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Can Competition Save Your Life?

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1. Introduction

During the past decade the hospital industry introduced profound organizational changes, including the extensive consolidation of hospitals through the mergers and formation of hospital systems. In addition, faced with falling profit margins, hospital industry saw an unprecedented wave of hospital closures and loss in operative capacity (Hsia et al. 2011). Both trends tend to decrease the existing competitive pressures for hospitals in the market.

This Chapter will investigate whether changes in competition in hospital markets tangibly affect health outcomes as measured by risk adjusted mortality rates after coronary artery bypass grafting (CABG) surgery. In this kind of surgery, a vein or artery from another part of the body is used to create a new path for blood to flow to the heart, bypassing the blocked artery. Since CABG is typically not an emergency but a scheduled procedure, hospital competition (based on health outcomes) is more likely to affect mortality rates and other measures of quality than in emergency cases where both the patients and treating physicians have limited hospital choices.

Economic theory predicts that concentration of market power leads to higher prices. This may or may not hold true in the healthcare industry due to the prevalence of public insurance, managed care pressures, as well as the prevalence of nonprofit hospitals. Moreover, higher hospital prices may signal higher quality. Thus, policy makers' attempts to make health care markets more competitive and to depress reimbursements may not necessarily lead to welfare improvements. The study results in this Chapter will contribute to the existing literature by shedding more light on the relationship between hospital competition and health outcomes as measured by risk adjusted mortality rates. If hospitals located in less competitive markets exhibit inferior health outcomes, then the case for promoting competition through antitrust enforcement and support of failing hospitals is strengthened.

2. Background

2.1 Existing literature

Previous literature does not provide a clear guidance as to the effects of hospital competition on health outcomes. For example, Propper et al. (2004) examined the relationship between hospital competition and mortality rates after emergency acute myocardial infraction (AMI). They find that higher competitive pressures in Britain's National Health Service actually increased mortality rates for AMI after controlling for patient mix and other observed characteristics of the hospital and its market area. Similarly, using a longer panel of

hospitals Propper et al. (2008) find a negative relationship between hospital competition and AMI mortality but they find that competition does decrease waiting times. The study concludes that hospitals in UK decreased unobservable dimensions of quality (such as patient outcomes) but improved observed waiting times. On the other hand, Shortell and Hughes (1988), Ho and Hamilton (2000) find no significant relationship between hospital competition and hospital quality. For example, Ho and Hamilton (2000) found that mergers increased 90-day readmission rates and early discharges for newborns for Mei-Cal patients but did not affect inpatient mortality rates.

In contrast to above mentioned findings, Sari (2002) and Kessler and McClellan (2000) show that hospital competition improves health outcomes along several important quality dimensions. Unlike UK studies above, Kessler and McClellan (2000) examined the effect of competition on AMI outcomes for Medicare patients and found higher AMI mortality rates when competition for Medicare patients decreased. Most recently, Gaynor and colleagues (2011) estimated the effect of moving from a market with 2.5 hospitals to one with 5 hospitals and find that such improvement in competition would result in about 55,000 more life years.

It is important to note that different patients may be affected differently by competition. Kessler and Geppert (2005) examined the effect of hospital competition on more and less severely ill patients. They show that higher competitive pressures improve health outcomes (and lead to higher costs of treatment) for severely ill patients but do not affect less severely ill patients. Finally, Gowrisankaran and Town (2003) and Schneider (2008) have found that hospital competition improves quality but these quality improvements are not always realized depending on Medicare penetration and hospital ownership status.

2.2 Importance of the study

CABG surgery is the most common surgical procedure for treating cardiovascular disease. Coronary artery disease is the leading cause of all adult non-maternal admissions to California hospitals, representing nearly 9% of all admissions (OSHPD). This study contributes to the existing research along several dimensions. First, we focus on 30 day mortality rates and risk adjusted mortality rates following CABG surgery, while the previous literature for this surgery only examined in-hospital mortality rates (Schneider 2008). Second, we use the hospital quality data from the time period when such reporting became mandatory rather than voluntary. Thus, relative to previous literature based on OSHPD data, there is less scope for hospital self-selection since all high and low quality hospitals have to report their mortality statistics to OSHPD. Lastly, the study attempts to examine the relationship between hospital-specific *changes* in CABG mortality rates and *changes* in market competition. We hope to gage whether changes in competitive pressures are responsible for changes in mortality statistics across hospitals.

