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THE COMPETITIVE EFFECTS OF NOT-FOR-PROFIT HOSPITAL MERGERS: A CASE STUDY*

MICHAEL G. VITA† AND SETH SACHER‡

Applying conventional horizontal merger enforcement rules to nonprofit hospitals is controversial. Critics contend that the different objective function of not-for-profits entities should mitigate competitive concerns about mergers involving nonprofit hospitals. We analyze a merger that reduced the number of competitors (both nonprofit) in the alleged relevant market from three to two. We find that the transaction was followed by significant price increases; we reject the hypothesis that these price increases reflect higher post-merger quality. This study should help policymakers assess the validity of current merger enforcement rules, especially as they apply to not-for-profit enterprises.

I. INTRODUCTION

ALTHOUGH RESEARCHERS have made innumerable attempts to analyze the relationship between competition (as proxied by concentration) and performance (e.g., price), empirical evidence on the actual competitive effects of horizontal mergers is scarce. Perhaps this is not surprising. When assessed by contemporary antitrust standards, most mergers (even most horizontal mergers) do not present a serious risk of competitive harm. The handful that do typically either will be blocked in their entirety, or approved conditional on the completion of some remedial action (e.g., the divestiture of a critical competitive asset to a third party) designed to ameliorate the risk of competitive harm. Hence, candidates for the study of (plausibly) anticompetitive mergers will arise only infrequently; when, for example, the enforcement agencies lose a merger challenge in court, obtaining no competitive relief, or when the enforcement agencies do not challenge a transaction for reasons unrelated to the transaction's perceived competitive effects.

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† Author's affiliation: US Federal Trade Commission, 600 Pennsylvania Ave., N.W., Washington, DC 20580, USA.
email: mvita@ftc.gov

‡ Charles River Associates, 600 13th St., N.W., Suite 700, Washington, DC 20005, USA.
email: sbs@crai.com

This paper takes advantage of one of these rare opportunities.[1] We provide an econometric analysis of a horizontal merger in a concentrated hospital market, Dominican Santa Cruz Hospital's acquisition of its sole rival in the city of Santa Cruz, California, AMI-Community Hospital. According to the FTC, only two competitors—both not-for-profit—remained in the relevant market after the transaction.[2] Absent substantial efficiencies, or a credible threat of entry, standard antitrust analysis would predict that an increase in concentration of this magnitude likely would lead to higher equilibrium prices for both competitors. Consequently, this transaction would have been challenged by the FTC, had the Commission been able to intervene before the transaction was completed.[3] However, because the transaction was too small (in absolute size) to trigger the Hart-Scott-Rodino filing thresholds, the FTC did not receive prior notification of the transaction, and the parties were able to consummate the acquisition before the FTC could seek a preliminary injunction. Ultimately, the FTC entered into a consent order with Dominican Hospital, but the decree required only that Dominican notify the Commission prior to any further acquisitions in the relevant geographic market—it did not restore the premerger market structure. For this reason, this acquisition provides an excellent opportunity to assess, *ex post*, the actual, as opposed to the predicted, competitive consequences of a horizontal merger.

This study should be of interest for at least two reasons. First, as noted, empirical studies of the price effects of horizontal mergers are comparatively rare, notwithstanding their apparent importance to appraising the efficacy of federal merger enforcement policy. Studies such as this should help policymakers assess whether the enforcement decision rules embodied in the *Merger Guidelines* predict with an acceptable degree of accuracy the competitive consequences of actual horizontal mergers.

Second, and more specifically, the applicability to hospital markets of the antitrust agencies' approach to horizontal merger analysis (i.e., the *Merger Guidelines*) recently has been called into question. A substantial share of hospital output (approximately 90%) is produced by private and public nonprofit hospitals. Critics have contended that the antitrust agencies and courts have assumed that these not-for-profit providers seek maximum profits, notwithstanding the substantial body of theoretical and

[1] Both the Federal Trade Commission and the Department of Justice have unsuccessfully challenged other horizontal hospital mergers. However, these transactions are less amenable to empirical analysis than the Dominican Santa Cruz-Community merger because (1) the transactions are too recent to allow measurement of post-merger market performance, and/or (2) reliable price data do not exist.

[2] See Complaint *In the Matter of Santa Cruz Hospital, et al.* 188 F.T.C. 382 (1994).

[3] See Statement of Chairman Janet D. Steiger in Support of Final Issuance of Consent Order *In the Matter of Dominican Santa Cruz Hospital, et al.* 118 F.T.C. 382 (1994).

empirical analyses suggesting that nonprofit entities—or more specifically, certain types of nonprofit entities—will eschew opportunities to profitably exercise market power.[4] For example (see Lynk [1995], pp. 440–41), it is conceivable that a private nonprofit hospital sponsored and administered by the local community, might function something like a consumer cooperative. If so, the incentives of producers and consumers would be aligned, and any incentives the hospital might otherwise have to raise prices anticompetitively would be attenuated. Alternatively, the behavior of a nonprofit hospital whose profits are used to fund some particular set of activities valued by the firm's managers—e.g., providing charity care to the poor——might be indistinguishable from that of an identically situated for-profit entity.

Whether the (potentially) different incentive structure of not-for-profit hospitals could attenuate the exercise of market power is of more than just academic interest. The courts that must adjudicate horizontal merger challenges also have found such arguments compelling. In at least one case,[5] a US Federal District Court found that the nonprofit, community-sponsored status of the merging parties was an important factor in rebutting an otherwise convincing *prima facie* case against the merger of two rival hospitals.

The transaction analyzed here provides an excellent opportunity to explore these possibilities. The acquiring entity (Dominican Santa Cruz Hospital) is part of a chain of Catholic hospitals operating in the western United States. Its sole remaining rival in Santa Cruz county, Watsonville Community, is a locally-sponsored community hospital. According to the arguments set forth above, Watsonville Community would appear to be the type of nonprofit hospital least prone to exercise market power; any such propensity to charge competitive prices would, moreover, place a powerful post-merger competitive constraint on Dominican's ability to raise prices. Consequently, an analysis of both entities' post-merger pricing behavior should provide a valuable insight into the behavior of nonprofit producers.

II. PREVIOUS STUDIES OF HOSPITAL COMPETITION

Many studies of hospital competition have been carried out using a variant of the 'Structure-Conduct-Performance' (S-C-P) paradigm. Early (i.e., pre-1983) studies frequently found a *negative* relationship between hospital

[4] See Lynk [1995] for a more detailed review of the relevant theory and evidence.

