Bidding in Almost Common Value Auctions: An Experiment

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Abstract

An almost common value auction differs from a pure common value auction in that one bidder has a higher (private) value for the item than the other bidders. Even an epsilon private value advantage can, under a wide variety of circumstances, have an explosive effect on equilibrium outcomes in English auctions with the advantaged bidder always winning and sharp decreases in seller revenue. We examine these predictions experimentally for experienced bidders who have clearly learned to avoid the winner's curse in pure common value auctions. The explosive equilibrium fails to materialize. Rather, bidder behavior is better characterized by a behavioral model where the advantaged bidders simply adds their private value to their private information signal about the common value, and proceed to bid as if in a pure common value auction.

Keywords: Almost common value auction, English auction, Behavioral model, Experiment

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1. Introduction

In a pure common value auction, the value of the object for sale is the same to all the bidders, but is unknown. Instead, the bidders receive signals about the object's value which they use to form an estimate of the common value. In the symmetric risk neutral Nash equilibrium for this game the bidder with the highest estimate of the object's value wins the auction (Wilson, 1977; Milgrom, 1981).

An almost common value auction differs from a common value auction in the following way: One bidder, the *advantaged* bidder, values the object more than the *regular* bidders. That is, in addition to its common value, the advantaged bidder places an added (privatel) value on the item; e.g., in the regional air wave rights auctions Pacific Telephone was widely believed to place a higher value on the West Coast regional area than their potential rivals because of their familiarity with the region and their existing customer base (Klemperer, 1998). This private value, called the private value advantage, can have a significant impact on equilibrium outcomes in both second-price sealed-bid auctions and, more importantly, in ascending price (English) auctions.

Bikhchandani (1988) shows that when there are only two bidders, even an epsilon private value advantage has an explosive effect on the outcome in a second-price sealed-bid auction. The advantaged bidder always wins as regular bidders bid very passively due to the heightened adverse selection effect, and seller revenue decreases dramatically. Even in an auction with more than two bidders, the private value advantage may have a serious impact on the auction outcomes. In this regard, Klemperer (1998) raises concerns about the use of ascending price (English) auctions in cases where a private value advantage exists. First, a known advantage may cause other bidders to not participate in the auction, thus reducing competition and driving prices down. Second, ascending price auctions always reduce to just two bidders, the case in which the explosive effect occurs. Although these effects clearly do not exist in all ascending price auction environments, they do hold in a wide variety of settings.[1]

The present experiment compares bidding in a pure common value English auction with an almost common value English auction using a within subjects design. All subjects had previous experience with a series of first-price sealed bid auctions. As such, they had learned to overcome the worst effects of the winner's curse, earning positive average profits equal to a large share of the predicted profits. These same subjects also do well in the pure common value ascending price auctions, again earning a respectable share of predicted profits. However, when placed in an almost common value auction the explosive effect fails to materialize. Advantaged bidders win only 27% of the auctions (versus 25% predicted by chance factors alone) and there is no significant reduction in seller revenue compared to the pure common value auctions. A behavioral model where the advantaged bidders simply add their private value advantage to their information signal about the common value, and proceed to bid as if in a pure common value auction, better organizes the data than the explosive equilibrium.

Two previous experimental studies have investigated the explosive effect predicted under the Bikhchandani (1988) and Klemperer (1998) models. Avery and Kagel (1997) look for it in a two person, second-price sealed bid "wallet auction." They failed to find an explosive effect. Rose and Levin (2004) extended the analysis to two person English clock auctions, since the clock auctions are known to

[1] See Levin and Kagel (2005) for an example of an auction environment in which the explosive effect is not present in an ascending price auction.

yield outcomes closer to equilibrium than second-price sealed bid auctions. They too failed to find an explosive effect. In both cases, however, bidders were subject to a winner's curse in the corresponding pure common value auctions. Thus, these failures to find an explosive effect could be attributed to the bidders lack of experience and the fact that they still suffered from a clear winner's curse, in which case the initial conditions that the Nash bidding model requires to get an explosive effect are clearly not satisfied.[2]

Our experiment differs from these earlier experiments in two ways. First, we use subjects with previous common value auction experience who have clearly learned to overcome the worst effects of the winner's curse. Second, in using an auction with four bidders, we can directly address Klemperer's concerns regarding the use of ascending auctions on bidders reluctance to enter the bidding process in the first place.

