Effects of hospital mergers and acquisitions on prices

Ranjani A. Krishnan\textsuperscript{a,*}, Hema Krishnan\textsuperscript{b,1}

\textsuperscript{a}Department of Accounting, The Eli Broad College of Business, Michigan State University, N251 North Business Complex, East Lansing, MI 48824, USA
\textsuperscript{b}Department of Management, Xavier University, 406 Schott Hall, Cincinnati, OH 45207, USA

Received 6 July 2001; accepted 6 September 2001

Abstract

This paper examines the price effects of mergers and acquisitions (M&A) in the US hospital industry, which has witnessed considerable consolidation in the 1990s. Using data from 113 hospitals including 20 acquisitions, we compare the change in revenue per patient, operating cost per patient and operating margins for merging hospitals with nonmerging hospitals located in the same market. Results indicate that hospital acquisitions result in increased revenue per patient and increased operating margins compared to nonmerging hospitals but do not result in lower operating costs. These results imply that acquired hospitals increased prices and improved their operating performance.

© 2003 Elsevier Science Inc. All rights reserved.

Keywords: Acquisitions; Market power; Hospitals

1. Introduction

Economic theory suggests that mergers have the potential to increase efficiency through economies of scale and scope and increased leverage over suppliers for procuring cheaper inputs (Ravenscraft and Scherer, 1987). If merger-related efficiencies are passed on to consumers in the form of lower prices, consumers benefit from a merger. However, market power theory suggests that consolidated market control following a horizontal merger provides opportunities to increase prices. Hence, mergers can potentially harm consumers by raising prices. Courts in the US define market power as “the power to control prices or exclude competition” (Baldwin, 1987). The net effect of a merger is thus a tradeoff between welfare gains due to increased efficiencies and welfare losses due to market power. The US Department of Justice (DOJ) uses this efficiency/market power tradeoff in determining whether or not to challenge a merger (Weiss, 1992).

This paper examines the price effects of mergers and acquisitions (M&A) in the US hospital industry. The healthcare sector accounts for US$1 out of every US$7 spent on final goods and services in the US economy, and the hospital industry accounts for about one-half of these expenditures (Folland et al., 1997). Hospital consolidation activity through mergers and acquisitions has surged in the last few years in response to changes in reimbursement mechanisms, slow growth, poor capacity utilization and increasing public pressure to reduce healthcare costs (Jaspen, 1998). Because of large fixed cost operations and declining occupancy rates in the hospital industry, mergers provide opportunities for achieving economies of scale and scope and hence lower healthcare costs. However, antitrust regulators such as the DOJ and the Federal Trade Commission (FTC) are concerned about the number and size of acquisitions and the increasing concentration in several hospital markets (Lynk, 1995). For example, in the California hospital markets, the Herfindahl–Hirschman Index (HHI) increased by over 1000 points in 14 out of 58 counties during the period 1990–1996. The HHI, defined as the sum of squares of the market shares (measured as percentages) of all the firms operating in the market (Martin, 1994), is a popular measure of market concentration used by antitrust agencies such as the DOJ and the FTC. According to the 1992 Horizontal Merger Guidelines issued by the DOJ and the
FTC, a merger that increases the market’s HHI by more than 100 points in a moderately concentrated market (i.e., HHI between 1000 and 1800) is considered potentially anticompetitive. If the postmerger HHI exceeds 1800, the market is considered highly concentrated, and even a small increase in HHI of about 50 points prompts concern about potential anticompetitive effects and requires to be examined (Bazzoli et al., 1995). Hence, empirical examination of the effects of hospital mergers on prices is of current policy interest.

Previous research on the effect of hospital mergers has primarily focussed on cross-sectional analysis of the relationship between prices and market concentration (e.g., Dranove et al., 1993; Dranove and Ludwick, 1999; Keeler et al., 1999). Such studies typically examine the relationship between prices, costs and a measure of market concentration, such as the HHI, and then infer the effect of mergers in the market. One of the major findings from these cross-sectional studies is that lower competition is associated with higher prices, thereby suggesting that hospital mergers raise prices.

There are no known longitudinal studies that specifically examine whether hospital mergers and acquisitions result in increased prices for privately insured patients. The only longitudinal study looking at hospital mergers is by Connor et al. (1997), which examines change in total patient revenue (including out-patients, Medicare and Medicaid patients) for all US hospitals that merged during the period 1988–1994. Connor et al. (1997) find that the price inflation rate for merging hospitals was five percentage points lower when compared to control hospitals. However, merging hospitals located in less competitive markets exhibited slightly higher (1.8 percentage point) price inflation rate compared to control hospitals. One of the limitations of their study is that they include revenues from Medicaid and Medicare patients, whose reimbursement is based on a fixed formula, in the price calculations. These two groups of patients provide little leverage for the hospitals to dictate prices.