[5] See *F.T.C. v. Butterworth Health Corporation and Blodgett Memorial Medical Center* (US District Court, Western District of Michigan, Southern Division), September 26, 1996, slip. op. at 27.

concentration and costs,[6] which usually was interpreted as evidence of insurance-induced moral hazard. Studies using data from the mid–1980s and after typically found a *positive* relationship between concentration and price.[7]

While suggestive, these price-concentration studies do not provide direct evidence of the effects of hospital mergers. One problem with drawing inferences about the competitive effects of mergers from this literature is that the results are almost surely sensitive to the way the geographic markets are defined, since this definition will determine the value of the concentration index.[8]

An alternative empirical strategy for assessing the consequences of merger-induced changes in market structure is to examine directly, through a comparison of the pre- and post-merger prices charged by the merged entity (and, perhaps, its plausible rivals). This 'event study' approach obviates the necessity of defining the 'relevant market.' If the merger creates market power, then (after suitably controlling for other possible shifts in the exogenous determinants of price) one should observe the merged entity raising its price post-merger. It is unnecessary to identify the relevant market to carry out this test—at minimum, one requires only data for the merged entity.

Early applications of the event study method (e.g., Barton and Sherman [1984]; Kim and Singal [1993]) used a relatively simple specification: they analyzed movements in the price of the product affected by the merger, relative to the price of a substitute product hypothesized to face similar demand and cost conditions, but unaffected by the merger. The equality of pre- and post-merger prices was then tested using a simple t test. Later implementations of the event study method (e.g., Schumann *et al.* [1992, 1997]) used a somewhat different approach—they estimated a price equation with data spanning the pre- and post-merger periods.[9] The competitive effect of the transaction was captured with a dummy variable set equal to one for the post-merger period. This method is potentially problematic if there are unobserved exogenous determinants of price that are correlated with the merger dummy. If so, the merger coefficient would reflect the competitive effects of the transaction, as well as movements in

[6] For a comprehensive review of this literature see Pautler and Vita [1994]. For seminal works see Joskow [1980] and Robinson and Luft [1985].

[7] See, e.g., Dranove *et al.* [1993]; Melnick *et al.* [1992]; Keeler, Melnick and Zwanziger [1999]; and Simpson and Shin [1998].

[8] For example, see Kessler and McClellan [1999] and Werden [1989]. Only the former have offered an alternative method for defining antitrust markets. Although there seldom may be good practical alternatives to patient flow data, it is nonetheless true that antitrust markets defined on this basis may lead to incorrect conclusions about the competitive constraints faced by a particular pair of merging hospitals.

[9] The control variables consisted of demand and cost shifters.

these unobserved price determinants, leading one to incorrectly estimate the price effects of the transaction.

Below, we propose an empirical framework that combines elements of the Barton and Sherman, and Schumann *et al.* approaches. We believe that this strategy will provide the best method for identifying accurately the competitive effects of the acquisition. Before setting forth this empirical strategy, we first describe in greater detail the events of the Dominican-Santa Cruz transaction.

III. HISTORY OF THE TRANSACTION

On March 8, 1990, Dominican Santa Cruz Hospital ('Dominican'), a 259-bed, not-for-profit hospital, affiliated with the Catholic Healthcare West system, purchased the only other hospital in the city of Santa Cruz, AMI-Community Hospital ('Community'). Community, which was affiliated with American Medical International, was licensed for 180 beds and was a for-profit entity. Dominican and Community were located about two miles apart. Five months after the acquisition (August 1990), Community was converted completely to a nursing home/rehabilitation facility. The only other hospital in Santa Cruz county was Watsonville Community Hospital, located about 14 miles south of the city of Santa Cruz. The city of Santa Cruz is located about 40 miles south of San Jose, and 80 miles south of San Francisco. Santa Cruz county is bordered on the south and west by the Pacific ocean, and on the north and east by the Santa Cruz mountains.

Contemporaneous data on patient flows showed that the overwhelming majority (about 94%) of the three Santa Cruz county hospitals' patients resided in Santa Cruz county, and that most (about 97%) Santa Cruz residents receiving inpatient hospital care received it from hospitals in that county.[10] The patient flow data also showed that very few—less than 2.5%—of the patients at the next closest set of competitors originated in Santa Cruz county.[11] In short, there was very little evidence to suggest that residents of Santa Cruz county regarded out-of-county hospitals as good substitutes for in-county hospitals, or that Santa Cruz county hospitals sought to attract patients from outside of the county. Accordingly, the FTC's complaint alleged that the relevant geographic market was 'Santa Cruz County and/or portions of Santa Cruz County.' Only two

[10] Nine Santa Cruz county ZIP codes account for over 80% of the privately insured inpatients at the two hospitals.

[11] The next closest competitors (Community Hospital of Los Gatos and Good Samaritan Hospital) were both located in Los Gatos (Santa Clara County). Both hospitals were approximately 25 miles (41 minutes driving time) from Dominican Santa Cruz Hospital. Watsonville Hospital, by contrast, was only 14 miles from Dominican (23 minutes driving time).

hospitals—Dominican and Watsonville Community—remained in this market post-merger. According to the Complaint, the merger increased the market share (of patient-days) of Dominican from 62% to approximately 73%, and increased the market share (of available beds) from 50% to 73%. The Herfindahl-Hirschman Index for the relevant antitrust market increased by over 1,700 points (from approximately 4,620 to approximately 6,350) when measured by patient-days; and by over 2,300 points (from approximately 3,770 to approximately 6,090) when measured by available beds. Under the *Merger Guidelines* enforcement criteria, a transaction generating concentration figures of this magnitude would be presumed anticompetitive. Absent compelling evidence that such a merger would create substantial efficiencies, or that the exercise of market power would be constrained by the threat of entry, normally the FTC would seek to preliminarily enjoin such a transaction.[12] Had the FTC had the opportunity to seek a preliminary injunction in this case, it would have done so.[13] However, as noted earlier, the small absolute size of the transaction failed to trigger the Hart-Scott-Rodino filing thresholds, and the FTC was not able to seek an enforcement action until after the transaction was completed.

In March, 1993, approximately three years after the merger was consummated, the FTC accepted a consent agreement with Dominican Santa Cruz Hospital and Catholic Healthcare West. The consent order did nothing to restore the pre-merger competitive environment; it required only that the respondents obtain the Commission's prior approval before acquiring any other hospitals in Santa Cruz County. Although all of the FTC Commissioners concluded that the merger probably had created significant market power, a majority of the FTC Commissioners concluded that the agency had few good remedies available to it.[14] The acquired hospital, Community, already had been converted to a skilled nursing/rehabilitative care facility. Thus, the effects of the merger could have been reversed only at considerable cost. Further, Sutter Health, a major Northern California hospital chain, had announced plans to construct an acute care hospital in Santa Cruz, and had already purchased a 3.8 acre

[12] According to the 1992 *Merger Guidelines* (§0.51(c)), 'the [FTC] regards markets [with HHIs above 1800] to be highly concentrated . . . [when] the post-merger HHI exceeds 1800, it will be presumed that mergers producing an increase in the HHI of more than 100 points are likely to create or enhance market power or facilitate its exercise.'