3. Methods

Empirical model and data sources are presented below.

3.1 Empirical model

The following model is used in this study:

$$\log(\Delta EM_i)_{nt} = \beta_0 + \beta_1(\Delta HHI)_i + \beta_2(Hospital)_i + \beta_3(\Delta Market)_i + \alpha_i + \varepsilon_i \quad (1)$$

where ΔEM represents changes in excess mortality between 2007 and 2003 for hospital i. Excess mortality is defined as the ratio between the observed mortality rate and the predicted rate. We estimate (1) using generalized linear model (GLM) separately for excess mortality and risk adjusted mortality rate relative to the state average.

Coefficient of interest is β_1 where *HHI* represents Herfindahl-Hirschman index (HHI) that measures hospital competition; the index is constructed based on available bed shares and CABG volume, to test whether our results are sensitive to the product definition. HHI is inversely related to competition and therefore we expect lower HHI to decrease excess mortality if competition indeed saves lives. We use hospital service area (HSA) as the relevant hospital market. Unlike market definitions based on geo-political borders (e.g., county), the HSA relies on patient flows.

It is important to note that HHI can be calculated based on patient flows as well as political boundaries (such as county or MSA). However, a recent study by Wong et al. (2005) calculated hospital competition index using county, MSA, health service area (as done in this study), fixed radius and variable radius measures. They found that the method of constructing HHI did not affect their estimates of the effect of competition on hospital costs. We believe that our two alternative measures of HHI will capture the effect of competition on patient outcomes although the magnitude of the effect may be different, as was found by Wong et al. (2005).

We also control for hospital characteristics and other market characteristics, as follows: the hospital characteristics include ownership, church affiliation, teaching status, hospital size, ER, trauma unit and disproportionate share hospital status. Hospital size is measured as the number of staffed beds. Teaching status is defined as hospitals with some residents. We do control for the disproportionate share hospital status since hospitals with such designation serve a disproportionately high number of medically indigent patients. Hospital market characteristics reflect competitive pressures (HHI), area characteristics (percent uninsured and per capital income) and demand for community benefits (percent MediCal enrollment).

3.2 Data

This study uses hospital data from the Hospital Annual Financial Disclosure Reports filed annually by all California hospitals with the Office of Statewide Health Planning and Development (OSHPD). Hospital data will be merged with risk adjusted mortality rates that are based on the California Coronary Artery Bypass Graft (CABG) Mortality Reporting Program (CCMRP). Mortality rates are adjusted for patient characteristics: age, gender, body mass index, acuity (elective, urgent, emergent or salvage) as well as for the secondary conditions (such as hypertension, diabetes, etc.). Two mortality rates have been calculated. Observed mortality rate is the ratio of the number of deaths and the CABG cases multiplied by 100. Expected mortality rate is the ratio of the number of expected deaths to CABG cases multiplied by 100; expected mortality rate is risk adjusted. In this study we calculate excess mortality as the ratio of observed to expected mortality rate. When excess mortality ratio is greater than 1.0, that indicates that there were more deaths at the hospital than would have been expected. A ratio less than 1.0 indicates that there were fewer deaths at a hospital than expected, given the case mix of patients treated at a hospital (CCMRP). Finally, we use risk

adjusted mortality rate which is obtained by multiplying the observed annual California state average mortality rate by a hospital's excess mortality ratio for that year.

In this study we used 479 California general acute care hospitals in 2003 and 456 hospitals in 2007 to compute HHI based on available beds. Then we reduced our sample to CABG performing hospitals to calculate HHI based on CABG surgeries. This definition of hospital competition uses a more narrow market definition since hospitals are assumed to compete only with other CABG performing hospitals. For our regression analysis, our sample was reduced to 109 hospitals that were performing CABG in both 2003 and 2007.

