Is Hospital Competition Socially Wasteful

By: Daniel Kessler and Mark McClellan

Presentation: Paul George

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Motivation

- Opposing views on whether or not hospital competition is socially beneficial
  - Patient/consumer insensitivity to price could lead to a medical arms race, resulting in the provision of medically unnecessary services

    OR
  - Competition reduces costs, improves quality, and increases efficiency

- Important policy ramifications
  - *E.g.,* Anti-trust policies

Research question

- Is hospital competition socially wasteful?

- Does their new HHI measure predict outcomes, specifically hospital spending, mortality, and complications, amongst non-rural, Medicare beneficiaries who had heart attacks, over the 1985-1994 period?

Contribution

- Novel HHI measure, based on exogenous factors
- “Virtually no previous research has determined the effects of competition on both health care costs and patient health outcomes.”

Key issues addressed in this paper

- Measures of output conventionally used to construct indices of competitiveness such as HHI may themselves be outcomes of competition
  - hospital bed capacity (more competitive markets might induce hospitals to build more),
  - actual patient flows (patient's hospital of admission may depend on unobserved determinants of their health status, which can induce a correlation between competition and unobserved determinants of cost and outcomes)

Preview of findings

- Prior to 1991, competition led to higher costs and, in some cases, lower rates of adverse outcomes for elderly Americans with heart disease

- After 1991, competition led to both substantially lower costs and significantly lower rates of adverse outcomes
  - Increasing HMO enrollment partially explains this change
  - Recall: HMO (health maintenance organization) is a type of health insurance plan that limits coverage to care from doctors/providers who work for or contract with the HMO

Overview of the paper

1. Core idea of their methodology is to model hospital choice based on exogenous factors, namely distance to hospital type
    - As opposed to endogenous factors, such as hospital beds or hospital-specific market

2. Use the above method to construct an HHI* (predicted HHI)
    - As opposed to typical HHI, which is based on, again, endogenous factors such as sum of squared shares of beds or number of patient discharges

3. Use HHI* as independent variable to predict outcomes (spending, mortality, complications)

Data Sources

- Patient data (healthcare): longitudinal Medicare claims data of non-rural beneficiaries who were admitted to a hospital with a new primary diagnosis of AMI in 1985, 1988, 1991, 1994

- Patient data (demographics): Health Care Financing Administrations HISKEW enrollment files

- Hospital data: American Hospital Association (non-rural, non-federal general medical or surgical hospitals)

TABLE I

POPULATIONS OF HOSPITALS AND PATIENTS USED IN ANALYSIS (TABLE ENTRIES ARE NUMBER OF OBSERVATIONS MEETING SELECTION CONDITIONS)

	Hospitals		
Year	Nonrural, nonfederal, ever general medical	. . . with valid Medicare ID and AHA data	. . . and with at least 5 AMI patients
1985	2975	2812	2698
1988	2889	2732	2608
1991	2793	2611	2502
1994	2706	2485	2382

	Elderly AMI Patients			
Year	Admitted to nonrural, nonfederal, general medical hospital	. . . with a valid Medicare ID and AHA data	. . . and with at least 5 AMI patients	. . . and who lived within 35 miles of index hospital (100 miles if large teaching hospital)
1985	157,343	152,700	152,359	146,569
1988	145,344	143,229	142,946	137,879
1991	154,224	152,657	152,410	145,555
1994	153,757	150,303	150,058	143,308

1. Model hospital choice

- Estimate the likelihood (probability) of each individual patient choosing each hospital within their (patient's) market

$$Y^*_{ij} = V(D^{1+}_{ij}, \ldots, D^{H+}_{ij}, D^{1-}_{ij}, \ldots, D^{H-}_{ij}; Z^1_j, \ldots, Z^H_j) + W(X_i; Z^1_j, \ldots, Z^H_j) + \epsilon_{ij}.$$

  - Y_{ij} = individual i's expected indirect utility from visiting hospital j
  - V = function of relative distances between hospital and patient
  - W = function of interaction between i's characteristics X_i and hospital characteristics Z_j

1. Model hospital choice (cont'd)

- Probability of individual i choosing hospital j is therefore

$$\Pi_{ij} = \Pr\left(Y_{ij} = 1\right) = \frac{e^{(V_{ij} + W_{ij})}}{\sum_{l=1}^{J} e^{(V_{il} + W_{il})}} .$$

2. Create new HHI measure

- Predicted share of patients from zip k going to hospital j

$$\hat{\alpha}_{jk} = \frac{\sum_{i \text{ living in } k} \hat{\pi}_{ij}}{\sum_{j=1}^{J} \sum_{i \text{ living in } k} \hat{\pi}_{ij}}.$$

- π = predicted probability of admission for every patient i to every hospital j in his/her market
  - Summing over all patients, these π_{ij} translate translate into a predicted number of patients admitted to each hospital

2. Create new HHI measure (cont'd)

- New HHI measure (predicted HHI for patients in zip code K):

$$HHI_k^{\text{pat}} = \sum_{j=1}^{J} \hat{\alpha}_{jk}^2.$$

  - Differs from previous measures in that it is based on exogenous determinants of patient flows, rather than potentially endogenous measures of bed capacity or actual patient flows
  - Assigns patients to hospital markets based on exogenous variable (zip code of residence), rather than endogenous (actual hospital of admission)
  - Use a weighted average (by hospital's expected share of patients) of the HHIs from above