[13] As then-FTC Chairman Steiger observed at the time, '[t]he facts of this case provide sufficient reason to believe that this acquisition violates Section 7 of the Clayton Act. Ordinarily, such facts would lead the Commission to seek a preliminary injunction in federal district court.' See Statement of Chairman Janet D. Steiger in Support of Final Issuance of Consent Order *In the Matter of Dominican Santa Cruz Hospital, et al.* 188 F.T.C. 382 (1994).

[14] See Statements of Chairman Steiger, Commissioner Azcuenaga, and Commissioner Yao *In the Matter of Dominican Santa Cruz Hospital, et al.* 118 F.T.C. 382 (1994).

site toward that end.[15] The FTC reasoned that entry by this entity likely would already have occurred by the time divestiture could be completed, thereby moving the market closer to the pre-merger status quo more rapidly than could be accomplished through the FTC's administrative process. As it turned out, some time in the second quarter of 1996, Sutter Health opened the Sutter Maternity and Surgery Center with 30 licensed and 21 staffed beds.

IV. EMPIRICAL ANALYSIS: METHODS AND DATA

IV(i). *Basic Price Regressions*

We begin our empirical analysis by first presenting some basic descriptive information on the behavior of prices at the two remaining Santa Cruz county hospitals. Our measure of price is derived from data supplied by the Office of Statewide Health Planning and Development (OSHPD). For each quarter (1986 through 1996, inclusive) we calculate the average net revenue received per inpatient acute-care admission (or, alternatively, per patient day[16]) for privately insured patients.[17] Of course, hospitals provide numerous inpatient services, some of which may or may not be demand- or supply-side substitutes. Nevertheless, a single measure of inpatient price is consistent with the so-called 'cluster' approach to defining hospital product markets used in virtually all hospital merger investigations.[18]

[15] *Sacramento Business Journal*, March 16, 1992.

[16] All of the estimates carried out with dependent variables defined as per-day values are available at the *JIE* Editorial website.

[17] In the OSHPD data, there are various categories for both gross and net patient revenue. Net revenue is equal to a hospital's gross revenue minus any discounts that it offers. In the data, the *gross* revenue figures distinguish between inpatient and outpatient revenue, however, the *net* revenue figures do not. As noted by Dranove *et al.* 1993], failure to account for discounts seriously understates the effect of competition on price. Thus, several adjustments must be done in order to obtain estimates of net inpatient revenue from the gross inpatient data. While OSHPD has been collecting quarterly data from hospitals since approximately 1980, data prior to 1986 did not in any way distinguish revenue by payer group. As a result, observations from prior to 1986 were eliminated. For data from 1986 to 1992, net inpatient price was calculated by multiplying total net revenues from non-Medicare, non-Medicaid patients by the ratio of gross *inpatient* revenue to gross *total* revenue at the hospital. While this net revenue figure eliminates Medicare and Medicaid patients it does include revenue from some patients in various non-Medicaid indigent programs. This net revenue figure is then divided by discharges to obtain the average price paid per non-Medicare, non-Medicaid acute-care inpatient. We also adjusted the number of discharges by the ratio (total revenue-bad debt/total revenue) in order to account for bad debt.

For data after 1992, patient revenue for various indigent programs is reported in a separate category. In order to keep the observations consistent over time, revenue from this category was added to the revenue figures for commercially insured patients. Net price was then calculated using the same methodology as outlined for the 1986 to 1992 data.

[18] For a critical overview of the 'acute care inpatient' product market definition used in hospital merger investigations, see Sacher and Silvia [1998].

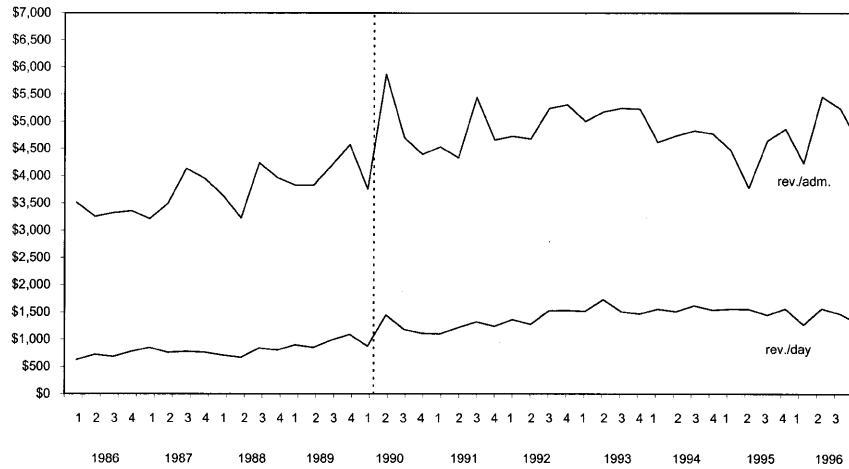

Figure 1
Quarterly Real Price per Admission and per Inpatient Day Dominican Hospital

It should be noted that the price series in Figure 1 does not include information on Community's prices. Normally, we would like to assess the competitive effects of a merger by examining the pre- and post-merger prices of both transaction partners. Unfortunately, that approach is not feasible here because Community was converted to a nursing home/rehab center shortly after the acquisition, and no post-transaction price data are available for it.[19] We have concluded, therefore, that the best available test of the impact of removing this competitive constraint on Dominican's pricing discretion is obtained from comparing Dominican's pre- and post-merger prices; accordingly, the regression results reported in Table III below are based on this comparison. However, to assess the robustness of these results, we also carried out all of regression analyses presented in Table III using (pre-merger) dependent and explanatory variables redefined as weighted averages of the values for Dominican and Community. Our principal findings are robust to this modification.[20]

Figures 1 and 2 depict the behavior of per-day and per-admission prices at Dominican and Watsonville hospitals for the entire sample period. The dashed vertical line indicates the quarter in which the merger occurred. Visual inspection of these series suggests that while there was an upward trend in real prices predating the transaction, prices did increase

[19] The conversion was completed by August 1990. OSHPD ceased reporting separate data for Community after the 1st quarter of 1990.

[20] We experimented with weights based on patient days, patient discharges, and inpatient revenue. All produced essentially the same results. The results reported at the *JIE* Editorial website are derived using inpatient revenue weights.