This study fills an important lacuna in the existing literature by examining the impact of hospital mergers on in-patient revenues using longitudinal (pre–post) data. By comparing the merging group with a nonmerging (control) group of hospitals, a more direct test of the effects of mergers is provided. Also, by restricting the study to privately insured patients, the study examines the price changes for a group of consumers over whom a hospital could exercise considerable bargaining power.

Data from 113 hospitals, including 20 acquisitions that occurred in the state of California during the period 1995–1996, are used to analyze postmerger changes in revenues for privately insured patients. We also examine changes in the postmerger operating margins and changes in operating cost per in-patient of the merged hospital in order to rule out alternative explanations such as increases in merger-related inefficiencies or increases in postmerger quality.

2. Theoretical framework and hypothesis

Two competing theories from the economics of industrial organization analyze the motives for mergers and acquisitions. Efficiency theory argues that mergers have the potential to generate synergies by combining the businesses of the two firms (Morck et al., 1988; Ravenscraft and Scherer, 1987). Synergy gains may arise from reduced costs through economies of scale and scope, adoption of more efficient production or operational technology, combining of administration and R&D labs and enhanced monopsony power in the market for inputs (Jensen and Ruback, 1983; Ravenscraft and Scherer, 1987). The benefits obtained through increased efficiencies can then be passed on to the consumers by way of lower prices (Ravenscraft and Scherer, 1987). On the other hand, market power theory argues that mergers result in increased prices (Chatterjee, 1991; Singal, 1996). This situation is more pronounced in horizontal mergers because firms gain more control over the market and limit the options available to customers and suppliers (Weiss, 1992).

The effect of mergers in the US hospital industry is of particular significance because since 1994, over 45% of all the hospitals in the US have been involved in some form of merger and acquisition activity (Jaspen, 1998). Merging hospitals argue that the economic benefits of their proposed consolidation outweigh any anticompetitive risks. In making this argument, they typically promise to pass along cost savings from mergers to consumers in the form of reduced prices (Gardner, 1997; Greene, 1994). However, empirical evidence suggests that hospital mergers and acquisitions do not yield significant cost reductions (Dranove and Shanley, 1995; Dranove, 1998). This is partly driven by the fact that a merger between two hospitals does not necessarily result in a single larger hospital. Often, it is the nonrevenue-producing cost centers, such as administrative and financial services, that are combined rather than the clinical services. Dranove (1998) examines the economies of scale from combining the nonrevenue producing cost centers and finds that efficiency gains are small or nonexistent, especially in medium-sized or large hospitals (those above 2500 discharges per year).

If a merger generates efficiency gains, then it will lower the marginal cost of the merged firm. Under competitive conditions, these efficiencies are passed on to the consumer and the merger will result in lower prices. On the other hand, if prices increase after a merger, it implies that efficiency gains do not exist or have not been passed on to the consumer due to enhanced market power. Hence, the direction of the postmerger price change indicates whether market power effects or efficiency effects dominate. For example, Kim and Singal (1993) used the direction of the postmerger price change as an indicator of whether market power effects or efficiency effects dominated from airline mergers. They found price increases after a merger and
therefore concluded that market power effects dominate. Based on prior findings in the airline industry, and results from cross-sectional studies in the hospital industry, it is predicted that hospital mergers are likely to result in increased prices.

**Hypothesis 1:** Hospital mergers will result in an increase in prices, thereby improving the revenue position of the merged hospital.

### 3. Methodology

#### 3.1. Sample and data

Data from acquisitions that occurred in California during 1995–1996 are used in the analyses and compared with a group of hospitals located in the same market that did not engage in acquisitions. We chose 1995–1996 because a larger number of acquisitions were completed during this year (Jaspen, 1998). California was chosen for the following reasons. First, it had a larger number of hospital acquisitions compared to other states during this period. Second, healthcare trends in California have generally led the nation. Hence, results obtained are likely to be of consequence elsewhere (Dranove and Shanley, 1995).

Data from a total of 113 hospitals were examined, including 20 hospitals acquired during the period 1995–1996. Because California has a large number of hospital markets, to control for local area conditions, only hospitals that were located in markets where acquisitions occurred were chosen. Hospitals located in Los Angeles were not included in the study because prior studies indicate that the Los Angeles hospital market is an outlier on many variables (Dranove et al., 1993; Lynk, 1995). Only acute care hospitals were included. Children’s hospitals and long-term care hospitals were excluded because they cater to a different patient population. Federal hospitals such as those belonging to the Veterans Administration and military were also excluded because prior studies suggest that their captive population aspects make them less comparable to other acute care hospitals (Lynk, 1995).

