## A. Online Supplemental Material

### A.1. Proofs

**Proof of Proposition 1.** First notice that the first-unit bid (i.e., the highest bid by a player) does not affect the auction price, and that increasing the second-unit bid without changing the auction allocation only increases the auction price and reduces players' profit. Therefore, a player may only have an incentive to deviate from the equilibrium described if this allows him to win two units — i.e., the speculator may only have an incentive to deviate by bidding more than $v_B$ for both units and the bidder may only have an incentive to deviate by bidding more than 50 for both units.

If the speculator bids any price higher than $v_B$ for both units, he wins two units at per-unit price $v_B$ but, because he cannot resell them at a price higher than the bidder's valuation, he obtains at most zero profit. If the bidder bids any price higher than 50 for both units, he wins two units at per-unit price 50 but obtains a profit that is lower than the equilibrium profit because

$$2v_B - r > 2\,(v_B - 50) \quad \Leftrightarrow \quad r < 100,$$

which is always true since the resale price cannot be higher than the highest possible bidder's valuation. Hence, neither the bidder nor the speculator have any incentive to deviate from the equilibrium described. ■

**Proof of Proposition 2.** The speculator may have an incentive to deviate from the equilibrium described only if this allows him to win a unit. If the speculator bids a price higher than $v_B$ for any unit, he wins a unit at price $v_B$ but, because he cannot resell it at a price higher than the bidder's valuation, he obtains at most zero profit. Of course, since the bidder wins both units at price 0 and obtains the highest possible profit, he has no incentive to deviate. ■

**Proof of Proposition 3.** We show that no player has an incentive to deviate from the strategies described. First, consider the speculator who bids 100 for both units and wins both units at price $\mathbb{E}\,[r]$ in the auction. By changing his strategy, he could only reduce the number of units he wins in the auction, without affecting the auction price.

Second, consider the speculator who bids $\mathbb{E}\,[r]$ for both units and wins no unit in the auction. In order to win a unit, he has to outbid the other speculator and raise the auction price up to 100. This would result in negative profit since he cannot resell a unit at a price that is higher than the highest possible bidder's valuation. Third, consider the bidder who wins no unit in the auction and acquires them in the resale market at price $r$. In order to win a unit in the auction, he has to outbid the speculators and raise the auction price up to 100. Since this is higher than $r$, by winning two units the bidder reduces his profit. ■

**Proof of Proposition 4.** We show that no player has an incentive to deviate from the strategies described. The bidder may have an incentive to deviate only if this allows him to win a unit. If the bidder bids a price higher than 100 for any unit, he wins a unit at price 100. In this case, however, he pays a price higher than his valuation and obtains negative profit.

Now consider the speculators. First notice that the first-unit bid by a speculator does not affect the auction price, and that increasing the second-unit bid without changing the auction allocation only increases the auction price. Therefore, a speculator may only have an incentive to deviate from the equilibrium described if this allows him to win two units. If the speculator bids a price higher than 100 for both units, he wins two units at per-unit price 100 but, because he cannot resell them at a price higher than the bidder's valuation, he obtains negative profit. ■

**Proof of Proposition 5.** A speculator may have an incentive to deviate from the equilibrium described only if this allows him to win a unit. If a speculator bids any price higher than $v_B$ for any unit, he wins a unit at price $v_B$ but, because he cannot resell it at a price higher than the bidder's valuation, he obtains at most zero profit. Of course, since the bidder wins both units at price 0 and obtains the highest possible profit, he has no incentive to deviate. ■

### A.2. Additional Analysis

The following figures and tables compare observed bidding behavior and outcomes to those arising with zero-intelligence players (similar to ZI-C bidders in Gode and Sunder, 1993). Zero-intelligence bidders bid randomly between 0 and $v_B$ for both units, while zero-intelligence speculators bid randomly between 0 and 100 for both units. For both players, the random bids for the two units are subsequently ranked into the highest bid (bid 1) and slowest (bid 2). In all simulations, speculators are assumed to enter into the auctions (so in the 2SE treatment there are always three auction participants).

