A research proposal submitted to the
Ronald and Maxine Linde Institute of Economic and Management Sciences at Caltech

The "Winner's Bliss" in Common-Value Auctions

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Project description

In this project we introduce and explore a new phenomenon – which we call the "winner's bliss" – in common-value auctions. As background, the "winner's curse" [1] is one of the most prominent and well-studied phenomena in the auction literature. In the usual common value auction with affiliated values [2], a rational bidder who wins an auction anticipates learning, if she wins, that her losing opponents had information which led to lower expected valuations of the object. Consequently, the prospect of winning causes the eventual winner to update downward her estimate of her value from the object. This winner's curse phenomenon has been studied from theoretical, empirical, and experimental angles [3, 4].

In the proposed research, we study the opposite phenomenon, which we call the "winner's bliss" which can happen in common value auctions in which bidders' preferences are *horizontally differentiated* rather than affiliated. Consider the following example: Two bidders are competing for a painting which may possibly be by Rembrandt. Each bidder independently gets a noisy signal as to whether Rembrandt actually painted the picture. While bidder 1 is a big fan of Rembrandt, bidder 2 hates Rembrandt; thus, the bidders have horizontally-differentiated preferences. Bidder 1's signal tells him that the painting is likely to be by Rembrandt. Naïvely, he submits a high bid. Supposing he wins the auction, he learns that bidder 2 submitted a lower bid; since bidder 2 hates Rembrandt, she must have bid low because *her signal also indicated that the painting was truly by Rembrandt.* Thus, in contrast to the usual affiliated value setting, the information learned from winning the auction actually *reinforces* (rather than contradicts) the positive signal that led to bidder 1's high winning bid. Instead of the winner's curse, we have the "winner's bliss". Consequently, as the winner's curse tends to dampen competition and lower revenues in affiliated value settings, we might expect contrasting implications in horizontally-differentiated settings due to the winner's bliss.

The information structure underlying the winner's bliss – common values with non-affiliated valuations – may be relevant across a number of settings. One prominent example are online ad auctions. Online advertisements are bought and sold via auctions, in which the bidders are advertisers who differ in the information they possess about key attributes of internet users, such as age, gender, or occupation. Advertisers also have horizontal preferences regarding user's attributes; for instance, cosmetic giant Lancôme may prefer to target their ads to women, while beer company Budweiser may prefer to aim their ads at men [5, 6]. Similarly to the noisy signals in the Rembrandt example above, advertisers in these auctions observe noisy signals of user attributes via the "cookies" they place on internet websites.

Financial markets are another setting where the winner's bliss may be important. Consider a securities market with two types of traders: value and growth investors. Traders are vying for a given stock and have private information concerning whether a given stock is a value or growth stock. In finance theory, a winner's curse-like phenomenon can lead to "no trade" as one trader's assent to a trade conveys information which causes her trading partner to update his information in a way which makes him unwilling to trade [7]. In our setting, however, one trader's assent to trade can convey information which reinforces her partner's willingness-to-trade, thus eliminating the no-trade problem.

As far as we are aware, there is no previous work on such common value auctions with horizontal preferences, and our "winner's bliss" is new to the existing literature. The goal of this proposal is to develop a simple theoretical model of the winner's bliss, and assess the model via lab experiments. We describe this briefly below.

Model. Here we present a simple two-bidder framework exhibiting winner's bliss, which we will simulate and test in the lab. A marble of unknown color (either blue or red) is being auctioned. The auction features two bidders, who can be of blue (B) or red (R) type. A bidder obtains utility 1 from winning if the marble's color corresponds to his type, and 0 otherwise. Each bidder knows his type prior to the auction, but not his opponent's type. Let μ be the publicly-known probability that the two bidders are of the same type. Consider a first-price sealed-bid auction where each bidder submits a bid $b > 0$ and must pay his bid if he wins. Before submitting their bid, each bidder observes an independent private signal $S \sim U[0,1]$. Given the signals (S_i, S_j) received by each bidder, the probability that the auctioned marble is blue is given by

$$\Pr(B|S_i = s_i, S_j = s_j) = \frac{s_i + s_j}{2}$$

As bidders' utilities in this model depend on their private information, this game resembles the well-known "wallet game" [8] in which bidders' utilities from winning the auction depend on the private information of the bidders.

We focus on a type-symmetric increasing equilibrium bidding strategy, denoted $\beta(\cdot)$. That is, $\beta(s|B) = \beta(1-s|R)$. For convenience, we exposit the model from a B-type bidder's perspective. In equilibrium, a B-type bidder with private signal s who bids an amount b receives profit equalling

$$\mu \int_0^{\beta^{-1}(b)} \left(\frac{s+s'}{2} - b \right) ds' + (1-\mu) \int_{1-\beta^{-1}(b)}^{1} \left(\frac{s+s'}{2} - b \right) ds'$$

which yields the following first order condition

$$\mu\left(\frac{s-b}{\beta'(s)}-s\right)+(1-\mu)\left(\frac{\frac{1}{2}-b}{\beta'(s)}-s\right)=0 \implies \left(\mu s+\frac{1}{2}(1-\mu)-b\right)=\beta'(s)s \tag{1}$$
$$\implies \beta(s)=\frac{1}{s}\int_0^s(\mu x+\frac{1}{2}(1-\mu))dx\frac{1-\mu}{2}+\frac{\mu}{2}s$$

Lemma 1. *Let $\mu \in (0,1]$. Eq. (1) is the equilibrium bidding strategy for a B-type bidder.*

The equilibrium strategies in Lemma 1, for different values of μ, are plotted in Figure 1.[1] In this figure, the solid grey line corresponds to a B-type bidder's ex-ante value of the object ($P(B|S_i = s)$) conditional just on her own signal s. When μ is high ($\mu = 1$ or $\mu = 0.7$ in the figure), the two bidders are likely to be the same type. In these cases, bidding corresponds to the usual affiliated value case, and we see that in both cases the bidding strategies (plotted in blue and purple in the figure) lie strictly below the ex-ante valuation, corresponding to the winner's curse, as the event of winning conveys to a bidder information which causes her to downgrade her valuation relative to her ex-ante valuation.