#### 3.2. Dependent variables

##### 3.2.1. Logarithm of change in revenue

Consistent with previous studies (e.g., Kim and Singal, 1993; Connor et al., 1997), the change in net revenue per patient is used as a proxy for price. Revenue is defined as the hospital’s gross revenue from in-patients’ less contractual discounts. Because revenue from Medicare and Medicaid patients is not subject to negotiation, only in-patient revenue for privately insured patients is used in the analysis. This helps to isolate the effect of the acquisition on a hospital’s bargaining power with insurance companies. Dranove and Ludwick (1999) note that it is unlikely that market forces affect the revenue that hospitals receive for Medicare patients and that including these patients in the empirical analyses is likely to add noise to the results. The natural logarithm of the ratio of revenues is used to measure the percentage change in revenue because using simple percentage changes instead of logs would yield elasticity estimates, which depend on the level of the hospital’s initial price, whereas the logarithmic form estimates a constant elasticity of change in price. The log linear model is commonly used in econometric estimation of demand equations, production functions and cost functions (Greene, 2000). The change in revenue is defined as (Eq. (1)):

\[
\log \left( \frac{\text{postmerger revenue per privately insured patient}}{\text{Premerger revenue per privately insured patient}} \right)
\]

To examine whether the change in revenue is driven by a change in marginal cost due to merger-related inefficiencies, the change in the operating margin, which is a critical profitability measure for the hospital industry (Tennyson and Fottler, 2000), is also analyzed. Change in the operating margin is defined as follows (see Eqs. (2) and (3)):

\[
\text{Postmerger year operating margin} = \frac{\text{Postmerger year operating margin}}{\text{Premerger year operating margin}}
\]

where

**Operating margin**

\[
= \frac{(\text{Operating revenues} - \text{Operating expenses})}{\text{Operating revenues}}
\]

The change in operating expense per in-patient was examined as an additional check to rule out the possibility that the merger produced inefficiencies, which are subsequently reflected in higher prices. This is the most comprehensive measure of hospital efficiency and has been used by prior research (e.g., Carter et al., 1997; Conner et al., 1998). The change in operating expense per in-patient also serves as a proxy to examine whether hospital quality increased after the merger. Gaynor and Haas-Wilson (1999) note that higher hospital prices may simply reflect higher quality. However, if the merged hospital increases the quality of services after the merger, then this should increase cost because in the hospital industry, increasing quality typically implies greater expenditures on facilities and supplies, which would lead to an increase in cost (Robinson and
Luft, 1985). Change in operating expenses is defined as follows (see Eqs. (4) and (5)):

\[
\text{Change in operating expense per inpatient} = \log \left( \frac{\text{Operating expense per inpatient in the postmerger year}}{\text{Operating expense per inpatient in the premerger year}} \right) \quad (4)
\]

where

Operating expense per inpatient
\[
= \frac{\text{Total operating expenses for inpatients}}{\text{Number of inpatient discharges}} \quad (5)
\]

3.3. Independent variable

3.3.1. Acquisition

This variable was coded as 1 if the hospital was acquired and 0 otherwise.

3.4. Control variables

Consistent with previous research (e.g., Dranove and Shanley, 1995; Lynk, 1995), the study controlled for the following 10 variables that may have an impact on post-merger prices.

3.4.1. Proportion of Medicare and Medi-Cal patients

Although the dependent variable is computed as price for privately insured patients only, we include control variables for the proportion of Medicare and Medi-Cal patients. This is because prior research suggests that hospitals may “cost shift,” i.e., respond to the burden of public assistance patients by raising the price to privately insured patients (Dranove, 1988). If this indeed occurs, then the coefficient on the Medicare and Medi-Cal control variables would be positive. The control variable for “Medicare” is defined as the number of Medicare patients admitted during the year divided by the total number of patients admitted to the hospital during the year. A similar definition is used for the proportion of Medi-Cal patients.

3.4.2. Change in Medicare and Medi-Cal patients

Because the dependent variable is defined as change in revenue per privately insured patient, the change in the proportion of Medicare and Medi-Cal patients are included as controls. This is defined for Medicare patients as [\log (Postmerger year proportion of Medicare patients/Premerger year proportion of Medicare patients)]. Change in proportion of Medi-Cal patients is defined as [\log (Postmerger year proportion of Medi-Cal patients/Premerger year proportion of Medi-Cal patients)].