Variable	Mean (St. deviation)	Minimum	Maximum
Excess mortality in 2003	1.0869 (0.687)	0	3.0372
Excess mortality in 2007	1.0570 (0.955)	0	7.457
Differences in excess mortality (2003-2007)	0.00936 (1.062)	-4.419	2.154
Risk adjusted mortality rate, 2003	3.156 (1.995)	0	8.81
Risk adjusted mortality rate, 2007	2.463 (2.246)	0	17.52
Differences in risk adjusted mortality rates (2003-2007)	0.621 (2.685)	-8.71	6.26
HHI, based on available beds, 2003	790.939 (621.272)	177.818	2545.682
HHI, based on available beds, 2007	603.411 (355.959)	181.108	1235.981
HHI differences, HHI based on available beds (2003-2007)	185.611 (344.853)	-111.175	1352.938
HHI, based on CABG volume, 2003	2297.811 (2058.170)	633.475	7847.276
HHI, based on CABG volume, 2007	1783.738 (1204.323)	613.0733	5235.165
HHI differences, HHI based on CABG volume (2003-2007)	512.0731 (1393.311)	-331.8247	5252.218

Table 1. Descriptive Statistics for Selected Variables

Table 1 shows that on average the hospitals in California experienced a decrease in both excess mortality and risk adjusted mortality rates between 2003 and 2007. Since our dependent variable measures the differences in excess mortality between 2003 and 2007, the higher the difference the greater the fall in excess mortality and risk adjusted mortality rates. Thus, our dependent variables measure improvements in health outcomes.

Between 2003 and 2007 the number of hospitals in California decreased by 4.8%. Although some hospitals saw an increase in competition and some hospitals saw a decrease in

competition, on average the hospital competition index actually decreased between 2003 and 2007. This decrease indicates that hospital markets became more competitive despite the decrease in the number of hospitals that operate in California and this holds true for both measures of hospital competition. Since HHI does not simply measure the number of hospitals but rather hospital market shares, this means that with fewer hospitals in the market hospital shares became more equal. In this study we look at differences between 2003 and 2007; the higher the difference, the higher the increase in competition for the hospital market.

If competitive pressures indeed improve health outcomes, we expected changes in HHI to have a positive effect on changes in health outcomes.

4. Empirical results

Our regression results are presented in Table 2 below.

Empirical results indicate that higher competitive pressures translate into better health outcomes as measured by decreases in excess mortality as well as decreases in risk adjusted mortality rates relative to the state average. Results are statistically significant at the 10% level for most specifications of the model. Although hospitals in the United States may not compete based on price due to high prevalence of public insurance and high prevalence of nonprofit hospitals in the industry, competition based on quality may be relatively more important, especially as public insurance coverage is being expanded after the passage of the Patient Protection and Affordable Care Act of 2010.

Other important variables include hospital ownership status. Although there is no statistically significant relationship between mortality rates in for-profit and nonprofit hospitals, the nonprofit hospitals saw the same or smaller improvements in mortality than for-profits between 2003 and 2007. Municipal hospitals (city and county hospitals) show higher risk adjusted mortality rates and Table 2 shows that they saw smaller improvements in mortality rates even after we controlled for CABG volume and area characteristics.

Although we do not see a statistically significant relationship between CABG volume and health outcomes, alternative specifications of the volume variable yield a better fit. For example, square root of volume has a statistically positive effect on mortality improvements (result not shown). This indicates that initial increases in CABG volume improve outcomes but this improvement, interestingly, increases at a decreasing rate. We also did not find a significant relationship between increases in the number of CABG surgeries performed and mortality statistics. This result is consistent with the previous research that shows that over time, the disparity in outcomes between low- and high-volume hospitals has narrowed as outcomes have improved significantly for all hospitals (Ho, 2000).

Finally, the effect of hospital competition on health outcomes can be ambiguous since higher competitive pressures may potentially decrease the volume of surgeries that each hospital performs. If higher-volume hospitals, in fact, deliver better quality of care, competition may be undesirable. In our model we measure the effect of hospital competition holding CABG volume constant. Thus, we re-estimate our model without the effect of CABG volume. We find that even in this specification of the model the relationship between the hospital competition (as measured by HHI) holds.