This paper is organized as follows: Section 2 presents the theoretical background. The experimental procedures and subjects prior experience are discussed in Section 3. Section 4 gives the results and Section 5 concludes.

2. Theoretical Considerations

2.1. Pure Common Value Auctions

Our experimental design uses an irrevocable exit English "clock" auction with the true value V^* drawn from a uniform distribution over $[\underline{V}, \overline{V}]$. The private signals x_i are drawn iid from a uniform distribution over $[V^* - \epsilon, V^* + \epsilon]$. Levin, Kagel and Richard (1996) derive the risk neutral Nash equilibrium (RNNE) for

[2] Part of the problem here might be the nature of the wallet auction itself which requires bidders to bid above their signal values, something most bidders are reluctant to do.

this design. Here, we summarize their results, tailored to our four bidder model.

Bidders remain active in the auction until the price reaches the point at which they are indifferent between winning the object and paying that price or losing the object. We refer to this price as their reservation price. Bidders determine their reservation prices using their own private signals and the information released during the auction through the drop-out prices of other bidders. We order the private signals from lowest to highest and denote them as $x_1 < x_2 < x_3 < x_4$. Let $d_1 < d_2 < d_3$ denote the sequential drop out prices. (Note that the auction ends when only one active bidder remains. Thus, there are only three drop out prices in a four bidder auction.) Let I_1 denote the information released to the remaining active bidders when the first drop out occurs. I_2 denotes the information released after the second drop out occurs. No new information is released when the third bidder drops out as the auction ends.

In the symmetric RNNE the low signal holder drops out of the auction at his private signal value. He assumes that all the other bidders have the same private signal that he holds. If everyone else drops at his private signal, the low bidder is indifferent between losing the object and winning the object and paying his signal value. Why doesn't the low signal holder stay active in the auction longer since more information is revealed as the auction continues? Given a uniform distribution, if the low signal holder stays active in the auction past his signal value and wins, then the expected value of the item conditional on winning is the average of his signal and the highest drop out price ($E(V^*) = \frac{d_3+x_1}{2} < d_3$), which is less than the price he must pay. The low signal holder can gain information by staying active in the auction, but the information comes too late to be of use and the low signal holder can expect to lose money if he wins.

Now, let $\gamma_1(x, I_1)$ be the reservation price of a bidder with private signal x who remains active after the first drop out, and $\gamma_2(x, I_2)$ be the reservation price of an active bidder after the second drop out occurs. Then

$$\gamma_i(x, I_i) = E(V^*|\lambda_i(x, Ii)) \text{ for } \; i = 1, 2$$

where $\lambda_1(x, I_1)$ denotes the event that $x_i = x$ for all remaining i, $i = \{2, 3, 4\}$ and $\lambda_2(x, I_2)$ denotes the event that $x_i = x$ for all i, $i = \{3, 4\}$ remaining after the second drop occurs. That is, the bidders assume that all the remaining bidders have the same private signal that they do and $d_i = \gamma_j(x, I_j)$, for $j = \{1, 2, \}$ and $i = \{2, 3, 4\}$

In what follows we focus on the signals falling in the range $\underline{V} + \epsilon < x_1 < x_j < \overline{V} - \epsilon$ (called Region 2). Given the uniform distribution of signal values around V^* , conditional on having the high signal value $(x_1 + x_i)/2$ provides a sufficient statistic for V^*, so that bidders determine their reservation prices based on their own signals and the first drop out price; i.e., they ignore the information contained in the additional drop out prices.[3] So that:

$$d_i = \frac{x_1 + x_i}{2} \text{ for } i = \{2, 3, 4\}$$

The high bidder's expected profit for the pure common value English auction is

$$E(\pi) = \frac{\epsilon}{n+1} - [\frac{4\epsilon^2}{\overline{V} - \underline{V}}][\frac{1}{(n+1)(n+2)}]$$

[3] See Appendix A of Levin, Kagel, and Richard (1996) for a more complete derivation of the equilibrium using uniform distributions. See Milgrom and Weber (1982) for a discussion of the general solution.

2.2. Almost Common Value Auctions

The almost common value auctions are exactly the same as the pure common value auctions with the exception that the value of the item to one bidder, the advantaged bidder, is $V_A = V^* + k$ where $k > 0$. The value to the three remaining (regular) bidders is $V_R = V^*$. As in the pure common value auctions, bidders remain active in the auction until the price reaches the point at which they are indifferent between winning the object and paying that price or losing object. Let $d_1 < d_2 < d_3$ denote the sequential drop out prices and assume that all signals are within region 2.