3.4.3. Case-mix index

Medicare case-mix index is used to control for the complexity of the cases treated by a hospital relative to the complexity of the national average of all hospital cases. Although the case-mix index is limited to Medicare admissions, it has been shown to be a good proxy for the level of complexity for the hospital services provided to all the patients in the market (Manheim et al., 1994).

3.4.4. Length of stay (LOS)

LOS is included as a control variable because prior research has shown that LOS influences price per admission (Lynk, 1995). LOS is defined as the total number of days between admission and discharge dates for each patient.

3.4.5. Change in LOS

This variable, defined as [\log (Postmerger year LOS/Premerger year LOS)], is included to control for the portion of change in price that may be driven by a change in LOS.

3.4.6. Size

The number of staffed beds in the hospital in the postmerger year is used as a control for hospital size because prior research has found that hospital size influences both hospital behavior and performance (Alexander and Lee, 1996; French, 1996; Mick and Wise, 1996; Robinson and Phibbs, 1989). French (1996) and Robinson and Phibbs (1989) found a positive association between hospital size and cost, and Mick and Wise (1996) found that hospital size is positively related to operating margins.

3.4.7. Competition

The HHI for the hospital market is the principal measure of competition used by antitrust agencies, such as the US DOJ and FTC, and researchers (e.g., Kim and Singal, 1993; Lynk, 1995; Ravenscraft, 1983). Ordover et al. (1982) show that the relationship between an outcome variable, such as price, and changes in HHI is a useful indicator of the effects of mergers. HHI is defined as the sum of squared market shares (for privately insured patients) of all the hospitals operating in the hospital market. A hospital’s market share is computed as a percentage of the total admissions of all the hospitals located in the hospital market. Change in HHI is defined as log (Postmerger year HHI/Premerger year HHI) for each hospital market, similar to Kim and Singal (1993). The following models are estimated (Eqs. (6)–(8)):

\[
\log \text{Change in revenue per patient for hospital } i = \alpha + \beta (\text{Acquisition dummy}) + \delta (\text{controls}) \quad (6)
\]
Change in operating margin for hospital $i$

$$= \alpha + \beta(\text{Acquisition dummy}) + \delta_i(\text{controls})$$ (7)

log Change in operating expenses per inpatient for hospital $i$

$$= \alpha + \beta(\text{Acquisition dummy}) + \delta_i(\text{controls})$$ (8)

4. Results

Table 1 contains variable means, standard deviations and ranges for the 20 hospitals acquired in 1995–1996 and the 93 other hospitals, which were not involved in a merger or acquisition in 1994, 1995 or 1996. In the premerger year, the mean revenue per privately insured patient was lower for merging hospitals (US$5240) compared to the nonmerging hospitals (US$6504) and this difference is statistically significant ($t = 2.25$, $P < .01$). In the postmerger year, the mean revenue per privately insured patients increased to US$6604, while for the nonmerging hospitals, mean revenue per patient decreased to US$6178 in the postacquisition year. The difference in revenue for merging and nonmerging hospitals in the postmerger year is not statistically significant ($t = 0.60$, $P < .50$). The increase in revenue per patient in the postmerger year was 0.19 for the merging hospitals and $-0.03$ for the nonmerging hospitals and the difference is statistically significant ($t = 2.62$, $P < .01$). The mean operating margin of merging hospitals increased from $-4\%$ in 1994–1995 to $6\%$ in 1996–1997, whereas the mean operating margin of nonmerging hospitals increased marginally from $-2\%$ in 1994–1995 to $1\%$ in 1996–1997. The average number of staffed beds is similar for merging hospitals and nonmerging hospitals (191 beds). Mean case-mix index is similar for both groups of hospitals. The patient mix measured as the proportion of patients from each type of insurance program (Medicare, Medi-Cal and privately/commercially insured) was also similar for the two groups of hospitals.

There were also no differences between the two groups in the premerger and postmerger operating expense per patient or the change in operating expense per in-patient. We also conducted tests of differences in medians between the two groups of hospitals for all the variables reported in Table 1. The results are consistent with the results for the differences in means.

Table 2 provides information on the correlations among the variables included in the analyses. To rule out the problems associated with multicollinearity, the data were tested using the approach suggested by Belsey et al. (1980). Results suggest no harmful multicollinearity between any of the variables in the sample.

