Discussion: Does Strategic Ability Affect Efficiency? Evidence from Electricity Markets
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Three Components of This Paper

1. Electricity generators' bidding decisions in the balancing market deviate from Nash Equilibrium

   - Observe marginal cost + a game-theoretic model with imposed Nash Equilibrium = predicted optimal bidding
   - Compare optimal bidding and observed bidding
   - Remarkable departure by small firms!

2. Characterize such deviations using a behavioral game-theoretic model: players have different levels of cognitive hierarchy

3. Simulations: exogenous increase of level; mergers b/w firms with different levels

Bottom line: pushes Hortacsu and Puller (2008) forward with Camerer, Ho and Chong (2004)

Big Questions of IO

- How do we model firm behavior?

  - Insight from this paper: room for limited rationality in firm strategy in a high-stake, game-theoretic setting

- When might government intervention improve market outcomes?

  - Insight from this paper: A merger b/w a high-level firm and a low-level firm increase strategic sophistication, and in turn, decrease production inefficiency (up to a substantial 4.2%)

This paper is exemplary in answering these questions

  - Relevant, transparent, and convincing

Why is This Insight Important?

- Policy makers need to understand that firms they regulate are heterogeneous in many dimensions:
  - Standard: different cost structure, product mix, and demand
  - Non-standard but entirely plausible: different ability to make correct strategic decisions

- This last dimension of heterogeneity may have important implications in the short and long run:
  - For example, a new industry often experience a "shake-out" period, in which less capable firms are tumbled out or acquired
  - Should policy makers intervene or let it be?

Comment 1: Horizontal Merger Guidelines

Section 10, "Efficiencies":

- "A primary benefit of mergers to the economy is their potential to generate significant efficiencies and thus enhance the merged firm's ability and incentive to compete"

- "Efficiencies are most likely to make a difference in merger analysis when the likely adverse competitive effects, absent the efficiencies, are not great."

- Suggestion: decomposing merger effects into gains from higher-level strategic sophistication and losses from less competition

Comment 2: Why Cognitive Hierarchy?

- Plenty of reasons why firms depart from optimal bidding:
  - The chaotic first few years of industry restructuring; less consequential markets; very different firms
- Is CH is *the* model of limited rationality here?
- It doesn't have to be: the goal is more about the race b/w CH and Nash Equilibrium bidding than the race b/w CH and alternative behavioral models.

- Suggestion 1: Non-nested model selection tests
- Suggestion 2: Be explicit about why CH is a good fit

Comment 3: Small Firms' Behaviour

- How do firms make mistakes?
  - Incorrect belief
  - Fail to optimize given (correct) belief (for example, rule of thumb decision making; satisficing; do not best respond …)
  - They are not making mistakes. Instead, they are just optimizing in an environment more complex than the our simple oligopoly IO model would suggest
- Paper can push for deeper understanding of the nature of mistakes:
  - Small firm bid vertically --- what type of mistake is this? What primitives in (expected) profit function can we go down to?
  - How expensive is it to hire someone to fix this mistake?
  - … small firms leave substantial money on the table (millions of dollars) through departures from optimal bidding

Money on the Table

| Firm | % of potential profits achieved by | | Capacity Utilization |
	Actual bids	BR to lagged bids	
Reliant	79.0	98.5	81.7
Bryan	45.3	100.0	76.6
Tenaska Gateway	40.9	99.6	125.9
TXU	39.3	96.7	97.1
Calpine	37.0	97.9	83.8
Cogen Lyondell	16.2	100.0	81.1
Lamar	14.7	99.6	76.2
Garland	12.6	99.9	93.6
WTU	8.1	100.0	92.9
CPL	7.7	98.7	98.8
Guadalupe	5.9	99.0	74.7
Tenaska Frontier	4.9	99.3	93.4

Comment 4: Evolution of Strategic Sophistication

- Are firms making better decisions now?
  - If yes, why?
    - Survival of the fittest: time weeding out the less capable firms?
    - Learning --- about demand, cost, or competitors?
  - If no, why?
    - Why do mistakes persist?
- Data employed: first few years of new market
- Is it possible to revisit this problem using more current data?
  - Especially, any recent merger case? "Efficiency claims substantiated by analogous past experience are those most likely to be credited."

Summary

- This paper: document the incidence of lack of strategic sophistication and quantify its impact in a critical, heavily regulated infrastructure industry

- Clean identification of deviations: nails down deviations as MC is observed (and optimal decisions can be inferred)

- Effective use of Cognitive Hierarchy framework to capture heterogeneity in decision making

- Get us to think about the typically presumed set of assumptions about firm behaviors and its implications for policy making
  - When do we employ a behavioral model in IO?

Expanding from our IO box

- Citing Severin Borenstein (2016)

"The big gains in the next decade will come much more from broadening than from deepening: from combining an IO approach with thinking about firm behavior that is outside the narrow IO box."

- This papers is a much needed step into this direction

Thank you!