Proposition 1 *In the explosive symmetric equilibria of the almost common value auction, the advantaged bidder wins the auction with probability one.*

The advantaged bidder remains active in the auction until the price reaches

$$B_A(x; d_j) \geq \quad x + \epsilon \quad j = 0, 1, 2, 3 \tag{1}$$

the regular bidders remain active in the auction until the price reaches

$$B_R^i(x, d_j) \leq \quad x - \epsilon \quad j = 0, 1, 2, 3; i = 1, 2, 3 \tag{2}$$

where d_j represents the drop out prices.

Proof. Note, since the reasoning here does not depend on the drop out prices, we simplify the notation to $B_A(x)$ and $B_R^i(x)$. First, we show that $B_R^i(x)$ is a best response given $\{B_A(x), B_R^{-i}(x)\}$. Suppose that regular bidder i remains active until the price reaches $B(x) > B_A(x)$. Given that the advantaged bidder remains active until the price at least reaches $x + \epsilon$, and that the signal x is always within ϵ

of the true value V^*, such a bid would insure that the regular bidder loses money. Therefore, the regular bidder would prefer to drop out of the auction earlier and lose the item. Any bid that insures losing is an optimal response; bidding $B^i_R(x)$ is one such bid.

Next, we show that given $B^i_R(x)$, $B_A(x)$ is optimal. Suppose the advantaged bidder remains active in the auction until the prices reaches $B(x) < B^i_R(x) = x - \epsilon$. The signal x is never more than ϵ away from the true value V^*, thus the regular players' bids of $B^i_R(x) \leq V^*$. Since the value to the advantaged player is $V_A = V^* + k$, the advantaged bidder would prefer to remain active longer and win the auction. Given B^i_R, any bid that wins is an optimal bid, raising the bid further does not matter, and since $V^* \leq x + \epsilon$, bidding $B_A(x)$ is one such bid. ■

To show that revenue declines in the almost common value auctions, we compare the expected profit of the advantaged bidder to the expected profit of the high bidder in the pure common value auction. The advantaged bidder wins the auction with probability one (earning $V^* + k$) and pays the bid of the highest signal holder among the three regular bidders. For signals falling in Region 2 ($\underline{V} + \epsilon < x_1 < x_j < \overline{V} - \epsilon$), the advantaged bidder's expected profit is

$$E_A(\pi) \geq E(V^*) + k - (E((x_{R,h}|V^*) - \epsilon) \tag{3}$$

where $x_{R,h}$ is the highest signal among the regular bidders. Since the private signals are drawn from a uniform distribution over $[V^* - \epsilon, V^* + \epsilon]$ we have

$$E_A(\pi) \geq E(V^*) + k - (E(\frac{3}{4}2\epsilon + V^* - \epsilon) - \epsilon) \tag{4}$$

After simplifying, the expected profit of the advantaged bidder is

$$E_A(\pi) \geq k + \frac{1}{2}\epsilon \tag{5}$$

For the parameters used in our design ($n = 4$, $\epsilon = \$12$, $[\underline{V}, \overline{V}] = [\$50, \$350]$, and $k = \$2$), average profit per auction in the almost common value auction should, at a minimum, be almost three times larger than in the pure common value auctions (\$8.00 versus \$2.35), with seller revenue \$3.65 less than in the pure common value auctions.

An explosive equilibrium generates two hypotheses for the effect of the private value advantage: (1) The advantaged bidder should win all the auctions, and (2) average bidder profits should be substantially higher, and seller revenue substantially lower, than in the pure common value auctions.

3. Experimental Design

3.1. General Design

In the experiment $[\underline{V}, \overline{V}] = [\$50, \$350]$, $\epsilon = \$12$ and $k = \$2$. The distribution of V^*, the value of ϵ, the number of bidders in the auction, and the size of k were all common knowledge, as this information was included in the instructions which were read aloud at the beginning of the session. At the beginning of each auction, subjects were randomly matched into groups of four. In the almost common value auctions one bidder, chosen at random, was designated to be the advantaged bidder.[4] It was common knowledge that there was a single advantaged

[4] We randomly determined the advantaged bidder since the equilibrium predicts passive bidding (and zero profits) for the regular bidders. Switching bidder roles in this way has been employed before in common value auctions with insider information (Kagel and Levin, 1999). It is commonly assumed that switching roles speeds up the learning process as regular bidders get to see the problem from the point of view of the advantaged bidder and vice versa.

bidder present in each auction, and bidders always knew their own status, as an advantaged or regular bidder.