Variable	Excess mortality differences (2003-2007)	Excess mortality differences (2003-2007)	Risk adjusted mortality rates differences (2003-2007)	Risk adjusted mortality rates differences (2003-2007)
Competition measures				
HHI differences, HHI based on available beds (2003-2007)	0.000657* (0.000397)	-	0.00170* (0.000995)	
HHI differences, HHI based on CABG volume (2003-2007)	-	0.000135 (0.0000978)		0.000361* (0.00220)
Hospital Characteristics				
CABG volume	-0.160 (0.138)	-0.138 (0.138)	-0.455 (0.345)	-0.397 (0.345)
Staffed beds	0.295 (0.243)	0.372 (0.242)	0.915 (0.607)	1.114* (0.607)
Church affiliation	0.564 (0.380)	0.696* (0.371)	1.562* (0.950)	1.908** (0.930)
Nonprofit, investor owned	-0.473 (0.304)	-0.509* (0.304)	-1.199 (0.761)	-1.295* (0.761)
Nonprofit, other	-0.864 (0.706)	-0.735 (0.712)	-2.434 (1.766)	-2.106 (1.784)
Municipal	-0.993** (0.452)	-1.074** (0.451)	-2.490** (1.131)	-2.702** (1.129)
Trauma unit	0.0868 (0.126)	0.0885 (0.126)	0.231 (0.314)	0.235 (0.316)
Emergency room	-0.205 (0.426)	-0.244 (0.428)	-0.608 (1.0668)	-0.709 (1.071)
Teaching	0.0887 (0.125)	0.0810 (0.126)	0.180 (0.314)	0.160 (0.314)
Disproportionate share hospital	-0.199 (0.265)	-0.242 (0.267)	-0.389 (0.663)	-0.498 (0.668)
Market characteristics				
Uninsured	-0.483 (0.829)	-0.0440 (0.841)	-1.265 (2.074)	-0.133 (2.107)
Per capital income	0.275 (0.604)	0.293 (0.609)	0.718 (1.511)	0.756 (1.525)
Percent Medical	0.157 (0.155)	0.0228 (0.131)	0.358 (0.389)	0.00774 (0.329)
Constant	-3.899 (8.567)	-3.611 (8.584)	-10.434 (21.438)	-9.623 (21.499)

Notes: * indicates significance at p<0.1 level, ** indicates significance at p< 0.05 level. All continuous variables are in the log form.

Table 2. Determinants of excess mortality differences (standard errors are in parentheses)

5. Limitations of the study

In this study we concentrate only on clinical outcomes as measured by risk adjusted mortality rates. Previous research by Gaynor and Vogt (2000) point out that patient and physician preferences may be the driving force in hospital competition. In response to patient preferences, some hospitals may compete along both clinical and nonclinical dimensions. Some hospitals may respond to competitive pressures by offering private rooms with televisions and private phones, hotel-like lobbies and waiting rooms (Lindrooth 2008). Improvements in such amenities may be important to patients but they are not addressed in this study.

6. Conclusions and policy implications

This study estimates the effect of changes in hospital competition on risk adjusted measures of hospital outcomes as measured by risk adjusted mortality rates. Using the data from the Office of Statewide Health Planning and Development of the State of California for the period 2003-2007 we find that hospitals that saw higher competitive pressures also experienced greater improvements in health outcomes as measured by mortality statistics following Coronary Artery Bypass Graft (CABG) surgery. Although higher competition in hospital markets may not affect health care prices due to the presence of the third-party payers, it does translate into quality competition and better health outcomes.

A review of health care consolidation trends by Goldberg (1999) indicates that consolidation is likely to continue at a rapid pace. Such consolidation can have a negative effect on health outcomes if it leads to increases in market power. Results of this study show that a decrease in the number of hospitals may not necessarily decrease hospital competition index as measured by HHI. Increases in HHI (i.e. decreases in hospital competition) significantly decrease quality of care as measured by risk adjusted mortality rates. In addition, Dranove and White (1994) estimated a trend beginning in the mid-1980s in which higher hospital competition lowered prices and cost of care. Similar results were found by Gaynor and Haas-Wilson (1999) and Keeler et al. (1999). Mounting empirical evidence leads us to conclude that hospital competition improves quality of care and lowers cost of care and prices, thus improving patient welfare.

