

Common Value Auctions and the Winner's Curse

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This book brings together the author's work on common value auctions. Chapter 1 is a new, up-to-date survey of experimental work on common value auctions and related topics such as the swing voter's curse, comparisons of experimental with field data, implications for the design of government auctions, such as the recent spectrum (air-wave) rights auctions, and the dialogue between theory and experiments. The remainder of the book consists of the authors' published papers on theory, experiments, and field studies of common value auctions. These include the winner's curse (I won the item but curse the fact that I lost money), the impact of different auctions institutions (open-outcry versus first-price sealed bid auctions), the role of insider information on seller's revenue, learning to avoid the winner's curse, and comparisons of sophisticated bidders drawn from the commercial construction industry with the standard college student population employed in experiments.

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The papers that follow provide detailed accounts and supplementary material from our work in common-value auctions. Chapter 2 reports our first common-value auction experiment with inexperienced bidders, using a first-price sealed-bid design, as in the offshore oil lease auctions that led petroleum geologists to first claim a winner's curse (Capen, Clapp, and Campbell, 1971). Our prior beliefs were like much of the economics profession at the time: with real payoffs and feedback we were not likely to observe a winner's curse for very long. This forecast could not have been more wrong. The winner's curse is quite robust in these data, being present for inexperienced bidders throughout, with the possible exception of when bankruptcies reduce the number of bidders to the point that the adverse selection problem has been essentially eliminated.

An appendix to this chapter reports unpublished data documenting the same outcome for inexperienced bidders in a second-price sealed-bid auction experiment carried out at about the same time. Instructions for both sets of experiments are provided as well. Both experiments were carried out with pencil and paper. Subsequent chapters also report data for inexperienced bidders under a number of different institutional arrangements.

Being unprepared for the persistence of the winner's curse, the experiments reported in Chapter 2 do not incorporate the kinds of controls one might wish for and which were incorporated into later studies. The primary problem here is that with bankruptcies, and our rule that subjects with negative cash balances can no longer bid, the number of bidders may be reduced unless measures are taken to control for this eventuality. With fewer bidders there is less of an adverse selection problem and higher expected profits, so that surviving bidders do not necessarily have to adjust their bidding strategies to go from making losses to earning positive profits. The obvious way to correct for this

problem is to employ reserve bidders, or to have more subjects than active bidders with only a subset bidding at any point in time (for example, 6 subjects with only 4 out of the 6 bidding in any given auction period). Then, if one is lucky, the session can be completed holding the number of bidders constant throughout. This still leaves potential self-selection problems to deal with (those going bankrupt are likely to bid more aggressively), but it does control for the original problem. Subsequent experiments employed these kinds of controls.

Initial reactions in a number of quarters to the inexperienced subject data reported in Chapter 2 essentially ran “So what? What do you expect from inexperienced bidders?” As such we employed once and twice-experienced bidders to explore two key comparative static predictions of the theory: The effects of public information on sellers’ revenue and the effects of changes in the numbers of bidders on individual bidding.

Chapter 3 looks at these more experienced bidders in first price sealed-bid auctions. With small numbers of bidders (four), more experienced bidders earn positive average profits (although still well below what the theory predicts) indicating that they had overcome the worst effects of the winner’s curse. However, these same bidders, in auctions with more rivals (six or seven) again suffer from a winner’s curse, earning negative profits on average. Bidders had, apparently, learned to adjust to the winner’s curse with fewer rivals through a trial and error learning process, but had no deeper understanding of the adverse selection forces at work. This paper also explores the effects of public information on bids and seller revenue. It provided our first insight that the release of public information about the value of the item could help bidders overcome the winner’s curse, thereby reducing sellers’ revenue, contrary to the theory’s prediction. This paper also makes a connection between the laboratory results and field data: Profit calculations for early Outer Continental Shelf oil lease sales

showed that greater profits were earned on drainage compared to wildcat leases, even for “non-neighbor” firms (those *not* holding leases next to the drainage tracts), in apparent violation of the theory’s prediction that more information about track value would reduce profits and raise revenue. However, these higher profits are consistent with our finding that public information is likely to raise bidders’ profits, not lower than, in the presence of a winner’s curse. Alternative explanations for this field data are reported in the paper, along with our explanation.

An addendum to Chapter 3 corrects a small error in that paper regarding the theoretical benchmark calculations for auctions with public information. The addendum characterizes the correct theoretical benchmark and briefly reanalyzes the data with respect to the correct benchmark. This reanalysis serves to strengthen the original conclusions reached in Chapter 3 regarding the impact of public information.