In each auction period a new V^* and a new set of private signals, x_i were drawn. Each bidder's private signal was displayed on his or her computer screen along with the range of possible values for V^* based on x_i. After a pause to allow bidders to review the information, the clock flashed red three times and began counting up in increments of $1.00.

Bidders were considered to be actively bidding until they pressed a key to drop out of the auction. Once they dropped out, they could not re-enter the auction. When a bidder dropped out of the auction, the clock paused and the drop out price was displayed on the screens of the remaining bidders. At the end of the pause, the clock resumed counting upwards, this time in increments of $0.50. This process repeated for the second dropout, but with price increments of $0.25 following the pause. When the third dropout occurred, the auction ended and the signals were revealed next to each bidder's drop-out price. The winning bidder's signal was also displayed with the drop-out price shown as XXX. In the almost common value auctions, the value of k (0 or $2.00) was also revealed next to the signals after the auction ended. In addition, V^*, the price paid, and the winning bidder's profit or loss was calculated and displayed to all the bidders in the relevant auction market.

Bidders were given time to review this information before the next auction. When the new information for the next auction was posted, the results of the last auction were moved to the history section. A bidder could always see the results of his last three auctions, with the most recent at the top of the screen. Earlier auctions could be reviewed by using a scroll bar.[5]

3.2. Experimental Procedures

Bidders were given a $15.00 starting capital balance (which included their $6.00 show up fee) to allow for experimentation and protect against bankruptcy. Profits and losses earned during the session were added or subtracted from this balance. They were paid their end of the session balances in cash. Payments varied from a low of $25.10 to a high of $86.25 with an average payment of $46.74. No one went bankrupt.

The experiment began with two practice, pure common value English auctions to familiarize subjects with the auction procedures. Subjects were encouraged to ask questions both during the instructions and the two practice rounds. Then 15 pure common value English auctions were played for cash. At the end of these auctions, a brief set of instructions were read out loud describing the almost common value auction structure, followed by 15 almost common value English auctions played for cash.

There were a total of twenty-eight subjects in the experiment, so that seven four-bidder auctions were conducted simultaneously throughout. All the subjects had participated in two prior four-bidder first-price sealed-bid auction sessions with the same underlying structure.[6]

We chose to use experienced bidders because past experiments have shown that inexperienced bidders in first-price sealed-bid and ascending price clock auctions

[5] Instructions employed in the experiment are posted on the web site http://www.econ.ohio-state.edu/kagel/almost_CV.pdf

[6] The only difference was the support for V^* which was $[50, 950]$ in the first-price auctions. The reason for the change is that since the price clock needed to start at 50, it would have taken an inordinately long period of time for each auction had the same support been used.

fall prey to the winner's curse[7]. That is, they tend to overbid and earn negative average profits with considerable numbers of bankruptcies as a consequence. In contrast, experienced bidders (even those who have participated in just one experimental session) typically have learned to overcome the worst effects of the winner's curse. In using twice experienced bidders any failure to observe an explosive effect in the almost common value auctions can not be attributed to unfamiliarity with common value auctions or to a gross winner's curse.

In the experiment the clock speed was 0.25 seconds per tick. That is, the clock increased by $1.00 per quarter second prior to the first drop out and by $0.50 per quarter second after the second drop out etc. The pause after every drop out was 3 seconds[8].

4. Results

The analysis focuses on the last 10 auctions for each treatment, thereby dropping periods during which subjects were adjusting to the clock format and the change in treatment between pure and almost common value auctions.[9] Further, the analysis is limited to draws in the interval $(\underline{V} + \epsilon < x_i < \overline{V} - \epsilon)$ for which there is little or no end-point information regarding V^* to impact on bidding. This yields a total of 60 pure common value English auctions, 63 almost common value auctions and 50 first-price sealed-bid auctions.

Performance measures for the last 10 first-price sealed-bid auctions from the experienced subject sessions are shown in Table 1. The high signal holder won 94%

[7] See Kagel and Levin (2002) for a review of the literature.

[8] Drop outs occurring during the pause were counted as dropping out at the same price, but as dropping later than the initial drop out. If additional bidders dropped out during the pause, the pause was extended for another 3 seconds.