Our results imply that overtime both technological improvements and antitrust policies will play a role in determining improvements in hospital quality. Antitrust analysis of the hospital industry should incorporate the potential effects of pro-competitive policies on health outcomes since such policies may in fact save lives.

7. References

Dranove D, White WD. Recent Theory and Evidence on Competition in Hospital Markets. *Journal of Economics and Management Strategy* 1994 3(1):169-209.

Gaynor M, Haas-Wilson D. Change, Consolidation, and Competition in Health Care Markets. *Journal of Economic Perspectives* 1999 13(1): 141-164.

Gaynor M, Moreno-Serra R, Propper C. Competition Could Substantially Benefit Healthcare. *BMJ* 2011 343:d4727.

Gaynor M, Vogt WB. Antitrust and Competition in Health Care Markets. In *Handbook of Health Economics* 2000 AJ Culyer, Newhouse JP, eds. Amsterdam: Elsevier.

Goldberg (1999)

Gozvrisankaran G, Town RJ. Competition, payers, and hospital quality. *Health Services Research* 2003 Dec;38(6 Pt 1):1403-21.

Ho V, Hamilton BH. Hospital mergers and acquisitions: does market consolidation harm patients? *Journal of Health Economics* 2000 Sep;19(5):767-91.

Ho V. Evolution of the volume-outcome relation for hospitals performing coronary angioplasty. *Circulation*. 2000 Apr 18;101(15):1806-11.

Hsia RY, Kellermann AL, Shen YC. Factors associated with closures of emergency departments in the United States. *JAMA*. 2011 May 18;305(19):1978-85.

Keeler E, Melnick G, Zwanziger J. The Changing Effects of Competition on Non-Profit and For-Profit Hospital Pricing Behavior. *Journal of Health Economics* 1999 18(1):69-86.

Kessler DP, Geppert JJ. The Effects of Competition on Variation in the Quality and Cost of Medical Care. *Journal of Economics and Management Strategy* 2005 14(3): 575-589.

Kessler DP, McClellan M. Is Hospital Competition Socially Wasteful? *Quarterly Journal of Economics* 2000 115(2) 577-615.

Lindrooth RC. Research on the Hospital Market: Recent Advances and Continuing Data Needs. *Inquiry* 2008 45: 19-29.

Propper C, Burgess S, Gossage D. Competition and Quality: Evidence From the NHS Internal Market 1991-9. *The Economic Journal* 2008 118: 138-170.

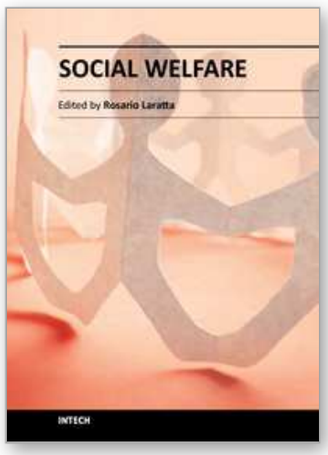
Propper C, Burgess S, Green K. Does competition between hospitals improve the quality of care? Hospital death rates and the NHS internal market. *Journal of Public Economics* 2004 88:1247-72.

Sari N. Do Competition and Managed Care Improve Quality? *Health Economics* 2002 11(7):571-584.

Shortell SM, Hughes EF. The effects of regulation, competition, and ownership on mortality rates among hospital inpatients. *N Engl J Med*. 1988 Apr 28;318(17):1100-7.

Schneider H. Incorporating health care quality into health antitrust law. *BMC Health Services Research* 2008 Apr 22;8:89.

Wong HS, Zhan C, Mutter R. Do Different Measures of Hospital Competition Matter in Empirical Investigations of Hospital Behavior? *Review of Industrial Organization* 2005 26:61-87.



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"Social Welfare" offers, for the first time, a wide-ranging, internationally-focused selection of cutting-edge work from leading academics. Its interdisciplinary approach and comparative perspective promote examination of the most pressing social welfare issues of the day. The book aims to clarify some of the ambiguity around the term, discuss the pros and cons of privatization, present a range of social welfare paradoxes and innovations, and establish a clear set of economic frameworks with which to understand the conditions under which the change in social welfare can be obtained.

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