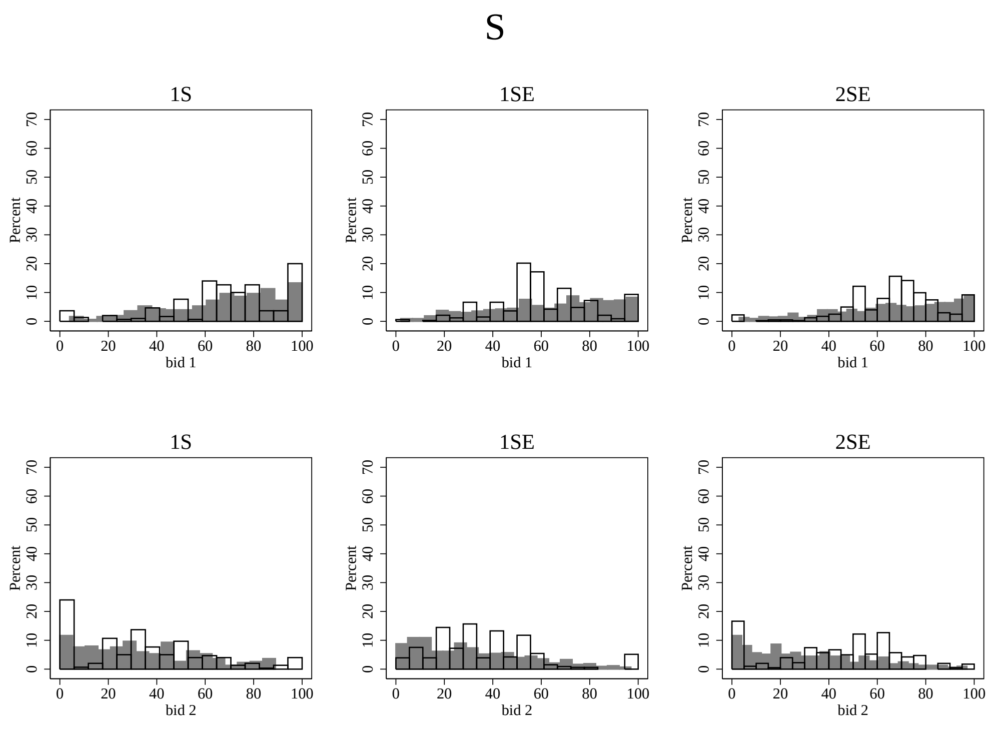


Figure A.1: Bid distributions for speculators: transparent is observed, grey is first order (bid 1) and second order (bid 2) random draws from U[0,100].