[9] The qualitative results are robust to including the first 5 auctions for both treatments.

of the auctions, indicating a high degree of symmetry in bidding. Predicted profits under the RNNE based on the random draws used in the experiment averaged \$4.84 per auction compared to average actual profits of \$3.18 per auction, 65% of the predicted profit. Although this is a statistically significant shortfall compared to predicted profits, the results are quite comparable to those found in first-price common value auctions with even more experienced bidders (see, for example, Kagel and Richard, 2001). Thus, we conclude that subjects in our experiment had overcome the worst effects of the winner's curse and were earning a respectable share of profits predicted under the RNNE in the first-price auctions.

Table 2 reports the results for the pure common value English auctions. Average actual profits are positive, averaging \$3.45 per auction. This is significantly higher than the profits predicted under the RNNE (\$2.42 per auction).[10] The proximate cause for this is that on average the first drop-out in each auction occurred *before* the predicted dropout (\$3.63 below x_1 on average), and there was inadequate adjustment to this fact on the part of the remaining bidders.[11] To account for this we also compute predicted profits assuming that higher signal

[10] The statistical analysis employed here might be objected to on the grounds that since we have a single session, even with subjects being randomly rematched following each auction, we have "only a single observation." Such a claim essentially asserts that whatever session level effects might be present in experiments of this sort *totally* dominate how subjects bid (see Frechette, 2005). There is no empirical basis for such a claim. In this respect, it is worthwhile noting that tests for session level effects in a series of first-price sealed-bid common value auctions using the same procedures as those employed here report essentially *no evidence* for such neighborhood effects (Ham, Kagel, and Tao, 2005). Further, statistical tests designed to distinguish whether individual subject bidding errors within a given English clock auction are better modeled as totally independent or totally dependent across rounds (drop-outs) come out in favor of the *former* assumption (Levin, Kagel, and Richard, 1996).

[11] Bikhchandani and Riley (1991) note that reservation prices for other than the two highest signal holders in the pure common value English auction are not unique. That is, there exist symmetric RNNE in which the low signal holder and the second lowest signal holder are indifferent between dropping out as described in the text or at lower prices. However, the expected profit calculated in Table 2 remains the same in their model as higher signal holders are predicted to adjust to these lower dropouts.

holders employ the actual low-drop out price, averaging it with their own signal to determine when to drop out, just as in the equilibrium characterized in Section 2.1, but without any adjustment for the fact that lower signal holders were persistently dropping out too soon. Profits predicted under this model are referred to as Nash_2 in what follows. As shown in Table 2, bidders are earning profits that are marginally lower than those predicted under the Nash_2 model.[12] Finally, note that only 63.3% of the auctions are won by the high signal holder, which is surprisingly low, particularly given the high percentage won by high signal holders in the first-price sealed bid auctions. However, Monte Carlo simulations assuming the existence of stochastic bidding errors, in conjunction with independent error draws between successive rounds of each auction, can readily account for this low percentage (see Levin, Kagel and Richard, 1996). Given that the actual profits earned are *higher* than those predicted under the symmetric RNNE, but below those predicted under Nash_2, we conclude that subjects have overcome the worst effects of the winner's curse in the pure common value English auctions, albeit with inadequate adjustment to the fact that, on average, the first dropout consistently occurred several dollars below the low signal value.

The performance of the bidders in the almost common value auctions is summarized in Table 3. The explosive Nash equilibrium predicts that the advantaged bidders will win all of the auctions, regardless of whether or not they are the high signal holder. However, advantaged bidders won only 27.0% of the auctions, little more than one would expect based on chance factors alone (25.0%). By contrast,

[12] Profits were also calculated under a variant of the Nash_2 model that permits bidders to be a bit more sophisticated. Bidders know that all signals must be within 2ϵ of each other, so that they should ignore a drop price that is too far from their own signal (i.e. a drop price that is less than $x - 2\epsilon$.) Predicted profits using this alternative measure are indistinguishable from the Nash_2 predictions.

bidders with the high private information signals won 62.0% of the auctions, which is not significantly different from the 63.3% frequency in the pure common value English auctions (Z < 1.0). The net result is no significant differences in seller revenue between the pure common value and almost common value auctions: average seller revenue was \$0.87 *lower* in the pure common value auctions (t < 1.0). Finally average profit per auction was \$3.12, well below predicted profits of \$7.30 under the explosive equilibrium (t = -6.71, p < 0.01).[13]

