

Spiteful Bidding in the Dollar Auction

(Extended Abstract)

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ABSTRACT

Shubik's dollar auction is a simple yet powerful auction model that aims to shed light on the motives and dynamics of conflict escalation. Technically, a dollar auction is a two-player all-pay auction, where the players compete for a dollar.

Common intuition suggests that the dollar auction is a trap. Both players may substantially overbid since, at any stage, leaving the auction leads to a certain loss. On the other hand, bidding further gives a chance to win the prize and, at least, minimize losses. However, O'Neill [8] proved that the dollar auction has a surprising solution in pure strategies. In particular, assuming the budgets of players are finite, only one player bids and wins the prize.

Does this mean that the conflict in the dollar auction does not escalate after all? In research we reconsider O'Neill's results following recent literature on spiteful bidders. We ask the question whether the escalation in the dollar auction can be induced by human meanness. Our results confirm this conjecture in various scenarios. A spiteful player is often able to escalate the auction and force the non-spiteful opponent to spend most of the budget. Still, it is the spiteful bidder who wins the prize.

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1. INTRODUCTION

On the surface, many social situations appear to be a trap, where it is a bad idea to move forward, but also bad to retract from the situation and lose already-invested resources. Such dilemmas are often faced by lobbyists who battle each other in a costly and seemingly endless process of acquiring a public contract [4], by oligopolistic companies pressured to invest in R&D only because the competitors have just done so [2], or by many ready-to-marry people who feel trapped in long-lasting relationships that somehow do not progress towards institutionalisation [9].

Shubik [11] proposed a simple yet powerful model to study such situations. In his so-called *dollar auction*, two bidders i and j compete for a dollar bill. Similarly to an English auction, the highest bidder wins the prize, but, unlike in the English auction, both the winner and the loser have to pay their bids to the auctioneer.

One might argue that it is best not to participate in the above all-pay auction. However, this is not always possible. Furthermore, the possibility that a player may choose not to bid creates a clear incentive for the other player to bid and get the prize. Matter-of-factly, this reasoning is the centrepiece of the entire dollar auction mechanism that ultimately pushes players towards conflict escalation. To illustrate this point, let us assume that the auction has started with player i bidding \$.05, and player j raising the price to \$.10. Player i faces the following dilemma: withdraw from the auction and lose \$.05 with certainty, or increase the bid to \$.15 with the hope of gaining \$.85. Since the same reasoning holds at any stage during the auction, the bidding may continue well past the bill of \$1.00 to be won. While past this point the bidders can only seek to minimize losses, they are still incentivized to increase their bids rather than drop out and lose everything.

The above dollar auction game has become an influential abstraction of conflict escalation processes. It makes for a great class-play for management students [5] but, more importantly, it offers insight into the dynamics of such processes as international conflicts, arms races, investment decisions or human relations, just to name a few. Any such situation may escalate to irrational levels despite the fact that, locally, every single participant makes a rational deci-

sion. Similar patterns of behaviour are observed in “clinical” experiments with the dollar auction—more often than not, a dollar bill is sold for considerably more than a dollar [11, 6].

One of the key reasons behind this “paradox of escalation” [11] is that a rational strategy to play this game is far from obvious. It is difficult to make an optimal choice between when “to quit” and when “to bid”, both when bidding for a dollar bill, or when facing similar real-life situations.

In his beautiful paper, O’Neill [8] offered a surprising solution to the dollar auction—he proved that, assuming finite budgets of players, in all equilibria in pure strategies, only one player bids and wins the prize. The exact amount of such a “golden” bid is a non-trivial function of the stake, the budgets, and the minimum allowable increment. In our example, if players i and j have equal budgets of \$2.50 each, the first player, who has the chance to move, should bid \$0.60. If his opponent is rational, he should leave the game with no prize and with no losses.

Does O’Neill’s result mean that the conflict in the dollar auction does not escalate after all? O’Neill’s results were revisited by Leininger [7], who showed that the escalation can be justified in this game because there exist equilibria with escalation in mixed strategies. Later on, Demange [3] proved that, if there is some uncertainty about the strength of the players, then the only stable equilibrium may entail escalation.

In this paper, we reconsider O’Neill’s results in pure equilibria from a different perspective. Following recent literature on spiteful bidders [1, 10, 12], we ask the question whether the escalation in the dollar auction may actually be caused by the meanness of some participants. Do some of us put others in an inauspicious position simply because of spite, rather than greed? Do we allow ourselves to be dragged along simply because we do not expect a spiteful opponent?¹

2. RESULTS

We study a number of scenarios in which a spiteful player challenges a non-spiteful one, and the non-spiteful player does not suspect the meanness of his opponent, meaning that he follows the strategy proposed by O’Neill [8]. We consider both equal and unequal budgets. Some of the most important findings are as follows:

- assuming equal budgets, a strongly spiteful player is almost always able to escalate the auction and force the non-spiteful opponent to spend most of his budget. Still, it is the spiteful bidder who gets the stake at the end!
- an extreme type of the spiteful player is a malicious player who cares only about maximizing the loss of the opponent, irrespective of his own costs. In this case, if the malicious player has the bigger budget, then he is always able to force the non-spiteful player to pay almost the entire value of the prize but not get it;
- while such an advantage of the malicious player with the bigger budget is not unexpected, we obtain a surprising result for the case where the malicious player i

is the one with the smaller budget b_i . In this case, he can force the non-spiteful opponent j to spend more than b_i . In other words, a weaker malicious player escalates the conflict more than a stronger malicious one!

Thus, our results suggest that the escalation in the real-life experiments with the dollar auction could be related not only to the desire to win but also (at least to some extent) to human meanness. In various scenarios in which a non-spiteful bidder unwittingly bids against a spiteful one, the conflict escalates. Not only can the spiteful bidder force the non-spiteful opponent to spend most of the budget but he also often wins the prize. Surprisingly, a malicious player with a smaller budget is likely to plunge the opponent more than a malicious player with a bigger budget. Thus, a malicious player should not only hide his real preferences but also the real size of his budget. Intuitively, a weak, easy-to-overcome bait may seem more attractive than a stronger one.

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¹A spiteful bidder, contrary to the common assumption of self-interest, maximizes a convex combination of his own profit and the opponent’s loss.