Regression results for the determinants of change in revenue per patient and change in operating margins are shown in Table 3. It can be seen that the hospitals involved in acquisitions in 1995–1996 had greater increases in revenue per patient relative to the nonmerging hospitals.
<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Log of change in net revenue per patient</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Change in operating margin per in-patient</td>
<td>.393***</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Change in expense</td>
<td>.001</td>
<td>−.386***</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Acquisition</td>
<td>.365***</td>
<td>.125</td>
<td>.005</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. LOS</td>
<td>.036</td>
<td>−.026</td>
<td>.061</td>
<td>−.110</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Change in LOS</td>
<td>.116</td>
<td>.051</td>
<td>.061</td>
<td>.158*</td>
<td>.295***</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Size</td>
<td>−.038</td>
<td>.029</td>
<td>.159*</td>
<td>.001</td>
<td>.033</td>
<td>.115</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Medicare</td>
<td>−.107</td>
<td>−.380***</td>
<td>.166*</td>
<td>.026</td>
<td>−.189***</td>
<td>−.161</td>
<td>−.161*</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Change in Medicare</td>
<td>.088</td>
<td>.086</td>
<td>.283***</td>
<td>.011</td>
<td>−.133</td>
<td>−.114</td>
<td>−.114</td>
<td>.066</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Medi-Cal</td>
<td>−.092</td>
<td>.106</td>
<td>.187**</td>
<td>−.011</td>
<td>−.167*</td>
<td>.179*</td>
<td>−.179*</td>
<td>−.229**</td>
<td>.123</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Change in Medi-Cal</td>
<td>.229</td>
<td>.016</td>
<td>.109</td>
<td>.197**</td>
<td>.098</td>
<td>.085</td>
<td>.085</td>
<td>−.075</td>
<td>.022</td>
<td>.009</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. HHI</td>
<td>−.042</td>
<td>−.141</td>
<td>.138</td>
<td>.060</td>
<td>−.205**</td>
<td>.016</td>
<td>−.088</td>
<td>−.075</td>
<td>.002</td>
<td>−.029</td>
<td>−.001</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Change in HHI</td>
<td>−.041</td>
<td>−.021</td>
<td>−.837</td>
<td>−.119</td>
<td>.068</td>
<td>−.059</td>
<td>.025</td>
<td>.055</td>
<td>−.124</td>
<td>−.158*</td>
<td>−.092</td>
<td>.002</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>14. Case-mix index</td>
<td>.054</td>
<td>−.019</td>
<td>−.059</td>
<td>.012</td>
<td>.053</td>
<td>.182*</td>
<td>.484***</td>
<td>−.156*</td>
<td>−.183*</td>
<td>−.115</td>
<td>−.077</td>
<td>−.120</td>
<td>.194**</td>
<td>1.000</td>
</tr>
</tbody>
</table>

* Statistically significant at the 10% level.
** Statistically significant at the 5% level.
*** Statistically significant at the 1% level.
Table 3
Analyses of California acquisitions regression results for determinants of change in 1-year postmerger net revenue, change in operating margin, and change in operating expense per in-patient (standard errors in parentheses)

<table>
<thead>
<tr>
<th>Predictor</th>
<th>(1) Dependent variable = log of change in net revenue per patient</th>
<th>(2) Dependent variable = change in operating margin</th>
<th>(3) Dependent variable = change in operating expense per in-patient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acquisition (1 if the hospital was acquired, else 0)</td>
<td>0.231*** (0.059) t = 3.92</td>
<td>0.090** (0.043) t = 2.10</td>
<td>−0.001 (0.046) t = −0.02</td>
</tr>
<tr>
<td>LOS in postmerger year</td>
<td>0.002 (0.012) t = 0.19</td>
<td>−0.001 (0.008) t = −0.15</td>
<td>0.01 (0.009) t = 1.17</td>
</tr>
<tr>
<td>Change in LOS</td>
<td>−0.007 (0.088) t = −0.08</td>
<td>−0.023 (0.097) t = −0.24</td>
<td>0.08 (0.10) t = 0.79</td>
</tr>
<tr>
<td>Size (number of staffed beds in postmerger year)</td>
<td>−0.00004 (0.0002) t = −0.21</td>
<td>−0.00005 (0.0001) t = −0.43</td>
<td>0.0001 (0.0001) t = 1.35</td>
</tr>
<tr>
<td>Medicare (proportion of Medicare patients in the postmerger year)</td>
<td>−0.208 (0.143) t = −1.45</td>
<td>−0.448*** (0.102) t = −4.37</td>
<td>0.286*** (0.108) t = 2.64</td>
</tr>
<tr>
<td>Change in Medicare (change in proportion of Medicare patients)</td>
<td>0.126 (0.113) t = 1.12</td>
<td>0.070 (0.085) t = 0.82</td>
<td>0.267*** (0.09) t = 2.96</td>
</tr>
<tr>
<td>Medi-Cal (proportion of Medi-Cal patients in the postmerger year)</td>
<td>−0.183 (0.149) t = −1.23</td>
<td>−0.012 (0.107) t = −0.12</td>
<td>0.166 (0.113) t = 1.46</td>
</tr>
<tr>
<td>Change in Medi-Cal (change in proportion of Medi-Cal patients)</td>
<td>0.0888 (0.071) t = 1.23</td>
<td>0.045 (0.055) t = 0.81</td>
<td>0.013 (0.059) t = 0.22</td>
</tr>
<tr>
<td>HHI (HHI in the postmerger year)</td>
<td>−0.020 (0.079) t = −0.26</td>
<td>−0.066 (0.060) t = −1.09</td>
<td>0.100 (0.064) t = 1.56</td>
</tr>
<tr>
<td>Change in HHI</td>
<td>−0.030 (0.082) t = −0.36</td>
<td>0.065 (0.155) t = 0.42</td>
<td>−0.079 (0.164) t = −0.48</td>
</tr>
<tr>
<td>Case (case-mix index)</td>
<td>0.109 (0.145) t = 0.75</td>
<td>−0.079 (0.106) t = −0.75</td>
<td>0.0005 (0.112) t = 0.01</td>
</tr>
<tr>
<td>Intercept</td>
<td>−0.099</td>
<td>0.238</td>
<td>0.272</td>
</tr>
<tr>
<td>Adjusted $r^2$</td>
<td>.1262</td>
<td>.1289</td>
<td>.1177</td>
</tr>
<tr>
<td>$N$</td>
<td>113</td>
<td>113</td>
<td>113</td>
</tr>
<tr>
<td>$R^2$ value of the model</td>
<td>2.36 ($P &lt; .01$)</td>
<td>2.39 ($P &lt; .01$)</td>
<td>2.26 ($P &lt; .02$)</td>
</tr>
</tbody>
</table>