The differences between the predicted outcomes under the explosive equilibrium and the actual outcomes can be attributed to both advantaged and regular bidders not playing their part of the predicted equilibrium. What would have happened if advantaged bidders had stepped up to play their part of the equilibrium and bid $x_i + \epsilon$? Would this have resulted in lower or higher profits than actually achieved *given how regular bidders were actually bidding*? In this case advantaged bidders would have earned an average of \$2.61 per auction, compared to the \$1.63 per auction actually earned.[14] Thus, the advantaged bidders failed to take advantage of relatively profitable unilateral deviations in the direction of the explosive equilibrium. We return to the issue of why the explosive equilibrium did not emerge in the concluding section of the paper.

The data in Table 3 show that subjects were clearly not following the explosive Nash equilibrium. In what follows we construct a behavioral model that takes significant steps towards organizing their behavior. We start by assuming that advantaged bidders are simply adding their private value advantage to their signals,

[13] Predicted profits are based on the actual sample of draws here.

[14] Bidding $x_i + \epsilon$ advantaged bidders would have won 60 of the 63 auctions. Note, in these calculations we take the bids of regular bidders as given. To account for the censoring of winning bids by regular bidders, we employ the bid predicted under the second variation of the behavioral model developed below.

and proceeding to play according to the equilibrium outlined in Section 2.1; i.e., as if they were in a pure common value English clock auction but with a signal value equal to $x_i + k$. We look at two variations of this model: (i) in which we assume that the bidder with the lowest signal value drops out at that value (called MPureCV - mistaken pure common value) and (ii) in which bidders use the observed first drop-out price to average with their own signal value in determining when to drop out (MPureCV$_2$). Note that the private value advantage k is simply added to the signal of an advantaged bidder, *before* averaging their signal value with the first drop-out price, but the k is added on to whatever the common value component of the profits are when they win. The results are shown in Table 4.

Average predicted profits are $2.28 and $3.85 per auction under the MPureCV and MPureCV$_2$ models, respectively. Average actual profits are not significantly different from either of these predictions. Both models predict that advantaged bidders will win 33.3% of the auctions compared to the 27% actually won. Further, advantaged bidders won 12 of the 21, or 57% of the auctions they were predicted to win under both models. While far from perfect, this is a substantially better "hit rate" than the explosive bidding model. Finally, advantaged bidders were the low signal holder 12 times (after adding in their private value advantage) and were the low bidder in 11 of these auctions.[15] Thus, we conclude that bidding in the almost common value auctions is (i) not explosive and (ii) better organized by a model in which advantaged bidders simply add their private value advantage to their signal value and proceed to bid as if in a pure common value auction, with

[15] The average drop point of low bidders, relative to the low signal (plus the private value advantage when relevant), was statistically indistinguishable from the average in the pure common value auctions: $2.83 below in the almost common value auctions versus $3.63 in the pure common value auctions ($t < 1.0$). Further, there are no significant differences in the average drop point relative to their signal value (after adding in the private value advantage) for advantaged and regular low bidders - $2.41 versus $2.92 ($t < 1.0$).

regular bidders behaving the same as in the pure common value auctions.

5. Summary and Conclusions

In an experiment employing experienced subjects who were familiar with common value auctions, and had already overcome the worst effects of the winner's curse, we find no evidence of the explosive effect of a private value advantage in an English clock auction. Advantaged bidders won only 27% of the auctions, little better than the 25% predicted by chance factors alone, with no significant change in average revenue compared to a series of pure common value English auctions. Further, bidders are better modeled as simply adding their private value advantage to their signal of the common value and proceeding to play as if in a pure common value auction, rather than seeking to win all the auctions as the explosive Nash equilibrium predicts.

Why do bidders perform reasonably close to the predicted Nash equilibrium in the first-price common value auctions and in the pure common value English auctions but fail to come anywhere close to the explosive Nash equilibrium in the almost common value auctions? One explanation that comes immediately to mind is that the adjustments to the winner's curse in both the sealed bid and English auctions represents a hot stove type learning - adjusting to the adverse selection effect without really understanding it. There is clear evidence to this effect from past experiments: Kagel and Levin (1986) show that moderately experienced bidders earning a respectable share of predicted profits in first-price sealed bid auctions with four bidders *increase* their bids in auctions with six or seven bidders, thereby succumbing once again to the winner's curse. Levin, Kagel and Richard (1996) show that the close conformity to the symmetric RNNE found in pure common value English auctions can be explained by a simple signal averaging hypothesis that does *not* require that bidder's recognize the adverse selection effect inherent in winning the auction. As such the initial conditions that the theory specifies as generating the explosive effect are absent – bidders being fully aware of the adverse selection effect inherent in winning the auction and that this will be exacerbated in the presence of a bidder with a private value advantage.