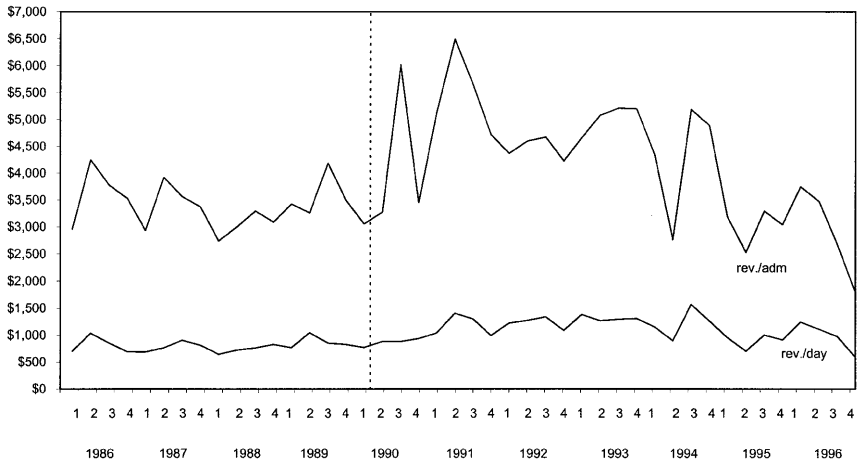

Figure 2
Quarterly Real Price per Admission and per Inpatient Day Watsonville Hospital

in the transaction's aftermath. This assessment is supported by the regression results reported in column (a) of Tables III and IV. Here we present simple regressions of price (real net revenue per admission) on a merger dummy variable (merge) and a time trend (time and time-squared).[21] These regressions suggest a substantial post-merger price increase at both Dominican and Watsonville, on the order of $700 and $1,800 respectively, even when the time trend is controlled for explicitly. We reject the null hypothesis of no merger effect at all conventional significance levels.

While the results contained in Tables III and IV are consistent with a merger-induced increase in price, obviously the simple specification on which they are based will fail to control for many of exogenous determinants of equilibrium prices (except to the extent that they follow a linear-quadratic time trend). If these omitted factors are correlated with merge we will improperly impute their effect to the merger. Similar to Schumann *et al.* (1992, 1997), we next attempt to estimate a more fully specified reduced form price equation.

IV(ii). *Reduced Form Price Equations*

To ensure that the observed price effect of the merger is not merely the

[21] As noted previously, all of the equations reported in the paper also have been estimated with the dependent variable computed on a per-inpatient day basis. In the fully specified version of the price equations, we find that the statistical significance of the coefficient on merge falls in the Dominican equation ($p = 0.18$), but increases in the Watsonville equation ($p = 0.07$).

result of omitted variable bias, it is necessary to control for factors that likely will affect the behavior of prices both over time and across hospitals. It is clear that the unit of output employed in this study—an inpatient discharge or inpatient day—is nonhomogeneous. Patient stays can and do vary substantially in terms of their resource intensity. Consequently, cross-sectional and intertemporal comparisons of the 'price' of this output are meaningless unless one controls somehow for this heterogeneity.

We employ several such controls. First, like other researchers (e.g., Simpson and Shin [1998]), we construct an index of hospital 'casemix.' The Healthcare Financing Administration (HCFA) assigns a 'caseweight' to each diagnostic related group (DRG).[22] This index measures the 'resource intensity,' used, on average, for each DRG relative to other DRGs and over time. The OSHPD discharge data set includes the date of discharge and DRG for each patient. Using these data, we created a quarterly casemix indicator for each hospital used in the empirical analysis. This was done as follows. Each non-Medicare/non-Medicaid discharge at each hospital for each quarter was weighted using the HCFA caseweight index for the relevant DRG. The weighted discharges were then summed and divided by the total number of discharges for each quarter at each hospital to obtain the casemix index.

As a further control for discharge heterogeneity, we also include the average length-of-stay for privately insured patients. The rationale for including this measure is straightforward—each additional day of hospitalization requires the consumption of additional labor and material resources. One cannot compare the price of a discharge across different time periods, or across different hospitals, unless one controls for variations in length-of-stay.

Equilibrium hospital prices also will be affected by exogenous changes in factor prices. We include two variables to control for these shifts. First, HCFA computes a wage index for all urban areas (a county or set of counties) based on the salaries and wages of various health care workers in the relevant locale. This index is used to adjust hospital payments under the Prospective Payment System (PPS) for Medicare. As an additional control variable, we include the BLS Producer Price Index for surgical and medical instruments and apparatus.

It is well-established empirically that the growth of managed care institutions (e.g., HMOs, PPOs) has facilitated more intense price competition among hospitals (e.g., Dranove, Shanley, and White [1993]; Kralewski *et al.* [1992]), as well as greater productive efficiency. Consequently, other things equal, we would expect to observe lower prices

[22] DRGs refer to a system of classifying patients based on medical diagnoses and surgical procedures. Originating at Yale University during the 1970s, the DRG system has been widely adopted by payers and providers as a way of classifying patients.

in markets where selective contracting by managed care organizations is more prevalent. Ideally, we would like to utilize some measure of the market share of managed care institutions in the relevant market. Unfortunately, such data are not readily available. As a proxy, we calculate for each hospital the percentage of total discharges for which the expected payment source is an HMO or other prepaid health plan.[23]

Similar to other empirical studies of hospital mergers (e.g., Lynk [1995], Simpson and Shin [1998]), we include a number of other variables to control for exogenous demand- and cost-side variation. These consist of per capita income, the county-level unemployment rate, county population density, share of admissions covered by Medicare, share of admissions covered by MediCal, and the Producer Price Index for medical and surgical equipment.

Last, we also control for the effects of the October 1989 northern California earthquake, which may have reduced (exogenously) Watsonville's productive capacity, leading to higher prices for reasons unrelated to the Dominican transaction. To capture the competitive effects of this event, we create a dummy variable (quake) equal to 1 for the 4th quarter of 1989 and all subsequent periods, and 0 otherwise. We also include a dummy variable (entry) indicating the entry of the small (21 bed) Sutter hospital in 1996.

We note that the earthquake dummy variable is potentially problematic for us, since it is highly collinear with the merger dummy. Essentially, there are only two quarters of data (1989:Q4–1990:Q1) that differentiate these two variables. This may make it difficult to estimate the respective effects of these two events on price with any precision.[24] That said, there are reasons to doubt that the quake actually had an economically significant impact on Watsonville's productive capacity. Whether measured by total patient days or total discharges, the OSHPAD data suggest that Watsonville's output actually increased in the aftermath of the quake.[25]

Column (b) of Tables III and IV presents the reduced form price regressions for Dominican and Watsonville, respectively. In the case of

[23] We recognize that this managed care index quite plausibly is an endogenous variable jointly determined with our price variable; as a consequence, its inclusion could induce simultaneous equations bias in our estimated coefficients. Accordingly, we estimate our equations both with and without this variable. None of our results are sensitive to this change in specification. These results are reported in full at the *JIE* Editorial website.