** Statistically significant at the 5% level.
*** Statistically significant at the 1% level.

The coefficient on the acquisition dummy is .231, indicating that the increase in revenue per patient for acquired hospitals was about 23 percentage points higher than the hospitals that were not involved in a merger or acquisition. These results provide evidence in support of Hypothesis 1 that acquired hospitals increased prices and thereby improved their revenue positions. The change in operating margin variable is also significant. The coefficient on the acquisition dummy is .09 in column 2, indicating that acquired hospitals significantly improved their margins compared to the nonmerging hospitals. The operating margin is an aggregate measure, which is influenced by all types of patients including the uninsured, Medicare and Medicaid patients, which are traditionally deemed unprofitable groups. These results imply that compared to the control group, the acquired hospital is able to generate a nine percentage points increase in operating margins after accounting for the unprofitable groups, thus suggesting that the hospital extracted these profits by raising the prices for the privately insured. Table 3, column 3, also shows that the change in operating expense per in-patient was not different for merging hospitals as the coefficient on the acquisition dummy is not significant. This also suggests that the merging hospitals did not achieve any efficiency gains, which would have reduced operating expenses after the merger. Taken together, these results rule out alternative explanations such as increase in postmerger quality or merger-related inefficiencies for the observed price increases of the merging hospitals.

The control variable Proportion of Medicare patients has a negative coefficient when the dependent variable is Change in operating margin and a positive coefficient when the dependent variable is Change in operating expense per in-patient. Further, the variable Change in proportion of Medicare patients has a positive coefficient when the dependent variable is Change in operating expense per in-patient. These results are consistent with earlier studies (e.g., Lynk, 1995) and suggest that hospitals with greater proportion of Medicare patients had significantly higher operating costs and lower operating margins.

4.1. 3-year postmerger results

We also examined the changes in prices, costs and operating margins for the 3-year period following the acquisition. The objectives of this analysis were, first, to explore whether the increase in prices were restricted to the postmerger year or whether merging hospitals continued to exhibit higher prices compared to the nonmerging hospitals and, second, to explore whether the merger resulted in any operating efficiencies in the form of lower operating costs. This analysis has some limitations because it is much noisier than the 1-year postmerger change in outcomes. Over a 3-year period, there are also likely to be significant changes in the external competitive environment, unrelated to the acquisition. Further, because the hospital industry has been very active in merger and acquisition activity during the period of the analyses, several of the control
hospitals were also acquired during the 3 years following the merger, which reduces our sample size from 113 to 100. Several researchers have argued that the time frame for postacquisition performance should be limited because a significant proportion of firms involved in mergers and acquisitions in the 1990s engaged in further acquisitions. Thus, adding further years may violate the “clean data” criterion (Ramaswamy, 1997; Choi and Philipapao, 1983; Lubatkin, 1987).