However, the mechanism specified in the theory for producing the explosive effect is not the only means to achieving it. For example, suppose that advantaged bidders are simply emboldened to bid more aggressively because of their private value advantage. Then in those cases where regular bidders become aggressive enough to beat them they are very likely to suffer losses, so that they bid more passively in later auctions, which further emboldens the advantaged bidders. Why didn't something like this happen here? We, of course, do not know why, but the fact remains that it did not happen even though such a deviation would have been profitable for advantaged bidders even if the regular bidders did not respond with very passive bidding.

What, if anything, does all of this have to say about behavior outside the lab? Here we are speculating, but with some insight. First, it's clear that a helpful condition for producing the explosive effect of a private value advantage is that both the advantaged and regular bidders understand the process. To do this it would seem helpful for bidders holding the private value advantage to announce to their rivals that they intend to top their opponents bids. This is in fact what PacTel did in the FCC major trading areas (MTAs) broadband personal communications services licenses for the Los Angeles and San Francisco licenses

(Cramton, 1997).[16] Second, it would seem that the advantaged bidder would have to have the resources and a sufficiently large private value advantage to make such an announcement credible. As such we seriously doubt the theory's prediction that even a small private value advantage would set off the explosive effect, even among sophisticated bidders.[17]

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[16] Bidders in our laboratory experiment obviously had no opportunity to make such announcements. These announcements, which would typically have a reputational element to them, are absent in the formal theory as well.

[17] There may also be some incentive under these circumstances in field settings for predatory bidding on the part of rivals (see, for example, Cramton, 1997 for discussion of the rich array of strategic options that were available for regular bidders in the FCC spectrum auctions). This would work against the revenue reducing forces implied by the explosive effect and indeed seems to have been at play in the MTA broadband sales.

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Table 1. First Price Auctions (standard error of the mean in parentheses).

Percentage of Auctions Won by High Signal Holder	Predicted Profits	Actual Profits	Predicted minus Actual Profits
94.0% (3.39)	\$4.84 (0.62)	\$3.18 (0.72)	\$1.67** (0.38)

** Significantly different from 0 at the 5% level (two-tailed t-test).

Table 2. Pure Common Value English Auctions (standard error of the mean in parentheses).

Percentage of Auctions Won by High Signal Holder	Predicted Profits		Actual Profits	Predicted minus Actual Profits	
	Nash	$Nash_2$		Nash	$Nash_2$
63.3% (6.27)	\$2.42 (0.52)	\$4.30 (0.58)	\$3.45 (0.64)	-\$1.03** (0.45)	\$0.85* (0.45)

* Significantly different from 0 at the 10% level (two-tailed t-test).
** Significantly different from 0 at the 5% level (two-tailed t-test).
$Nash_2$ – predicted profits assuming that higher signal holders employ the actual low-drop out price without adjustment.

Table 3. Bidding in Almost Common Value Auctions (standard error of the mean in parentheses).

Percentage Won by High Signal Holder	Percentage Won by Advantaged Bidders	Predicted Profit: Advantaged Bidders	Actual Profit	Difference from Predicted Profit
62.0% (6.17)	27.0% (5.64)	\$7.30 (0.54)	\$3.12 (0.66)	\$4.18** (0.62)

** Significantly different from 0 at the 5% level (two-tailed t-test).

Table 4. Predictions of Behavioral Bidding Model for Almost Common Value Auctions (standard error of the mean in parentheses).

Percentage of Auctions Advantaged Bidders Wins	Predicted Profits		Predicted minus Actual Profits		Predicted minus Actual Wins
	MPureCV	$MPureCV_2$	MPureCV	$MPureCV_2$	
33.3% (5.99)	\$2.28 (0.44)	\$3.47 (0.90)	-\$0.84 (0.53)	\$0.73 (0.48)	6.35% (5.93)

MPureCV – Mistaken pure common value model in which the advantaged bidders simply add their private value advantage to their private information signal.
$MPureCV_2$ – same as MPureCV but assuming that higher signal holders employ the actual low-drop out price without adjustment.