[24] We note, however, that in the several of the Watsonville regressions, the coefficients on both merge and quake are individually significant, suggesting that there is sufficient variation in the sample to accurately estimate both parameters.

[25] A regression of total patient days against a time trend and the quake dummy yields a coefficient on quake of 803.51 (s.e. = 480.65). A similar regression using total discharges yields a coefficient (standard error) on quake equal to 53.18 (182.24) The full regression results are available at the *JIE* Editorial website.

Dominican, adding these additional explanatory factors to the reduced form price equations leaves the coefficient on merge essentially unchanged (it actually increases slightly, from \$696/admission to \$749/admission), but it does increase the standard error of the estimate, from \$169 to \$474. The corresponding t statistic (1.61) leads one to reject the null hypothesis of no merger price effect at the $p = 0.12$ significance level. For Watsonville,

TABLE I
VARIABLE DEFINITIONS

Variable Name	Description
rprice_d	real net revenue per private admission, Dominican Hospital
rprice_w	real net revenue per private admission, Watsonville Hospital
rprice_p	real net revenue per private admission, peer group hospitals
rpday_d	real net revenue per private day, Dominican Hospital
rpday_w	real net revenue per private day, Watsonville Hospital
rpday_p	real net revenue per private day, peer group hospitals
expadm_d	real expense per admission, Dominican
expadm_w	real expense per admission, Watsonville
expadm_p	real expense per admission, peer group hospitals
expday_d	real expense per inpatient day, Dominican
expday_w	real expense per inpatient day, Watsonville
expday_p	real expense per inpatient day, peer group hospitals
length-of-stay_d	average length-of-stay, Dominican Hospital
length-of-stay_w	average length-of-stay, Watsonville Hospital
length-of-stay_p	average length-of-stay, peer group hospitals
medi-Cal share_d	share of admissions MediCal, Dominican Hospital
medi-Cal share_w	share of admissions MediCal, Watsonville Hospital
medi-Cal share_p	share of admissions MediCal, peer group hospitals
medicare share_d	share of admissions Medicare, Dominican Hospital
medicare share_w	share of admissions Medicare, Watsonville Hospital
medicare share_p	share of admissions Medicare, peer group hospitals
casemix_d	casemix index, Dominican
casemix_w	casemix index, Watsonville
casemix_p	casemix index, peer group hospitals
popdensity_p	population density, peer group counties
popdensity_s	population density, Santa Cruz County
hmo_d	share of admissions HMO insured, Dominican
hmo_w	share of admissions HMO insured, Watsonville
hmo_p	share of admissions HMO insured, peer group
income_s	real per capita income, Santa Cruz County
income_p	real per capita income, peer group counties
ppi_med	producer price index, medical and surgical instruments
unemploy_p	unemployment rate, peer group counties
unemploy_s	unemployment rate, Santa Cruz County
wage_d	HCFA wage index, Dominican
wage_w	HCFA wage index, Watsonville
wage_p	HCFA wage index, peer group
quake	= 1 for 4th quarter 1989 and after, 0 otherwise
merge	= 1 for 2nd quarter 1990 and after, 0 otherwise
entry	= 1 for 2nd quarter 1996 and after, 0 otherwise
time	time trend
timesquared	time trend squared

estimating the price effect of the merger using the expanded set of regressors reduces the estimated merger effect from $1,843 per admission to $496 per admission. In contrast to Dominican equation, the standard error on the merge coefficient falls with the addition of these regressors to the equation. In this specification, we reject the null hypothesis of no merger effect at the $p = 0.10$ significance level.

TABLE II
DESCRIPTIVE STATISTICS

Variable Name	Mean	Minimum	Maximum
rprice_d	4434.55	3212.89	5882.0
rprice_w	3897.98	1794.32	6490.128
rprice_p	5088.39	3526.29	6299.39
rpday_d	1192.75	623.53	1730.41
rpday_w	994.16	593.75	1566.64
rpday_p	1242.72	783.33	1626.55
expadm_d	4118.93	3212.4	4986.1
expadm_w	3343.72	2582.8	3969.6
expadm_p	4038.26	3185.02	4628.92
expday_d	719.92	497.07	962.92
expday_w	756.47	581.91	1064.58
expday_p	810.87	554.70	1116.33
length-of-stay_d	4.01	2.71	5.63
length-of-stay_w	3.99	2.71	6.79
length-of-stay_p	4.28	3.53	4.88
medi-Cal share_d	0.14	0.051	0.17
medi-Cal share_w	0.29	0.10	0.48
medi-Cal share_p	0.21	0.17	0.25
medicare share_d	0.39	0.33	0.44
medicare share_w	0.31	0.22	0.40
medicare share_p	0.39	0.36	0.42
casemix_d	0.85	0.75	1.04
casemix_w	0.76	0.67	0.87
casemix_p	0.94	0.84	1.06
popdensity_p	88.55	78.69	95.69
popdensity_s	516.96	486.10	539.57
hmo_d	0.25	0	0.50
hmo_w	0.06	0	0.25
hmo_p	0.13	0.05	0.23
income_s	16104.97	14464.69	17700.51
income_p	13214.04	12892.70	13504.33
ppi_med	121.19	107.27	131.27
unemploy_p	10.46	8.02	14.23
unemploy_s	8.35	5.37	13.83
wage_d	1.22	0.97	1.42
wage_w	1.20	0.97	1.39
wage_p	1.16	1.12	1.23
quake	0.659	0	1
merge	0.63	0	1
entry	0.11	0	1
time	22.5	1	44
timesquared	667.5	1	1936.0