3. Use HHI* to predict outcomes

$$\ln(R_{ikt}) = \delta_k + \sigma_t M_k + U_{ikt}\phi + HHI_{kt}^{pat*} * I(1985 \vee 1988)\eta_{1980s} + HHI_{kt}^{pat*} * I(1991 \vee 1994)\eta_{1990s} + OMC_{kt} * I(1985 \vee 1988)\psi_{1980s} + OMC_{kt} * I(1991 \vee 1994)\psi_{1990s} + \xi_{ikt},$$

- $\boldsymbol{\delta}$ = zip code fixed effect
- $\boldsymbol{\sigma}$ = time fixed effect, for zip code k
- M = size of individual i's market
- U = patient observable characteristics
- OMC = market characteristics

TABLE IV

Effects of Hospital Competition on Expenditures and Outcomes for Elderly AMI Patients, HHI^{pat*} versus Conventional 75 Percent-Patient-Flow HHI, Pre- and Post-1990

	Using HHI^{pat*}				Using conventional 75-percent patient-flow *HHI*			
	1-year hospital expenditures	1-year mortality	1-year AMI readmit	1-year HF readmit	1-year hospital expenditures	1-year mortality	1-year AMI readmit	1-year HF readmit
Pre-1990 effects of competition and capacity (omitted category = very low HHI)								
Very high HHI	−2.18	0.84	0.58	−0.03	−13.14	2.25	−0.02	−0.16
	(1.04)	(0.67)	(0.32)	(0.39)	(0.62)	(0.39)	(0.19)	(0.22)
High HHI	0.44	0.15	0.34	−0.07	−8.01	1.37	0.23	−0.05
	(0.88)	(0.57)	(0.27)	(0.33)	(0.53)	(0.33)	(0.16)	(0.19)
Low HHI	1.05	0.88	0.11	−0.08	−6.07	1.31	0.03	0.07
	(0.69)	(0.44)	(0.20)	(0.25)	(0.46)	(0.29)	(0.14)	(0.17)
Bed capacity/ AMI patient	4.53	0.31	−0.12	0.03				
	(0.22)	(0.14)	(0.07)	(0.08)				
Post-1990 effects of competition and capacity (omitted category = very low HHI)								
Very high HHI	8.04	1.46	0.54	−0.43	−1.12	1.81	0.24	0.10
	(1.08)	(0.69)	(0.33)	(0.40)	(0.62)	(0.38)	(0.18)	(0.23)
High HHI	4.43	0.46	0.23	−0.30	−0.97	1.64	0.39	0.30
	(0.91)	(0.57)	(0.28)	(0.34)	(0.55)	(0.34)	(0.17)	(0.20)
Low HHI	3.25	0.65	0.16	−0.24	−1.51	0.60	0.38	0.34
	(0.70)	(0.44)	(0.21)	(0.26)	(0.48)	(0.29)	(0.14)	(0.18)
Bed capacity/ AMI patient	1.73	0.42	−0.23	−0.23				
	(0.27)	(0.17)	(0.08)	(0.10)				

TABLE IV

EFFECTS OF HOSPITAL COMPETITION ON EXPENDITURES AND OUTCOMES FOR ELDERLY AMI PATIENTS, *HHI*^{pat*} VERSUS CONVENTIONAL 75 PERCENT-PATIENT-FLOW HHI, PRE- AND POST-1990

	Using *HHI*^{pat*}				Using conventional 75-percent patient-flow *HHI*			
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- Pre-1990, competition led to higher costs and, in some cases, lower rates of adverse outcomes

Reference level is very low HHI, and recall that lower HHI generally means higher competition

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- After 1991, competition led to both substantially lower costs and significantly lower rates of adverse outcomes
- *"Compared with patients in the most competitive areas, patients from the least competitive areas experienced 1.46 percentage points higher mortality from AMI."*
- They also look at how rise of HMOs could have influenced this change post 1991

Reference level is very low HHI, and recall that lower HHI generally means higher competition

Why the difference between HHI* and HHI?

- Bias due to assigning hospital market competitiveness to patients based on actual hospital of admission (as opposed to predicted hospital)
  - Hospitals facing more competition produce higher quality care, and thus draw unobservably high-cost patients
  - Hospitals that are high-cost and high-quality draw patients from a broader area

Major question/issue

assessments of the impact of competition. In this paper we develop models of the effects of hospital competition on costs and health outcomes for all nonrural elderly Medicare recipients hospitalized for a treatment of a new heart attack (AMI) in 1985–1994. We identify the effects of hospital market competition with a relatively exogenous source of variation—travel distances between patients and hospitals—that depends neither on unobserved characteristics of patients nor on unobserved determinants of hospital quality. Based on this identifying assumption, we construct geographic hospital markets that have variable size, and continuous rather than discrete boundaries. We also explore

- Is distance to hospital truly exogenous? Could sicker individuals choose to live closer to major hospitals / better hospitals / more competitive hospitals?

Idea for future research

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Today, Children's is one of the richest pediatric health care systems in the country, the AJC found. Hefty increases in net revenue from patient services over the years, combined with solid investment earnings and generous donations from fundraising, have given Children's unrestricted cash reserves that last year stood at more than $6 billion and has grown even larger this year. In recent years, such riches at other nonprofit hospitals have prompted state and federal lawmakers to question whether the hospitals do enough for their communities to justify their tax exemptions.

- Use their HHI measure to determine how competition amongst pediatric hospitals impacts quality of care measures and hospital spending