Games and Economic Behavior 109 (2018) 40–64

Contents lists available at ScienceDirect

Games and Economic Behavior

www.elsevier.com/locate/geb

An experiment on first-price common-value auctions with asymmetric information structures: The blessed winner ☆

Brit Grosskopf [a], Lucas Rentschler [b,*], Rajiv Sarin [a]

[a] Department of Economics, University of Exeter, United Kingdom
[b] Department of Economics and Finance, Utah State University, United States

ARTICLE INFO

Article history:
Received 3 May 2016
Available online 15 December 2017

JEL classification:
D44
D82
D72

Keywords:
Auctions
Asymmetric information structures
Underbidding
Public information

ABSTRACT

In common-value auctions bidders have access to public information, and may also hold private information prior to choosing their bids. The literature has predominately focused on the case in which bidders are ex-ante symmetric and privately informed, and finds that aggressive bidding such that payoffs are negative is common (the winner's curse). In practice, bidders often only have access to public information, and use this information to form (possibly differing) beliefs. In addition, a bidder who is not privately informed may face bidders who are. We examine bidding behavior of both informed and uninformed bidders, and vary the information structure they face. We find that uninformed bidders underbid dramatically and persistently, while informed bidders tend to overbid in the two-bidder case. Our results highlight the importance of correctly modeling the information available to bidders.

1. Introduction

An important and well studied class of auctions are those for leases of oil and gas tracts, studied by Hendricks and Porter and co-authors (1987, 1988 and others).[1] Such auctions are typically referred to as common-value. They share the characteristic that all bidders have access to public information regarding the value of the lease. Bidders may also hold private information about this value prior to choosing their bids. Auctioned offshore tracts typically fall into two categories. In the first, referred to as drainage tracts, some or all of the bidders have access to private information regarding the value prior to bidding. Auctions of drainage tracts include situations in which all bidders have private information, and also cases in which some bidders have private information, while others only have public information.[2] In the second category, referred to as wildcat tracts, no bidder has access to private information prior to bidding.

☆ We thank audiences at the ESA meetings, audiences at the Department of Economics at Texas A&M University, John Kagel and John Morgan for helpful comments and suggestions. We also thank the associate editor and three referees. Financial support from the Department of Economics at Texas A&M University and the BID cluster at the University of Exeter is gratefully acknowledged.

* Corresponding author.
E-mail addresses: b.grosskopf@exeter.ac.uk (B. Grosskopf), lucas.rentschler@usu.edu (L. Rentschler), r.sarin@exeter.ac.uk (R. Sarin).

[1] Some of these papers include Hendricks et al. (1987), Hendricks and Porter (1988), Hendricks et al. (1989, 1993, 2003).

[2] It has been observed that when there was more than one bidder who held private information, bidders who only had public information tended to drop out of the auction.

https://doi.org/10.1016/j.geb.2017.12.013
0899-8256/

The literature on auctions has been largely concerned the case in which all bidders have access to private signals, which might differ in their level of informativeness. We are not aware of any experimental study of first-price auctions which has investigated bidding behavior when some or all of the bidders only have access to publicly available information as is typically the case in wildcat auctions.[3] Interestingly, wildcat auctions make up the overwhelming majority (83%) of auctions in the dataset studied by Hendricks, Porter and co-authors. This paper provides a first experimental investigation of these cases while contrasting it with the better studied case in which all bidders observe private signals. As such, we investigate the central information settings faced by bidders in the Hendricks–Porter et al. studies.

Interestingly, the data used by Hendricks, Porter and co-authors shows that the number of bidders in both wildcat and drainage auctions was relatively small, with the overwhelming majority of auctions attracting less than seven bidders.[4] In fact, auctions with only two bidders account for 24% of drainage auctions and 18% of wildcat auctions. If we take out auctions that only attracted one bidder, two bidder auctions make up 41% of drainage auctions and 29% of wildcat auctions.[5] This is particularly interesting as experimental studies of first-price, sealed-bid common-value auctions usually are conducted with four or more bidders. In order to fill the void, we design an auction experiment with two bidders in three different information structures. The value of the good is common, but uncertain. We vary the number of bidders who have private information at the time they choose their bids. Either both bidders observe signals, as is commonly studied in the literature, or only one bidder receives such private information, while the other only has access to the common knowledge distribution from which the value of the good is drawn. Lastly, we study auctions where both bidders only have access to public information.

In line with other experimental studies, we find that agents with private information tend to overbid, and are susceptible to the winner's curse. Our main finding is that agents who only observe public information systematically underbid, and this behavior persists over time. When no agent has private information the magnitude of this underbidding is overwhelming and this behavior involves not best responding by all players. The underbidding of uninformed agents occurs both when the other bidder is privately informed and when she is not. When all bidders have only public information, this underbidding results in the players getting large profits. Hence, in contrast to previous experimental studies which involved all agents obtaining private information and overbidding, we find that when no agent has private information the winner of the auction may be thought of as "blessed."

The primary contribution of this paper is to uncover the behavior of agents who have only public information about their environment. We argue that the underbidding of such agents cannot be explained by risk and loss aversion, collusion or cursed bidders. While a model of level-k reasoning is qualitatively in line with our results, our estimates suggest that bidders must hold implausible beliefs for this explanation to hold.

We check for the robustness of our observations by increasing the number of bidders from two to four and to six in auctions where no bidders hold private information. We find that, on average, underbidding persists, although the level of underbidding decreases in the number of bidders. When there are two or four bidders, bidders earn a positive payoff. When there are six bidders, the winning bid is aggressive enough that payoffs are negative, on average.

The remainder of the paper is structured as follows. Section 2 introduces the theoretical predictions. Section 3 presents our experimental design, followed by Section 4 which describes our results. Section 6 assesses the ability of alternative bidding models to explain our data. Section 5 reports the results of additional experimental sessions which study auctions with two, four and six bidders, where there is only public information available to the bidders. Section 7 contains a concluding discussion.

2. Theory

We study the simplest framework which has not been previously studied and which is capable of yielding robust insights. In particular, we examine first-price, sealed-bid auctions with two bidders. The prize has a common but uncertain value x, where x denotes the realization of a random variable X with uniform density on $[25, 225]$. The distribution from which the prize is drawn is assumed to be common knowledge.

Prior to bidding, each bidder may (or may not) obtain a private signal regarding the value of x. If a bidder observes a signal we say she is informed; if she does not we say she is uninformed. We are interested in all the possible information structures that can arise in such a game. In particular, we study auctions with an asymmetric information structure (ASYM), in which only one bidder is informed, auctions where all information is symmetric and public (SPUB), in which neither bidder is informed, and auctions where bidders are ex-ante symmetric but there is private information (SPRIV), in which both bidders are informed.

[3] While the auctions in Bazerman and Samuelson (1983) did not provide private information to subjects, each subject reported their estimate of the value, and this was taken as an informative signal in the analysis.

[4] http://capcp.psu.edu/data-and-software/outer-continental-shelf-ocs-auction-data.

[5] While auctions with only two bidders are remarkably common, it is possible that this comes about through endogenous entry. As a result, some bidders may decide on their bids before they know the exact number of bidders. These issues have previously been studied in the experimental literature. For example, Cox et al. (2001) study entry in common-value auctions in environments where the number of bidders is revealed before bids are placed. De Silva et al. (2009) study entry in both common and private value auctions where bidders are not informed of the number of entrants before placing bids.