Table 4 contains the results of the changes in postmerger net revenue per patient, operating margin and operating expenses for the 3-year period following the merger. Column 1 of Table 4 indicates that the merging hospitals continue to show an increase in revenue per privately insured patient, which is higher than revenue per patient for the nonmerging hospitals. Several of the control variables are also statistically significant. Hospitals with a greater increase in LOS had greater increases in revenue per patient. Because change in LOS is often an indicator of the complexity of illness, these results suggest that hospitals, which admitted patients with more complex ailments, had greater increases in revenue per patient. Hospitals with a greater proportion of Medicare and Medi-Cal patients had a greater increase in revenue per privately insured patient. This suggests that hospitals may be “cost shifting,” i.e., offsetting losses from public assistance patients by raising the price to privately insured patients as suggested by prior research (Dranove, 1988). The HHI has a positive coefficient, suggesting that hospitals located in markets with lesser competition (higher HHI) had greater increases in revenue per privately insured patient. Larger hospitals had greater increase in revenue per patient, as suggested by the positive coefficient on the size control variable.

Column 2 of Table 4 provides the results for the change in operating margin, which is not significantly different for the merging hospitals. This is either driven by the noise in the 3-year horizon or suggests that the increase in revenue for the merging hospitals did not translate into improved margins over the 3-year period. The only control variable that is significant is the proportion of Medicare patients, which has a negative coefficient. This suggests that hospitals, which had greater proportion of Medicare patients, had greater deterioration in operating margins. However, these results should be interpreted cautiously because the regression reported in Column 2 of Table 4 is not statistically significant ($P < .15$).

Column 3 of Table 4 contains the results for the change in operating expenses per inpatient for the 3-year time horizon. The results do not suggest that merging hospitals had significantly different changes in operating expenses. The results suggest that larger hospitals, hospitals with a greater increase in the proportion of Medicare patients and hospitals with greater increase in LOS had greater increase in operating expenses. Taken together, the results for the 3-year horizon support the conclusion that the hospital mergers resulted in increased prices and do not suggest that the mergers resulted in efficiencies. As a further check, we also analyzed the change in prices for all the patients as a whole

### Table 4

Analyses of California acquisitions regression results for determinants of change in 3-year postmerger net revenue, change in operating margin, and change in operating expense per in-patient (standard errors in parentheses)

<table>
<thead>
<tr>
<th>Predictor</th>
<th>(1) Dependent variable = log of change in net revenue per patient</th>
<th>(2) Dependent variable = change in operating margin</th>
<th>(3) Dependent variable = change in operating expense per in-patient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acquisition (1 if the hospital was acquired, else 0)</td>
<td>0.101* (0.059) $t = 1.71$</td>
<td>0.314 (0.381) $t = 0.82$</td>
<td>−0.07 (0.057) $t = 1.18$</td>
</tr>
<tr>
<td>LOS in postmerger year</td>
<td>−0.002 (0.002) $t = −1.21$</td>
<td>0.011 (0.052) $t = −0.22$</td>
<td>0.001 (0.002) $t = 0.63$</td>
</tr>
<tr>
<td>Change in LOS</td>
<td>0.675*** (0.153) $t = 4.41$</td>
<td>0.133 (0.658) $t = 0.20$</td>
<td>0.28* (0.15) $t = 1.93$</td>
</tr>
<tr>
<td>Size (number of staffed beds in postmerger year)</td>
<td>0.0005** (0.0002) $t = 2.56$</td>
<td>0.0007 (0.001) $t = −0.53$</td>
<td>0.0004** (0.0002) $t = 2.06$</td>
</tr>
<tr>
<td>Medicare (proportion of Medicare patients in the postmerger year)</td>
<td>0.824*** (0.204) $t = 4.04$</td>
<td>−4.407** (1.35) $t = −3.28$</td>
<td>−0.175 (0.197) $t = −0.89$</td>
</tr>
<tr>
<td>Change in Medicare (change in proportion of Medicare patients)</td>
<td>0.130 (0.129) $t = 1.01$</td>
<td>0.023 (0.101) $t = 0.02$</td>
<td>0.280** (0.14) $t = 2.06$</td>
</tr>
<tr>
<td>Medi-Cal (Proportion of Medi-Cal patients in the postmerger year)</td>
<td>0.659*** (0.150) $t = 4.38$</td>
<td>0.347 (1.19) $t = 0.29$</td>
<td>0.105 (0.141) $t = 0.74$</td>
</tr>
<tr>
<td>Change in Medi-Cal (change in proportion of Medi-Cal patients)</td>
<td>0.092 (0.08) $t = 1.10$</td>
<td>0.090 (0.55) $t = 0.17$</td>
<td>−0.080 (0.087) $t = −0.91$</td>
</tr>
<tr>
<td>HHI (HHI in the postmerger year)</td>
<td>0.210** (0.088) $t = 2.37$</td>
<td>0.296 (0.63) $t = 0.47$</td>
<td>0.103 (0.084) $t = 1.23$</td>
</tr>
<tr>
<td>Change in HHI</td>
<td>0.267 (0.221) $t = 1.21$</td>
<td>0.089 (1.28) $t = 0.70$</td>
<td>−0.478 (0.212) $t = −2.25$</td>
</tr>
<tr>
<td>Case (case-mix index)</td>
<td>−0.03 (0.153) $t = −0.16$</td>
<td>0.29 (1.006) $t = 0.29$</td>
<td>0.213 (0.154) $t = 1.38$</td>
</tr>
<tr>
<td>Intercept</td>
<td>−0.17</td>
<td>0.557</td>
<td>−0.368</td>
</tr>
<tr>
<td>Adjusted $R^2$</td>
<td>0.433</td>
<td>.089</td>
<td>0.21</td>
</tr>
<tr>
<td>$N$</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>$F$ value of the model</td>
<td>8.45 ($P &lt; .01$)</td>
<td>1.53 ($P &lt; .15$)</td>
<td>3.60 ($P &lt; .01$)</td>
</tr>
</tbody>
</table>

