

Just dropped a paper with @bahrani_maryam and @Tim_Roughgarden on how auction theory changes when bidders are DAOs vs individuals. TL;dr more than we thought! Turns out there is a conflict between incentive-compatibility (IC) and maximizing welfare.

<https://arxiv.org/pdf/2306.17099.pdf>

Inspired by Constitution DAO, we consider a setting where there are groups of bidders who participate in an auction as a collective unit. The idea being that individuals can pool their bidding power to increase their competitive power

Formally these auctions are composed of two parts: an upper and lower mechanism. The lower mechanism deals with how groups aggregate individual bids, split payments, etc, and the upper mechanism decides which group wins the auction and how much they pay

As an example of this, imagine a mechanism where every group aggregates its bids by summing the bids of everyone in its group. Then a first price auction is run across the groups where the winning group simply has each of its members pay their bid

This mechanism suffers from a classic free-riding problem. If the group is large enough, everyone assumes that the high cost of winning the auction will be covered by someone else and bids a small amount (less than their true value) assuming they aren't pivotal

We ask whether there are mechanisms in this framework that don't suffer this issue and that are IC for individual bidders while still ending up with allocations that guarantee an approximation to social welfare that degrades slowly with the size of the largest group.

Drawing on ideas from cost-sharing literature we give a mechanism that is IC and gets a \ln (size of largest group) worst-case approximation of the optimal welfare and show that this is the best any IC mechanism can do. Here we rely on some amount of excludability for the good

The mechanism works by running a second price auction in the upper mechanism and winning group splitting their payment equally amongst a subset of its members. This subset of the group that is able to cover this payment are the only ones that get access to items

The welfare loss of the mechanism can be characterized in terms of the heterogeneity of values within a group, with the maximum loss occurring when bidders within a group have very different values for the item (and no loss when they agree)