Chapter 4 looks at the effects of public information on sellers’ revenue and the effects of changes in the numbers of bidders on individual bidding in second-price sealed-bid auctions using more experienced bidders. Second-price sealed-bid auctions have more robust predictions than first price sealed-bid auctions: Risk aversion has the unambiguous implication in second-price auctions that bids will be below the risk neutral Nash equilibrium benchmark, and individual bids must decrease with increasing numbers of bidders. The disadvantage is that first price auctions are far more common in practice and bidders tend to have problems with second-price auctions (they systematically deviate from the dominant strategy even in simple private-value second-price auctions; see Chapter 5). Nevertheless the two papers make a nice pair, with the results of one reinforcing the other.

The experiment in Chapter 5 was motivated by the effects of public information reported in Chapters 3 and 4. In Chapters 3 and 4 we argue that the failure of public information to raise revenue

as the theory predicts results from the existence of a winner's curse. Public information is also predicted to raise revenue in auctions with affiliated private values (the same mechanism is at work in both cases). But since bidders have private rather than common values, there is no scope for a winner's curse. The experiment in chapter 5 shows that public information reliably raises average revenue in this private-values setting, but not by as much as predicted. The latter results in part from individual bidding errors and in part because of a general tendency to bid above equilibrium to begin with. One unanticipated result of this experiment, repeated now in a number of different settings (see Chapter 6 below), is the closer to equilibrium outcomes found in an open-outcry (English) auctions compared to sealed-bid auctions.

Chapter 6 studies bidding in ascending-price, English auctions. This experiment represents a natural extension of the study of public information reported in Chapters 3 and 4. Drop out prices in English auctions reveal information about bidders' signal values (bidders with lower signal values tend to drop out first). Hence the initial question motivating this experiment: Does the endogenous release of public information impact on bidding in the same way as the exogenous release of public information? The quick and easy answer for inexperienced bidders was yes: with inexperienced bidders English auctions reduce rather than raise average sellers' revenue compared to first price auctions, as bidders use the information contained in rivals' drop-out prices to correct for the winner's curse. The answer for more experienced bidders was harder to come by. It was not until we had sufficiently experienced bidders that they took home a substantial share of equilibrium earnings in the first-price sealed-bid auctions that the English auctions raised average sellers' revenue.

However, this paper contains more than the answer to this relatively simple question. Estimates of individual subject bid functions show that a simple and natural signal-averaging rule, that does not

require recognizing the adverse selection effect of winning the auction, better characterizes the data than the Nash bid rule. Further, Monte Carlo simulations using the full information maximum likelihood estimates of the signal averaging rule provide a number of insights into behavior: (i) the relatively low percentage of (50-60%) of high signal holders winning the auctions is completely consistent with a symmetric bidding model with bidding errors of the magnitude observed, (ii) “panic” drop outs observed during the auctions (bidders dropping out immediately after a rival has dropped, but prior to arrival of any new information) can be explained on the basis of bidding errors in conjunction with the English auctions format, and (iii) an assumption of independent errors across successive rounds of bidding is more consistent with the data than an assumption of perfectly correlated errors. This last point is of some general importance since it has sometimes been argued that subjects interacting across a number of trials within an experimental session create such strong interdependencies that one is effectively left with only one observation per experimental session. This argument implies highly correlated errors between trials (auctions), no less between successive rounds of a given auction.

Chapter 7 explores bidding in auctions with insider information. The original motivation for this experiment was to see if the existence of a perfectly informed insider might shock outsiders into overcoming the winner’s curse faster. It does not, at least not in this setting. The paper then goes on to explore the comparative static predictions of the theory for experienced bidders.

The experimental design employed in Chapter 7 was motivated by a desire to maintain procedures as close as possible to those employed in auctions with a symmetric information structure. This resulted in a design that differed in important ways from the standard insider information model employed in the literature. In the latter, the insider typically has a double informational advantage, she knows the value of the item with certainty and knows all the information that the outsiders have as well.

In contrast, in our experiment outsiders have some proprietary information (although the outsiders have less information than the insider, the insider does not know exactly what information the outsiders have). The latter seems more realistic in a number of settings. In addition, it yields a number of different predictions from the standard model. Most important, the existence of an insider can raise sellers' expected revenue compared to a symmetric information structure (and does so for our design). In the standard model the existence of an insider unambiguously reduces expected revenue. Although failure to employ the "standard" model gave us fits in terms of solving for the Nash equilibrium, it led to several new theoretical insights that were satisfied in the data.

Chapter 8 shows the interaction between theory and experiments, exploring the possibility for revenue raising effects of better informed bidders first discovered in Chapter 7. Developing a manageable benchmark model for comparing revenue in common-value auctions with symmetrically informed bidders, compared to auctions where one bidder is better informed, this paper explores games in which the insider holds a double informational advantage as well as games in which the outsiders maintain some proprietary information. This paper connects the revenue raising effects of an insider to more general propositions regarding the revenue raising effects of increased bidder information found in Milgrom and Weber (1982).

