

## Title: Collusion in Multi-unit Auction with Ex Ante Asymmetric Bidders: Uniform vs Discriminatory

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This paper studies a simple multi-unit auction game in which two units of a homogeneous object were auctioned off among  $N$  bidders. We introduce ex ante asymmetry through a publicly observable partition structure  $S$  on the set of bidders in which bidder's value distribution is affiliated with the size of subset she belongs to. Only bidders with the highest value (the active bidder) within each subset will participate the grand auction game. We characterize the asymmetric monotone Bayes-Nash equilibria of two standard multi-unit auction formats. In a uniform-price auction (UPA), the active bidder of a larger subset tends to converge her low bid to high bid (i.e., submit a flatter demand curve), which indicates that inefficient allocation becomes less severe when bidders' expected valuations are more separated. Such asymmetric equilibria are not observed in the discriminatory-price auction (DPA) counterpart. We further apply this model to analyze bidders' coalition incentives at the ex ante stage. We claim that UPA is more vulnerable to collusion than DPA in the sense that: 1) bidders' expected payoff is higher (resp. lower) from a larger ring in UPA (resp. DPA); 2) only the grand coalition has nonempty core in DPA, whereas all rings are core-stable in UPA.