TABLE III
DOMINICAN HOSPITAL PRICE AND EXPENSE REGRESSIONS
(STANDARD ERRORS* IN PARENTHESES)
Quarterly Data, 1986–96

	net rev./ admission (a)	net rev./ admission (b)	net rev./ admission (difference) (c)	exp./ admission (difference) (d)
merge	696.50‡	749.68	1005.49§	172.74
	(169.31)	(474.71)	(506.40)	(139.75)
income		−0.30†	−0.16	−0.27‡
		(0.12)	(0.22)	(0.07)
popdensity		−5.45	29.86	4.36
		(23.99)	(34.57)	(8.45)
unemploy		−72.30†	−36.61	16.61
		(31.26)	(55.09)	(31.19)
length-of-stay_d		486.26†	469.45†	39.81
		(177.77)	(178.71)	(65.01)
hmo_d		−683.03	−868.32	229.97
		(1021.00)	(1483.21)	(652.06)
casemix_d		−1609.06	1638.76	−857.21
		(1793.83)	(1355.49)	(968.89)
wage_d		−177.02	−603.42	−616.17†
		(390.12)	(905.70)	(297.87)
ppi_med		71.25	94.55	−34.73
		(70.36)	(87.17)	(38.73)
medicare share_d		3805.44	5191.34	−1409.13
		(2623.12)	(3122.95)	(1847.34)
medi-Cal share_d		1076.23	4752.39	1581.50
		(3032.58)	(3579.07)	(1862.95)
time	68.60‡	31.19	−170.48	−10.24
	(14.40)	(88.26)	(109.39)	(30.01)
timesquared	−1.18‡	−0.54	1.44	0.75†
	(0.25)	(1.00)	(0.96)	(0.34)
quake		263.89	207.52	407.36‡
		(290.56)	(302.42)	(143.69)
entry		634.83†	480.23†	334.38†
		(247.04)	(219.56)	(147.97)
intercept	3241.67‡	1110.79	−21598.48	2549.66
	(120.26)	(14136.84)	(19087.31)	(5076.65)

* Newey-West heteroskedasticity and autocorrelation consistent standard errors (lag length = 4)
† significant at $p < 0.05$
‡significant at $p < 0.01$
§ significant at $p < 0.10$.

TABLE IV
WATSONVILLE HOSPITAL PRICE AND EXPENSE REGRESSIONS
(STANDARD ERRORS* IN PARENTHESES)
Quarterly Data, 1986–96

	net rev./ admission (a)	net rev./ admission (b)	net rev./ admission (difference) (c)	exp./ admission (difference) (d)
merge	1843.47‡	495.92§	671.83§	79.27
	(433.58)	(287.58)	(399.48)	(176.02)
income		−0.54‡	−0.18	−0.22†
		(−0.15)	(0.21)	(0.08)
popdensity		−103.17‡	−51.67	−38.51†
		(22.03)	(40.76)	(17.73)
unemploy		0.59	77.21	70.60
		(52.02)	(90.65)	(45.63)
length-of-stay_w		765.42‡	527.40†	308.64‡
		(170.76)	(221.03)	(58.56)
hmo_w		−2681.78	−834.28	831.62
		(2922.64)	(2823.67)	(1395.01)
casemix_w		7281.31‡	7529.36†	−676.27
		(1655.52)	(3318.51)	(918.54)
wage_w		−554.65	−666.00	178.95
		(1080.64)	(1780.47)	(610.52)
ppi_med		290.81†	285.55†	81.73
		(110.51)	(123.90)	(71.53)
medicare share_w		952.24	6768.92	2113.03
		(5536.11)	(5999.19)	(1800.28)
medi-Cal share_w		−3653.65§	−1089.69	−1723.45†
		(2043.66)	(2238.37)	(660.39)
time	49.74	102.91	−185.62§	−33.61
	(33.93)	(82.25)	(109.71)	(45.63)
timesquared	−2.32‡	−2.42§	0.91	0.33
	(0.59)	(1.28)	(1.40)	(0.63)
quake		−485.24§	−754.18†	−472.89‡
		(266.57)	(281.97)	(139.17)
entry		105.66	446.43	−46.91
		(404.22)	(426.99)	(121.96)
intercept	3199.53	22994.06	−7145.13	7779.72
	(304.76)	(14053.78)	(18614.65)	(6938.94)

* Newey-West heteroskedasticity and autocorrelation consistent standard errors (lag length = 4)
† significant at $p < 0.05$
‡ significant at $p < 0.01$
§ significant at $p < 0.10$.

IV(iii). *Reduced Form Price Estimates with 'Peer Group' Controls*

Although we have attempted to specify the reduced form price equation as fully as possible, it is questionable whether this specification fully captures all of the exogenous factors that might affect the equilibrium prices of the merged entity and its competitors.[26] To better capture the effects of these factors, and thus estimate more precisely the equilibrium impact of the merger, we incorporate into our empirical approach elements of the Barton and Sherman [1984] and Kim and Singal [1993] merger studies. These studies analyzed movements in the price of the product affected by the merger, conditional on the price of a substitute product believed to have faced similar demand and cost conditions, but which is unaffected by the merger. By so doing, they controlled for otherwise unobserved demand and cost factors, unrelated to the merger, that might influence intertemporal price behavior at the merging entities.

The State of California has undertaken two studies to categorize hospitals into 'peer groups' for purposes of setting Medi-Cal reimbursement levels, the most recent in 1991 (Department of Health Services, [1991]). These studies form the basis for the construction of the control group used here. The peer grouping method used by the State of California first placed specialty, teaching, and prepaid hospitals in their own separate peer groups. The study then used 'cluster' analysis to group rural hospitals and other 'unusual' hospitals (*see* State of California [1991], § 5). After the latter were classified into these peer groups, only urban short term facilities remained. These facilities were then subdivided into peer groups on the basis of licensed bed size. In the 1982 study, Dominican Santa Cruz and Community Hospital of Santa Cruz were placed in the 'moderately-sized' urban category, while Watsonville was placed in the 'small-urban' hospital peer group. In the 1991 study, Dominican Santa Cruz was placed in the 'medium-sized urban' hospital peer group, which consisted of all hospitals not elsewhere classified with between 170 and 270 licensed beds. Watsonville was placed in the 'moderately small- sized' urban hospital peer group, which consisted of all hospitals not elsewhere classified with between 95 and 170 licensed beds.

We used the following procedure to establish a control group for the current study. First, to ensure that peer hospitals were located in markets as similar as possible to the Santa Cruz market, hospitals located in counties that were part of very large Primary Metropolitan Statistical Areas (PMSAs) were eliminated. This eliminated hospitals located in the following counties: Los Angeles, Orange, Ventura, Riverside, San Bernardino, San Diego, San Francisco, Alameda, Contra Costa, Marin,

[26] Several of the control variables (income, popdensity, unemploy, hmo and wage) vary only on an annual, not quarterly, basis.

San Mateo and Santa Clara. The competitive environment in such large urbanized areas likely is very different from that found in the less urbanized area of Santa Cruz.