Chapter 9 explores bidding in second-price, "shoe-box" auctions with both symmetric and asymmetric payoffs. In auctions with asymmetric payoffs one of the bidders has a private-value advantage. This might happen, for example, if the item up for auction is complementary to other holdings of one of the bidders. Auctions with asymmetries of this sort are quite common outside the lab. For example, in the recent FCC air-wave auctions it was well known that certain bidders wanted to complement existing holdings (Cramton, 1997). In both second-price and English auctions these

asymmetries are predicted to have an explosive effect on bidding, causing large reductions in the disadvantaged bidders bids and a large reduction in expected revenue compared to the symmetric payoff case. In the experiment, the effect of the asymmetry on bids and prices is proportional rather than explosive. Although advantaged bidders are close to making best responses to disadvantaged bidders, the latter bid much more aggressively than in equilibrium. The paper explores alternative explanations for this more aggressive bidding.

Chapters 10 and 11 explore learning and adjustment processes of inexperienced bidders. Large numbers of inexperienced bidders were recruited to participate in a series of sealed-bid auctions, with all subjects invited back for a second experimental session. All inexperienced subject sessions had reserve bidders. Several sessions had two groups bidding at once, so that if too many bankruptcies occurred the groups could be combined and the auctions continue holding the number of active bidders constant.

Chapter 10 explores adjustments over time in first price sealed-bid auctions. The data reveal (i) a market adjustment effect as the most aggressive bidders, and those going bankrupt, declined invitations to return more often than other bidders, and (ii) learning on the part of surviving bidders. The market adjustment effect, although quite pronounced in analyzing the data, was far from obvious at the time the experiment was conducted. Individual bidders are found to be responsive to their own losses (experiential learning), as well as to losses that would have occurred had they applied their bidding strategy to the high bidder's signal value (observational learning).

Chapter 11 briefly explores cross-game learning. Experience in first price auctions improves performance in English auctions as the injunction to bid more conservatively than naive expectation's warrant is well served in both auctions. In contrast, experience in English auctions has no transfer value

for first price auctions as the informational crutch bidders learn to employ in English auctions (other bidders drop out prices) is not present in the first price auctions.

One common criticism leveled at laboratory experiments is that the behavior of the typical experimental subject (college sophomores) is likely to be quite different from that of mature agents with field experience. Chapter 12 addresses this question directly by comparing performance of student subjects (“naive” bidders) with experienced executives from the commercial construction industry. The somewhat surprising answer is that behavior is essentially the same in our experimental design as both suffer from a severe winner’s curse. Chapter 13 goes on to try and understand why this is the case through a series of interviews with industry executives and study of industry data. The paper identifies essential differences between the field environment and the laboratory that account for the executives’ success in the field and a winner’s curse in the lab. These are (i) industry-specific mechanisms which enable contractors to escape the winner’s curse even when they bid too low, (ii) learned, industry-specific behaviors that enable experienced contractors to avoid the winner’s curse in the first place, and (iii) important private-value elements that underlie bidding in the field that were not present in the lab.

From the psychology literature on learning generalizability and expertise, it seems clear that it will typically *not* be the case that experienced professionals will perform any better in the lab than the typical student subject, unless the laboratory experiment is set up to *very* closely correspond to the field setting the executives are familiar with. The problems with transfer from the field to the lab are twofold. First, transfer of learning across environments is very difficult in general unless people have been specifically trained to make such transfers. Further, the more settings differ from each other, the less likely there is to be positive learning transfer (transfer of knowledge that is helpful in the new situation; see the references cited in footnote 7 in Chapter 1). Second, expertise tends to be context

specific, so that experts outside a familiar context tend to perform no better than non-experts. For example, in classic experiments involving chess pieces arranged as they might be in the course of an actual game, experts recalled the position of many more pieces than novices. This greater recall was not based on greater memory capacity but rather on the ability to organize groups of pieces into subpatterns which could then be recalled as a chunk (e.g., a castled king, a chain of pawns). As a result, when pieces were arranged on the board in random positions, experts were no longer able to recall the positions with any greater accuracy than the novices.¹ Economic experiments are usually aimed at studying basic principles of behavior. As such, they typically lack the specific contextual clues that trigger learned responses from field settings. Some flavor of these clues for the commercial construction industry are identified in Chapters 12 and 13.

¹See Glaser (1990) and Zeitz and Glaser (1994) for summaries of the many differences between experts and novices identified to date.