* Statistically significant at the 10% level.
** Statistically significant at the 5% level.
*** Statistically significant at the 1% level.
5. Discussion

This study examines the effects of mergers on prices. It uses data from the hospital industry, which is undergoing rapid transformations in market structure, as a context to study these pricing issues. In addition to being an emergent issue in business research, healthcare costs and pricing for health services are currently among the most important public policy issues under discussion. In 1997 alone, the Wall Street Journal devoted over a hundred articles to healthcare policy, healthcare reform and healthcare expenditures. There are, however, few systematic studies of the impact of hospital mergers and acquisitions on prices of hospital services. This study makes a significant contribution to the field by examining the implications of hospital mergers on changes in hospital revenues. Results suggest that in the hospital industry, mergers result in increased revenues and operating margins in the postmerger year. Further, mergers do not appear to lower operating costs, thereby suggesting that efficiencies (or inefficiencies) did not materialize, at least in the short run. Recent anecdotal evidence supports these results. For example, an article in the New York Times (Steinhauer, 2001) states how mergers have helped hospitals obtain higher prices from insurance companies. At the same time, there have not been cost savings or consolidation of facilities.

Several issues need to be considered while interpreting the results of this study because there may be alternate explanations for the observed price increases. First, it is possible that the acquired hospitals gained reputational advantages or improved technology following the acquisition. For example, Dranove and Shanley (1995) found evidence that multihospital systems enjoy reputational advantages due to reductions in consumer search costs, which may translate into consumers' willingness to pay higher prices. Future research could examine this issue empirically. Second, the current study examines price increases only for the 1- and 3-year periods following the acquisition. Therefore, studies over longer time periods need to be conducted to examine whether the price effects prevail over extended periods of time (Kim and Singal, 1993).

Third, we focus on prices for privately insured patients in this study because the hospital has better bargaining power over these patients. As against this, Medicare and Medi-Cal patients are reimbursed on a flat-fee or per-diem basis, and it is unlikely that a hospital can exercise market power against these patients. However, it is possible that the presence of Medicare and Medi-Cal patients within a hospital affects the outcomes in subtle and indirect ways. Future research should examine the impact of different types of patients in a hospital’s patient mix on hospital outcomes.

6. Future research

One of the limitations of this research concerns the ability to generalize the findings on price increases following acquisitions to other industries. Nevertheless, given the ambiguity regarding this phenomenon, future research can help resolve some of the issues concerning price effects of mergers. First, several factors such as reputation, quality, innovation or bundling may be influencing or contributing to the increased prices. A closer examination into the causal linkages between alternate explanations to price increases and controls for price elasticity of demand are required. Second, studies over extended periods of time are necessary to understand what really motivates organizations to engage in mergers and acquisitions and to develop sophisticated tools for detecting the effects of market power. Third, it is important to isolate the gains to the different stakeholders. Although numerous studies exist on the gains to acquiring firms, rival firms and target firms following a merger announcement or completion, studies on gains to customers and other critical constituencies are relatively rare. Finally, studies need to be conducted at the product or service level. This is because a merger may enhance market shares differentially across various services offered by a hospital.

Acknowledgements

We thank the Associate Editor, Professor Harlan Platt and two anonymous reviewers for their assistance.

References

Connor RA, Feldman RD, Dowd B. The effects of market concentration