Next, the peer group was restricted to those hospitals that were placed in any of the short term urban hospital peer groups in the 1991 California study, and were licensed with between 100 and 300 beds in that year. While somewhat arbitrary, these licensed bed cut-offs would appear to limit the sample to hospitals reasonably comparable to the hospitals in Santa Cruz. This left 41 potential peer group hospitals. We next eliminated those hospitals in this group that were not in the same bedsize category, and/or that did not fall under one of the urban hospital groupings in the 1982 California Peer Group survey. This left 33 potential peer group hospitals. Eight more hospitals were eliminated because (according to the 1996 *AHA Guide*) they did not fall into the appropriate bedsize category. We then eliminated all hospitals that had themselves been involved in a horizontal acquisition as reported in the OSHPD Hospital History Listing database, or were located in a county where a horizontal merger had occurred during the sample period. This group of 16 remaining hospitals constitutes our peer group (*see* Appendix A).

Column (c) of Tables III and IV presents estimates of the reduced form price regressions incorporating the peer group controls. In these equations the dependent and explanatory variables have been redefined as the difference between the own- and peer group value (e.g., in the Dominican equation, the dependent variable equals the Dominican price minus the (mean) peer group price). The results from this specification continue to suggest a fairly large price effect from the transaction ($1,005/admission in the case of Dominican; $672/admission in the case of Watsonville). These estimates are statistically significant at the $p = 0.06$ and $p = 0.10$ levels, respectively.

Many of the other coefficients in this equation have the expected sign, but are not always statistically significant. The coefficient on average length-of-stay (alos_d and alos_w) is positive in both equations, and significant at the $p = 0.02$ level. The medical equipment price index is positive in both equations, as expected, but significant at conventional levels only in the Watsonville equation. Similarly, the estimated parameter on the casemix index is positive and significant only in the Watsonville equation. The HMO share variable is negatively related to price in both equations, as one would expect, but is never significant.

We also observe an interesting pattern of results on the two event variables, quake and entry. In both equations, the coefficient on entry is large and positive; in the case of Dominican, we can reject the null of a zero coefficient at the $p = 0.04$ significance level. Obviously, this is somewhat counterintuitive; one possible explanation is that the entry of Sutter induced Dominican to increase its quality, leading to higher prices

and higher unit costs. This possibility receives some support from the expense regressions reported in column (d), which show that Dominican's expenses per admission increased by about \$263 ($p = 0.08$) when Sutter entered the market. However, the results for the Watsonville equation do not support this hypothesis.

The pattern of coefficients on quake (positive in the Dominican price equation, negative in the Watsonville price equation) can be potentially rationalized as an exogenous quality reduction at Watsonville that allowed Dominican to raise its price. The quake coefficient is not significant in the Dominican equation, however, though it is in the Watsonville equation ($p = 0.06$).

V. ALTERNATIVE EXPLANATIONS FOR THE POST-MERGER PRICE INCREASE

While the empirical results presented in Tables III and IV suggest a post-merger price increase—with the evidence strongest in the case of the merged entity, Dominican—our inability to observe and measure quality perfectly means that we cannot rule out the possibility that the price increases reflect improvements in quality, rather than increased price-cost markups with unchanged (or even diminished) quality levels. The evidence on this possibility is mixed. We observe first that the parties to the acquisition made no such claims in defense of the transaction. If significant quality improvements resulted from the transaction, they were not foreseen by the parties at the time of transaction. Rather, the parties claimed that the efficiencies from the transaction would derive from the realization of scale-related production efficiencies.[27] To the extent that such scale economies were realized, we would expect prices to fall, other things held constant.

It is perhaps conceivable that consolidation of particular services at Dominican could lead to volume-related quality increases—for example, because clinical outcomes for some procedures improve as the procedure is performed with higher frequency at a particular location.[28] Then, Dominican might be able to capture some or all of the value of this quality increase in the form of higher prices.

The problem with this explanation is that it fails to explain the post-merger increase in price at Watsonville Hospital. If the elimination of Community Hospital as a provider of the services in question leads to higher (quality-unadjusted) prices at Dominican because of the efficiencies

[27] See Statement of Commissioner Yao. Dominican claimed that Community Hospital was inefficiently small, and that efficiencies could therefore be realized by converting it to a skilled nursing/rehabilitation facility, and channeling its patients to Dominican.

[28] For a large number of clinical procedures there is empirical evidence that outcomes improve with patient volume. See, e.g., Begg *et al.* [1998] and Selby *et al.* [1996].

described in the preceding paragraph, Watsonville would either have to (1) reduce its price (assuming that its quality remained unchanged); or (2) match Dominican's quality increase. If Watsonville captured some of the patient flow that otherwise would have patronized Community, then it too might be able to realize volume-related quality increases. But if this occurred, then it is unclear why prices would rise unless the transaction also had adverse competitive effects.[29] In a competitive market, prices are determined by cost, not demand (demand determines the equilibrium quantity, but price will be determined by marginal cost). If the quality of certain services increases at both hospitals (but costs remain unchanged), then there will be a market-wide increase in demand for the service, leading to an increase in the total quantity sold. But if marginal costs are constant, and prices are determined competitively, the price at which this service is sold would not change. If prices increase, it suggests that the transaction has increased market power, even if it simultaneously yielded efficiencies.

It perhaps is conceivable that the merger led to other types of quality increases at both Dominican and Watsonville that are not related to volume, but which manifest themselves in greater resource use per patient. If so, we might observe a post-merger increase in expenses per admission or expenses per day—hence prices—at both hospitals, other things held constant. We carry out two tests of this hypothesis. First, we construct dependent variables equal to the difference in per admission expenses between Dominican (Watsonville) and the peer group, and regress this difference against the same explanatory variables employed in the column (c) regressions. Column (d) of Tables III and IV reports the results of these regressions. The results of this test do not support the hypothesis of higher post-merger quality. In the Dominican equation, the coefficient on merge suggests only a small increase in per-admission expenses; we cannot reject the hypothesis that there was no post-merger increase in per-admission expenses. Similarly, in the Watsonville expense regressions we find only a small ($79) post-merger increase in per-admission expenses; as with Dominican, we cannot reject the hypothesis that the true coefficient on merge equals zero.

We conduct a second test of the efficiency hypothesis by examining data on patient flows. If the transaction improved the quality of hospital care provided in Santa Cruz County, relative to that provided in hospitals outside the county, we would expect to observe (*ceteris paribus*) an increase in the proportion of Santa Cruz County residents who seek hospital care within Santa Cruz county. To test the efficiency hypothesis,

[29] The other possibility is that marginal cost increases with output. This possibility is difficult to reconcile with the efficiency claims actually put forth by the parties; i.e., that the merger allowed the merged entity to enjoy scale-related reductions in unit cost.

we divide the total number of Santa Cruz County residents who obtained inpatient care at a Santa Cruz hospital, by the total number of Santa Cruz County residents who were hospitalized anywhere. We regress this figure against a constant, the merge dummy, and Santa Cruz's population. If the efficiency hypothesis is correct, we would expect to obtain a positive coefficient on merge. As it turns out, however, the coefficient is negative and significant at the $p = 0.14$ level.[30] Thus, this result also fails to support the efficiency hypothesis.

