Estimating a Model of Strategic Network Choice: The Convenience-Store Industry in Okinawa

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Overview

- Understanding how chains (networks) compete is important.
- Modeling/estimating this interaction is very difficult.
  - Firms make high dimensional choices knowing rivals do the same.
  - Even "small-ish" problems (enter/don't enter in 2000 locations) lead to choice sets with many more elements than atoms in the universe.
- "Full-solution" methods that use exhaustive search are infeasible.
- Two options
  1. Stick with full solution but find a way to narrow the search (Jia, 2008).
  2. Work with inequalities instead (Pakes et al. (2006), Fox (2007)).[1]

[1] Full disclosure: I have a paper (Ellickson, Houghton, and Timmins (2007)) that uses this approach.

From Jia to Nishida

- Nishida follows Jia in using 'lattice' structure to narrow search.
  - If game is **supermodular**, it has a greatest and least element.
  - Tarski's theorem $\Rightarrow$ upper and lower bounds.
  - Then use exhaustive search for fixed point between the bounds.
- **Restrictions** needed to ensure supermodularity
  1. Spillovers (net effect of business stealing and density economies) must be **positive**.
  2. Only **two** firms compete.
- For this reason, Jia focused on Wal-Mart/Kmart and only included small markets with at most one outlet per firm (no cities).
  - But **cities** are probably key for many retailers...
  - Also introduces **selection & endogeneity** problems, and limits scope for counterfactuals.

Nishida's Contribution

- Nishida relaxes assumption 1 to allow for multiple outlets per market
  - This *greatly* expands the applicability of the full solution approach
  - Spillovers *across* markets still positive (smaller issue)
  - He's working on relaxing 2!
- Nishida also provides a mechanism for incorporating post-entry revenue information
  - Useful for breaking up net density/business stealing effect
  - Provides additional moments to match
  - Might aid in identification

Questions & Suggestions

- Should provide some intuition for why local spillovers don't need to be signed (right now it's just equations in the appendix)
- How much is revenue data really helping? (or could it be hurting?)
  - No data on individual revenue (just market aggregates + censoring) so parametric structure must play a big role here
  - Even with store-level revenue data, hard to know what to put in (and leave out) of this reduced form
    - Some discussion of identification would help
  - Suggestion: Report merger counterfactual without revenue data

Multiplicity (not unique to Nishida)

- Simultaneous move static games generally exhibit multiplicity
- "Solutions"
  - Focus on something that's unique or change the timing
  - Impose (or estimate) a selection rule
  - Estimate using preference inequalities (may yield sets)
- Nishida uses a selection rule (most profitable eqbm for firm 1)
- Putting aside estimation, how should we think about performing and reporting counterfactuals in these models?
- A particular selection rule is pretty arbitrary, reporting several is probably better, but we know we can't find them all.
- What's most useful for policy analysis?