B

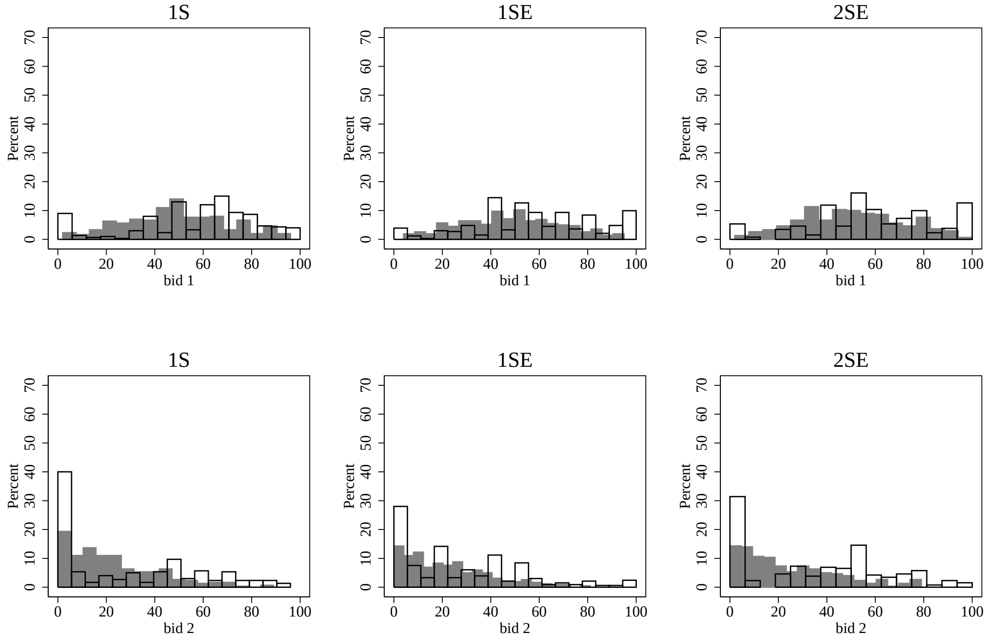


Figure A.2: Bid distributions for bidders: transparent is observed, grey is first order (bid 1) and second order (bid 2) random draws from U[0,$v_B$].

| | bid 1/bid 2 | 1S | 1SE | 2SE |
|---|---|---|---|---|
| | Avg. | 69/34 (68/35) | 60/36 (63/32) | 65/42 (65/33) |
| $S$ | Median | 72/30 (72/31) | 60/30 (67/28) | 67/46 (68/28) |
| | % bid 2 = 0 | 18 (1) | 2 (2) | 13 (2) |
| | % bid 1 = bid 2 | 15 (1) | 18 (1) | 17 (2) |
| | Avg. | 57/29 (49/23) | 58/27 (48/22) | 58/35 (50/24) |
| $B$ | Median | 60/20 (48/19) | 60/20 (49/19) | 60/40 (50/19) |
| | % bid 2 = 0 | 36 (2) | 22 (2) | 29 (2) |
| | % bid 1 = bid 2 | 17 (3) | 13 (2) | 19 (1) |

Table A.1: Summary statistics for observed bids with a comparison to random bidding in parentheses.

| | Units won by $S$ | | | | | | Resale Market | |
|---|---|---|---|---|---|---|---|---|
| % observed (% simulated) | 0 | 0 Last 5 | 1 | 1 Last 5 | 2 | 2 Last 5 | | Last 5 |
| 1S | 16.3 (7.3) | 15.0 (4.0) | 57.7 (61.0) | 60.0 (70.0) | 26.0 (31.7) | 25.0 (26.0) | 83.7 (92.7) | 85.0 (96.0) |
| 1SE | 15.7 (10.0) | 15.7 (11.4) | 61.1 (62.6) | 59.8 (62.1) | 23.2 (27.4) | 24.5 (26.4) | 84.3 (90.0) | 84.3 (88.6) |
| 2SE | 12.6 (4.0) | 13.9 (7) | 38.3 (36.3) | 43.0 (40.0) | 49.0 (59.7) | 43.0 (53.0) | 87.4 (96.0) | 86.1 (93.0) |

Table A.2: Frequency of units won by S and of the resale market, with a comparison to random bidding in parentheses.

| Auction Price (simulated) | | Last 5 | $B$ won $< 2$ | $B$ won $< 2$ Last 5 | $B$ won 2 | $B$ won 2 Last 5 |
|---|---|---|---|---|---|---|
| 1S | 36.6 (32.9) | 29.8 (35.5) | 35.9 (32.7) | 29.8 (35.2) | 39.7 (33.8) | 29.3 (36.9) |
| 1SE | 37.2 (31.4) | 35.6 (30.1) | 36.2 (31.4) | 32.7 (31.1) | 42.3 (31.5) | 51.1 (28.4) |
| 2SE | 50.9 (50.7) | 46.2 (49.6) | 50.1 (50.4) | 44.8 (48.6) | 56.4 (51.6) | 54.8 (51.7) |

Table A.3: Average auction and resale prices (per unit), with a comparison to random bidding in parentheses.