Discussion: Algorithmic Collusion of Pricing and Advertising on E-commerce Platforms (Zhao and Berman)

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Algorithmic Collusion

- Algorithmic price competition with no coordination
  - non-trivial: algorithms based on stationary environments
  - algorithmic competition: environment is endogenous/nonstationary

- Literature: Supra competitive prices with AI pricing
  - mechanisms in simulated markets: *facilitate repeated games* (Calvano et al 2020, Kline 2021), *correlated learning* (Hansen et al 2021), *sophistication* (Asker et al 2021), *hub and spoke* (Harrington 2021)
    - Limited/no theory: Results in the form "showing existence" and mechanisms are inferred

This paper

- Extends the literature to platforms
  - Sellers: set prices and bid for location

- Platform: runs auction to set location
- Buyers: some type does not search

- Main results (when search costs are high enough)
  - Q-learning results in lower advertising bid and lower prices
  - Does not hurt consumers or the platform

Main Thoughts

- Show alogirthmic collusion results are knife-edge

Does Q-learning represent seller behavior here?

- Q-learning's has slow convergence rate ($\sqrt{(t)}$ v log(t))
- Extending Calvano et al to add bidding increases dimensionality of both the action and state space
- Q-learning would require ~100 millions time-periods
- Unrealistic in real environments: requires consumer preferences to be stable over a long time-frame

Suggestions

- Setup
  - Search is exogenous (mental costs) – consider choice frictions

- Outcome of auctions bundled with profits – consider adding seperately to the state

- Amazon data: very reliant on assumptions
  - estimating search is the key empirical result – consider click-though data
- Overall: An interesting addition to a growing literature