Measuring Competition in Health Care Markets

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Motivating Questions

- How do we measure competition in health care markets?
- How do we apply these measures to retainer-based medicine?
Important Conceptual Issues For Measuring Competition (Baker, 2001)

1. Identifying the product(s) and competitors of interest
2. Identifying the geographic market area
3. Choosing a basic measure of competition
4. Forces that modify traditional competitor dynamics, e.g., mobility of patients
Research Plan & Proposed Methodology

1. Describe data sources.
2. Describe the reduced form approach.
3. Display summary statistics.
4. Describe the structural approach.
5. Display structural estimation results.
Data Sources

- **Supply Side:**
  - SK&A Physician Data: The SK&A data includes detailed information on practice characteristics, patient volume, and other organizational characteristics obtained through survey-based phone calls.

- **Demand Side:**
  - Randomly generated patient-level data (in place of pending Medicare A/B/D Insurance Claims data)
  - Marrying the supply-side with the demand-side offers a 360 degree view of the patient.
Reduced Form Approach - HHI Computation

- The Herfindahl-Hirschman Index - HHI - is a measure of the size of firms in relation to the industry and an indicator of competition in a market.

- By definition,

\[ HHI = \sum_{i=1}^{N} s_i^2 \]

where \( s_i \) is the market share of firm \( i \) in the market, and \( N \) is the number of firms.

- The index range: \( 0 \leq HHI \leq 10,000 \); where 0 is perfectly competitive (low concentration), and 10,000 is a monopoly (high concentration).
Clinic-HHI Computation

- We customize the traditional HHI and compute clinic-specific HHIs to measure concentration in physician markets,

\[ Clinic - HHI_j = \sum_{z} \sum_{m=1}^{M} \left[ \frac{Clinic j's \ patients \ from \ zip \ z \ & \ condition \ m}{Clinic \ j's \ total \ patients} \right] [HHI_{z,m}] \]

where \( z \) is the zip code of patients, \( m \) is the market, \( j \) is the clinic. (go back to email to check this)

- Necessary conditions for calculating clinic-specific HHIs:
  - Defining product markets
  - Defining geographic markets
Competition Simulations

- We limit the product market, i.e. “specialty” to Internists.
- Hypothetical: 1 physician in each zip code loses 2/3 of their patients
- 3 simulated scenarios to assess changes in clinic-HHIs:
  - First scenario: Goes to one other physician within same zip code with least number of patients
  - Second scenario: Shared equally among 5 docs in same zip with least number of patients
  - Third scenario: Shared equally among all physicians in zip code
## Summary Statistics

<table>
<thead>
<tr>
<th>Year</th>
<th>Case 1</th>
<th>Case 2</th>
<th>Case 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>1072.288</td>
<td>1071.687</td>
<td>1074.296</td>
</tr>
<tr>
<td>Median</td>
<td>1013.453</td>
<td>1012.857</td>
<td>1015.362</td>
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<tr>
<td>Standard Deviation</td>
<td>403.802</td>
<td>403.564</td>
<td>404.486</td>
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<tr>
<td>Minimum</td>
<td>178.768</td>
<td>178.596</td>
<td>178.993</td>
</tr>
<tr>
<td>Maximum</td>
<td>1728.174</td>
<td>1727.136</td>
<td>1731.173</td>
</tr>
<tr>
<td>25th percentile</td>
<td>774.615</td>
<td>178.596</td>
<td>178.993</td>
</tr>
<tr>
<td>75th percentile</td>
<td>1370.085</td>
<td>1369.420</td>
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<tr>
<td>N</td>
<td>4,440</td>
<td>4,440</td>
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</tr>
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</table>
Structural Approach - Discrete-Choice Framework

- Another way to think about competition - physician substitutability
- Computing an indirect utility function (McFadden, 1981)
  - Assume that patients choose the physician that maximizes their utility given their own characteristics and the characteristics of the physicians in their feasible choice set.
  - Match patients to physicians in SK&A dataset
  - Geocode patient and physician addresses (we limit this to five cities in Florida)
  - Compute distance between patient and physician
  - Create distance threshold - limit choice sets
  - Predict utility from chosen physician
  - Compute willingness to pay and consumer surplus
Preliminary Estimation Strategy

- Conditional logit with fixed effects model: to capture the determinants of a patient’s choice, account for physician heterogeneity (omitted variable bias),

\[ Y_{it} = \beta_1 X_{it} + \alpha_i + u_{it} \]

where \( \alpha_i \) is the unknown intercept for each physician, \( Y_{it} \) is the DV, \( X_{it} \) is the vector of independent variables, and \( u_{it} \) is the error term.

- Multinomial logit model: to capture the choice probability of a patient,

\[ P_{ij} = \frac{\exp(X_i \beta_j)}{\sum_{k=j}^J \exp(X_i \beta_k)} \]

where \( X_i \) is the vector of characteristics of patient \( i \), \( J \) is the number of unordered alternatives (physicians), and \( P_{ij} \) the probability that individual \( i \) chooses physician \( j \). We assume that the random component of utility affecting physician choice is Type I extreme value.
## Preliminary Estimation Results

**Dependent variable:** Choice (Physician Selection by Patient)

<table>
<thead>
<tr>
<th>Model:</th>
<th>FE (1)</th>
<th>FE (2)</th>
<th>MNL (3)</th>
<th>MNL (4)</th>
<th>MNL (5)</th>
</tr>
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<tbody>
<tr>
<td>Distance</td>
<td>-0.0097***</td>
<td>-0.0096***</td>
<td>-0.4273***</td>
<td>-0.4271***</td>
<td>-0.4272***</td>
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<tr>
<td></td>
<td>(0.0004)</td>
<td>(0.0004)</td>
<td>(0.0172)</td>
<td>(0.0172)</td>
<td>(0.0173)</td>
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<tr>
<td>Sex-match</td>
<td>0.0251***</td>
<td>1.0234***</td>
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<td></td>
<td>(0.0014)</td>
<td>(0.0526)</td>
<td>(0.0526)</td>
<td>(0.0527)</td>
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<td>Patient Volume</td>
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<td>0.0015**</td>
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<td></td>
<td>(0.0006)</td>
<td>(0.0006)</td>
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<tr>
<td>Size of Practice</td>
<td>-0.0928***</td>
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<tr>
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<td>(0.0074)</td>
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<table>
<thead>
<tr>
<th>NPI FE</th>
<th>X</th>
<th>X</th>
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<tbody>
<tr>
<td>(N)</td>
<td>58,505</td>
<td>58,505</td>
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<tr>
<td>(R^2)</td>
<td>0.141</td>
<td>0.146</td>
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Fixed Effects - Physician Heterogeneity

NPI heterogeneity

Density

D[npi]

Kernel = epanechnikov, bandwidth = 0.0007
Moving Forward

- Machinery set up for analysis upon data arrival
- Apply measures of competition to retainer-based medicine
- Experience with working with fake data - useful, as an academic exercise - but take results with a grain of salt
- Using an alternative-specific conditional logit (McFadden’s choice) model
- Measuring willingness to pay: difference between the utility from chosen doctor and the utility from the next highest choice
- Critical Question: If physicians are aware of patients’ willingness to pay, does this match the retainer fee that we observe?
Lessons Learned

- Data limitations
- Data simulations
- Economic theory underlying competition and market structure
- Patient choice/physician-selection mechanisms
- How individual choices translate into market structures
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