in English auctions than in FPAs: the fraction of bids that are overbids and the average magnitude of the overbids are both significantly larger in the English auctions, while a significantly larger proportion of English auctions are won by overbids than FPAs. Pronounced overbidding in English auctions is consistent with longstanding popular notions of "auction fever," a phenomenon in which an individual may get swept away when bidding in an English auction and bid beyond what they would have been willing to pay for an object outside of the auction.[3] Auction fever has not previously been observed in the laboratory, but there are a number of field studies that seek to determine the causes of auction fever. For example, Heyman et al. (2004) focus on cues and framing in online auctions as determinants of preferences. Their discussion of the environment revolves around the emotional intensity of auctions, and they provide some possible explanations for auction fever, such as escalation of commitment and the quasi-endowment effect. Escalation of commitment implies that because consumers have expended time and effort to be at the auction and make bids, they keep raising their bids beyond their value for the object because they do not recognize that their time and effort are sunk costs. The quasi-endowment is a weaker version of the endowment effect discussed in Thaler (1980) wherein subjects feel ownership of an object the longer they have been the high bidder. Ku et al. (2005) investigate escalation of commitment and "competitive arousal" in both live and online auctions. The evidence in that study lends support to competitive arousal—emotional intensity exacerbated by things such as feeling rivalry with another bidder, or the presence of a crowd—and escalation of commitment as explanations of bidding behavior. Similarly, Ariely and Simonson (2003) also focus on competitive behavior driving excited bidding. The overbidding in the English auctions with uncertain values is driven by overbids toward the end of auctions that are consistent with both escalation of commitment and rivalry with another bidder.

The current experiment does not address or manipulate the emotional or psychological drivers of auction fever, but it may be that uncertain values open an avenue for these factors to play a role. If a subject has a certain value there is a compelling case for him to bid no more than his value because otherwise he will definitely lose money, but this is not the case with uncertain values. If uncertain values open the door to the excited bidding predicted in field studies, it is unclear how this will interact with a bidder's risk preferences.

2. Previous research

An extensive experimental literature on English auctions finds that bidders rapidly converge on the dominant strategy of value bidding. Coppinger et al. (1980) find that the average difference between the actual price in English auctions and the theoretically predicted price (the second-highest private value among bidders) is only 0.0124 when values are drawn in increments of \$0.10 from a discrete uniform distribution over [\$0.10, \$10.00]. They attribute the small and insignificant overbidding to rounding errors due to discrete bid increments. Kagel (1995) reviews a number of laboratory studies arriving at the same conclusion: subjects conform to the predicted strategy of value bidding. All of these experiments, however, study auctions in which subjects have certain, private values for the item being auctioned.

In the only other laboratory experiment with uncertain values, Erhart et al. (2008) examine whether auction dynamics, the quasi-endowment effect, and source dependence impact bidding. Source dependence occurs if subjects place more value

[3] Lee and Malmendier (2010) provide illustrative citations from ancient Roman laws that address "bidder's heat" and "bidding frenzy."