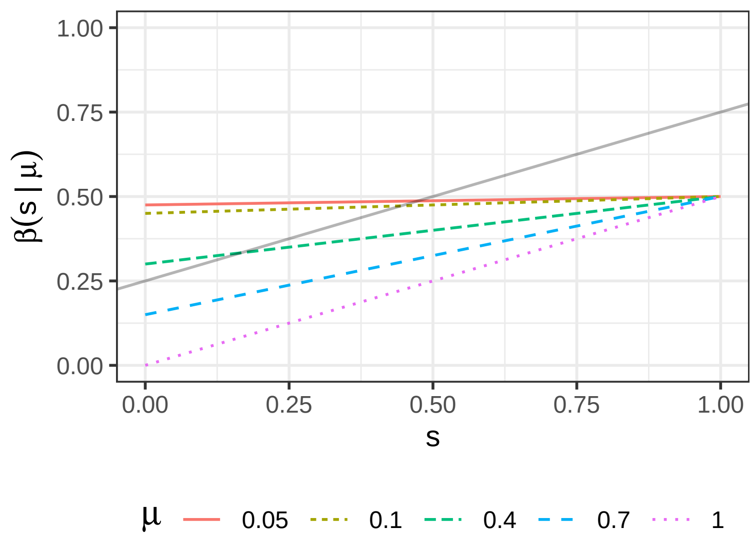
For smaller values of μ, however (the figure illustrates $\mu = 0.4$, $\mu = 0.1$ and $\mu = 0.05$) we see that the equilibrium bid can lie *above* the ex-ante valuation line for lower values of the signal (i.e., $\beta(s) > \Pr(B|S_i = s)$), suggesting that winning the auction in these cases conveys information which causes a bidder to *upgrade* her expected valuation of the object. This is the *winner's bliss*, and it never happens in the affiliated value case.

Specifically, for $\mu \in (0, 0.5)$, the winner's bliss occurs when $s \leq \frac{0.5-\mu}{1-\mu}$. Intuitively, when the rival bidder is R-type, a B-type bidder with a low signal $S_i = s$ wins only if the rival's signal is $S_j > 1-s$. Therefore, the lower her private signal, the more optimistic she becomes about the expected value, conditional on winning. Anticipating this, she is willing to bid higher than her ex-ante value if the probability that her rival is R-type is sufficiently high. This effect dampens as the signal s increases and, as the figure shows, the winner's curse occurs for all values of μ, when the signal $s > 0.5$.

Experimental design. We will test our model predictions in a series of experiments that simulate both "winner's curse" and "winner's bliss" auctions. The experiments will feature an auction framework modelled directly upon the blue/red marble setup in the previous section. The goal of these experiments is to examine whether, and how, participants' bids respond to (i) the signal concerning the value of the uncertain good being auctioned and (ii) the likelihood that the bidders in the auction have similar vs. opposing preferences for the auctioned good.

[1] At the extreme value of $\mu = 0$, there is no pure strategy equilibrium, and we do not consider that case here.

Figure 1: Equilibrium bidding strategies for $\mu \in (0, 1]$



Participants in this experiment will each take part in a total of 24 first-price sealed-bid auctions. In each auction, every participant receives an independent signal concerning the likelihood that the good being auctioned will have a positive monetary value for them vs. zero value for them. In addition, they are informed about the likelihood that the other bidder(s) in the auction share their valuation of the good (yielding a potential "winner's curse") vs. have an opposing valuation of the good (yielding a potential "winner's bliss"). With this information in hand, every participant then bids on the uncertain good. We plan to execute two sets of auction experiments.

Experiment 1 – Online Samples & Sequential Auctions: Our first experiment will be carried out sequentially with online samples. That is, each participant will independently (on his/her own) submit the bids for each auction, without (yet) being paired with other bidders. Only after all participants have submitted their bids to every auction will we determine bidder pairings and alignments.

Experiment 2 – Lab Samples & Simultaneous Auctions: Our second experiment will be carried out simultaneously in a physical lab space. We will recruit groups of 4-10 participants (always in even numbers) to partake in the auctions in real-time. In this study, will we determine bidder pairings and alignments prior to each auction. In addition, we will use physical marbles of different colors.

Budget

The budget includes funds for paying experimental subjects, hiring a research assistant to help recruit experimental subjects, run the lab studies, and analyze the experimental data, and traveling expenses to conferences. The total requested amount is \$20000 broken down as follows.

1. Paying experimental subjects:
   - Online experiments: 150 subjects $\times$ \$30 =\$4500
   - In-person lab experiments: 150 subjects $\times$ \$30 = \$4500
2. Graduate research assistant: 30 weeks $\times$ 12 hrs/week $\times$ \$25/hour = \$9000.
3. Travel to conferences to present research findings: \$2000

References

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