VI. CONCLUSION

The combination of Dominican and Community Hospitals in Santa Cruz, California, affords researchers a rare opportunity to study the competitive effects of a horizontal merger in a concentrated antitrust market dominated by not-for-profit producers. We have attempted to assess these effects by estimating a reduced form price equation for the merged entity and its closest rival, Watsonville Community Hospital. Controlling for casemix, input prices, and other cost- and demand-side characteristics, our results suggest strongly that Dominican Hospital raised prices in the aftermath of the transaction. Though post-merger quality improvements cannot be ruled out completely, they cannot fully account for the observed increase in average price. The results for Watsonville also suggest a substantial price increase, albeit of a somewhat smaller magnitude relative to Dominican.

The results also indicate that the small scale entry that occurred after the merger was consummated did not mitigate the observed price increases. These price increases—and in particular, the price increase at Watsonville hospital, a locally-sponsored and administered community hospital—suggest that mergers involving not-for-profit hospitals are a legitimate focus of antitrust concern.

[30] The estimated regression is available at the *JIE* Editorial website.

APPENDIX A
PEER GROUP HOSPITALS

HOSPITAL	COUNTY	BEDS-1996
Mercy*	Kern	261
San Joaquin Community*	Kern	178
Feather River*	Butte	121
Chico Community	Butte	105
Oroville*	Butte	120
El Centro	Imperial	107
Natividad	Monterey	181
Salinas Valley	Monterey	180
Queen of the Valley*	Napa	176
Redding Medical Center	Shasta	162
Mercy Medical Center-Redding*	Shasta	220
North Bay Medical Center*	Solano	108
Sutter Solano Medical Center*	Solano	109
Woodland*	Yolo	103
Rideout*	Yuba	128
Marian Medical Center*	Santa Babara	225

*Non-profit hospital

REFERENCES

Barton, D. M. and Sherman, R., 1984, 'The Price and Profit Effects of Horizontal Merger: A Case Study', *The Journal of Industrial Economics*, 33, pp. 165–177.

Begg, C. *et al.*, 1998, 'The Impact of Hospital Volume on Operative Mortality for Major Cancer Surgery', *Journal of the American Medical Association*, 280, pp. 1747–1751.

Bresnahan, T., 1989, 'Empirical Studies of Industries With Market Power', in Schmalensee, R., and Willig, R. (eds.), *Handbook of Industrial Organization, vol. II* (North Holland, New York).

Department of Health Services, State of California. *Hospital Peer Grouping*, 1991.

Dranove, D., 1988, 'Pricing by Non-Profit Institutions: The Case of Hospital Cost-Shifting', *Journal of Health Economics*, 7, pp. 48–57.

Dranove, D., Shanley, M. and White, W., 1993, 'Price and Concentration in Hospital Markets: The Switch from Patient-Driven to Payer-Driven Competition', *Journal of Law and Economics*, 36, pp. 179–204.

Elzinga, K. and Hogarty, T., 1973, 'The Problem of Geographic Market Definition in Antimerger Suits', *Antitrust Bulletin*, 18, pp. 45–81.

Greene, W., 1997, *Econometric Analysis (3rd edition)* (Prentice Hall, Upper Saddle River, NJ).

Joskow, P., 1980, 'The Effects of Competition and Regulation on Hospital Bed Supply and the Reservation Quality of the Hospital', *Bell Journal of Economics*, 11, pp. 421–447.

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

Kessler, D. and McClellan, M., 1999, 'Designing Hospital Antitrust Policy to Promote Social Welfare', *NBER Working Paper No. 6897.*

Kim, E. and Singal, V., 1993, 'Mergers and Market Power: Evidence From the Airline Industry', *American Economic Review*, 83, pp. 549–569.

Kralewski, J., *et al.*, 1992, 'Factors Related to the Provision of Hospital Discounts for HMO Inpatients', *Health Services Research*, 27, pp. 133–153.

Lynk, W., 1995, 'Nonprofit Hospital Mergers and the Exercise of Market Power', *Journal of Law & Economics*, 38, pp. 437–461.

Melnick, G., Zwanziger, J., Bamezai, A. and Pattison, R., 1992, 'The Effects of Market Structure and Bargaining Position on Hospital Prices', *Journal of Health Economics*, 11, pp. 217–233.

Newey, W. and West, K., 1987, 'A Simple, Positive Semi-Definite, Heteroskedasticity and Autocorrelation Consistent Covariance Matrix, *Econometrica*, 55, pp. 703–708.

Pautler, P. and Vita, M., 1994, 'Hospital Market Structure, Hospital Competition, and Consumer Welfare: What Can the Evidence Tell Us?', *Journal of Contemporary Health Law & Public Policy*, 10, pp. 117–167.

Robinson, J. and Luft, H., 1985, 'The Impact of Hospital Market Structure on Patient Volume, Average Length of Stay, and the Cost of Care', *Journal of Health Economics*, 4, pp. 333–356.

Sacher, S. and Silvia, L., 1998, 'Antitrust Issues in Defining the Product Market for Hospital Services', *International Journal of the Economics of Business*, 5, pp. 181–202.

Schumann, L., Rogers, R. and Reitzes, J., 1992, 'Case Studies of the Price Effects of Horizontal Mergers', Federal Trade Commission, *Bureau of Economics Staff Report*.

Schumann, L., Rogers, R. and Reitzes, J., 1997, 'In the Matter of Weyerhauser Company: The Use of a Hold-Separate Order in a Merger With Horizontal and Vertical Effects', *Journal of Regulatory Economics*, 11, pp. 271–289.

Selby, J. *et al.*, 1996, 'Variation Among Hospitals in Coronary-Angiography Practices and Outcomes After Myocardial Infarction in a Large Health Maintenance Organization', *New England Journal of Medicine*, pp. 1888–1896.

Simpson, J. and Shin, R., 1998, 'Do Nonprofit Hospitals Exercise Market Power?', *International Journal of the Economics of Business*, 5, pp. 141–157.

Vita, M. and Schumann, L., 1991, 'The Competitive Effects of Hospital Mergers: A Closer Look', *Journal of Health Economics*, 10, pp. 359–372.

Werden, G., 1989, 'The Limited Relevance of Patient Migration Data in Market Delineation for Hospital Merger Cases', *Journal of Health Economics*, 8, pp. 363–376.