

**Online Appendix to “Ascending Prices and Package Bidding:  
A Theoretical and Experimental Analysis”** J. H. Kagel, Y. Lien, and P.  
Milgrom.

This online appendix reports details of two results referenced in the paper: (1) Detailed breakdown of bid patterns in Hard versus Easy CCA auctions and (2) the impact of a small change in the defaults rule for bids in the SAA auctions.

*Bid Patterns in Hard versus Easy CCA auctions:* Table A1 below reports bids using the same format as Table 2 in the text only broken down into the Hard versus Easy classification of CCA bids resulting from the simulations.

Tests for differences in number of items bid on and distribution of bids between Easy versus Hard cases were conducted using the Wilcoxon signed rank test using individual bidder average values over rounds (number of bids, percentage of bids on highest value package, etc) as the unit of observation. We are unable to reject a null hypothesis of no difference at the two-tailed 5% level in any of the cells. Note that this test could not be performed for number of items bid on in rounds greater than 15 for global bidders in the CCA4 auctions and regional bidders in the CCA6 auctions as we did not have sufficient numbers of observations for the same subject in both Easy and Hard cases.

**Table A1**  
**Percentage of Profitable Packages Bid on in CCA Auctions (Easy vs Hard)<sup>a</sup>**

Easy	Global Bidders			Regional Bidders <sup>b</sup>		
		Distribution of Bids <sup>d</sup>			Distribution of Bids <sup>d</sup>	
CCA 4 Auctions	Average Number Bids <sup>c</sup>	Most Profitable	2 <sup>nd</sup> Most Profitable	Average Number Bids <sup>c</sup>	Most Profitable	2 <sup>nd</sup> Most Profitable
Rounds 1-5	4.4 (13.8)	81.7%	42.5%	1.5 (2.9)	89.8%	40.9%
Rounds 6-10	1.6 (6.8)	82.2%	17.8%	1.2 (2.5)	85.8%	33.4%
Rounds 11-15	1.5 (3.9)	82.4%	21.9%	1.2 (2.3)	84.2%	33.0%
Rounds >15	1.0 (3.4)	92.9%	7.1%	1.1 (2.1)	87.9%	19.0%
CCA 6 Auctions						
Rounds 1-5	12.3 (60.4)	73.7%	53.9%	3.1 (6.9)	81.1%	52.6%
Rounds 6-10	2.5 (33.3)	77.5%	36.4%	2.0 (5.6)	79.5%	43.1%
Rounds 11-15	1.6 (12.5)	85.6%	21.2%	1.5 (4.1)	79.6%	33.8%
Rounds >15	1.0 (4.4)	91.7%	0.0%	1.5 (4.8)	100.0%	29.2%

Hard	Global Bidders			Regional Bidders <sup>b</sup>		
		Distribution of Bids <sup>d</sup>			Distribution of Bids <sup>d</sup>	
CCA 4 Auctions	Average Number Bids <sup>c</sup>	Most Profitable	2 <sup>nd</sup> Most Profitable	Average Number Bids <sup>c</sup>	Most Profitable	2 <sup>nd</sup> Most Profitable
Rounds 1-5	3.3 (13.7)	71.3%	45.3%	1.5 (2.7)	92.3%	48.1%
Rounds 6-10	1.6 (8.0)	81.1%	15.3%	1.2 (2.2)	83.6%	37.2%
Rounds 11-15	1.2 (4.6)	91.0%	16.7%	1.1 (1.9)	90.6%	20.0%
Rounds >15	1.4 (4.0)	80.0%	20.0%	1.0 (1.5)	90.1%	12.2%
CCA 6 Auctions						
Rounds 1-5	10.6 (60.5)	84.4%	57.0%	3.1 (6.7)	81.0%	56.7%
Rounds 6-10	2.7 (37.9)	68.6%	28.6%	1.8 (5.3)	76.0%	48.0%
Rounds 11-15	2.4 (13.9)	84.9%	31.3%	1.5 (3.6)	77.6%	46.6%
Rounds >15	1.4 (7.7)	85.2%	18.5%	1.2 (2.7)	91.2%	25.5%

<sup>a</sup> Only rounds in which a bidder is not a provisional winner, profitable bids are available, and a bid is submitted are considered in calculations.

<sup>b</sup> Only includes packages where all items had positive value for regional bidders.

<sup>c</sup> In parenthesis are average number of profitable packages available to bid on.

<sup>d</sup> Percentages add up to more than 100% as subjects bid on the most profitable package as well as the second most profitable package.

*SAA Auction Defaults:* Our initial set of SAA4 auctions required that bidders be proactive in each round to maintain their eligibility. That is, if no bid was made, the *default* bid was zero demand for all items. The result of the default bid was to drop that bidder from the auction. In looking at the data, we identified a number of cases where bidders reduced their eligibility, or dropped out of the auction completely, well before prices reached their standalone values. To the extent that such behavior is confined to bidders with low potential profits, it would be predicted to reduce revenues but have little effect on efficiency. To the extent that it extends even to bidders with high potential profits, it could also reduce efficiency.

We conjectured that this pattern of bidding might be attributed to the complexity of the auction and the relatively short time bidders had to place a bid, combined with the default rule for maintaining eligibility. To test this and possibly correct the problem, we modified the auction procedures by changing the default. In the revised auction, the initial default bid was a bid for all items and the default bid in any round after the first was the bid placed in the previous period. In addition, bidders were notified when a new bid would reduce their eligibility and were required to confirm such a bid. These results are summarized below, with SAA4<sub>0</sub> denoting the auctions with the original default rule and SAA4<sub>1</sub> denoting the auctions with the revised default rule.

1. The change in the default bid had minimal impact on efficiency, with no significant differences in average efficiency between the SAA4 auctions where the default bid was zero on all items (SAA4<sub>0</sub>) and the SAA4 auctions where the default bid was the bid in the previous round (SAA4<sub>1</sub>). Efficiency was 86.2% (2.0%) for the SAA4<sub>0</sub> auctions versus 87.2% (2.0%) for the SAA4<sub>1</sub> auctions ( $p > 0.10$ ) (with standard errors of the mean in parentheses).
2. Average auction revenue was substantially lower in the SAA4<sub>0</sub> auctions compared to the SAA4<sub>1</sub> auctions: 86.2% (1.5%) of minimum revenue in the core compared to 100.3% (2.1%) ( $p < 0.01$ ).
3. Total profits were substantially higher in the SAA4<sub>0</sub> auctions, averaging 21.3% (2.2%) of total value at the efficient allocation versus 10.5% (2.8%) for the SAA4<sub>1</sub> auctions ( $p < 0.01$ ).

Based on these results, we chose to use the SAA4<sub>1</sub> data for our analysis.