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## A Bargain at Twice the Price? California Hospital Prices in the New Millennium

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# A Bargain at Twice the Price? California Hospital Prices in the New Millennium

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## Abstract

We use data from California to document and offer possible explanations for the sharp increase in hospital prices charged to private payers after 1999. We find a downward trend in price for private pay patients in the 1990s and a rapid upward trend beginning in 1999, amounting to an annual average increase of 10.6% per year over 1999-2005. Prices in 2006 were almost double prices in 1999. By contrast, there was little discernable trend in prices for Medicare and Medicaid patients, although these prices varied from year-to-year. Surprisingly, the increase in prices is not correlated, geographically, with the change in hospital market concentration. For example, the greatest price rises came from hospitals in monopoly and highly concentrated counties which experienced little or no change over our sample period. Two recent California state hospital regulations, the seismic retrofit mandate and the mandatory nurse staffing ratio affected hospital costs. However, the cost increases due to the nursing staffing regulations are not large enough to account for the price increase, and the price increase is not substantially correlated with the costs of compliance with the seismic retrofit mandate. Therefore, the source of the near-doubling of California hospital prices remains something of a mystery.

**KEYWORDS:** hospital, price, concentration, regulation, nursing, inflation

## Introduction

After relatively modest growth in the 1990s, US healthcare costs began to rise more rapidly again with the start of the new millennium. From 1992 to 1999, per capita healthcare costs rose in nominal dollars from \$3,265 to \$4,518, a compound average annual growth rate of 4.7%. These costs rose from \$4,782 to \$7,421 between 2000 and 2007, at an annual growth rate of 6.5%. Adjusting for inflation using the CPI yields an average growth in real per capita spending of 2.2% from 1992-1999 and 3.7% from 2000-2007.<sup>1</sup> The difference in growth rates was even greater for hospital costs, as their real per capita growth rate rose from 0.4% from 1992-1999 to 3.8% from 2000-2007.

This increase in hospital costs has drawn attention in the popular press and the public policy community. For example, a recent article in the *Wall Street Journal* (Martinez and Johnson, 2009) reports that hospitals have been achieving 6-9% price increases “in recent years.” A report prepared by PricewaterhouseCoopers for the California Healthcare Foundation (PricewaterhouseCoopers, 2007) found that the profitability and financial position of California hospitals had improved in the new millennium relative to the 1990s.

There are a number of potential explanations for the increase in hospital costs and prices since 2000. These increases could reflect increased costs from increasing input prices, increased costs from new regulatory requirements, increased bargaining power due to the decreasing influence of managed care, increasing market concentration of hospitals, or some other cause. In this work, we take advantage of California’s unusually good hospital data to document the price increase for California hospitals over recent years and to explore the possible causes for it.

## Literature Review

The upsurge of inpatient hospital prices for commercial patients in California after 1999 has received some attention in the literature. Melnick and Keeler (2007) for instance, document that the period covering 1999 to 2003 showed significant growth in the price of inpatient services. They use data on average net revenue per discharge for 10 common Diagnosis Related Groups (DRGs) in California to show that price increased rapidly between 1999 and 2003. The increase in price varied with system membership. Hospitals that belonged to systems were able to charge a much higher price than comparable non-system

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<sup>1</sup> All calculations use data for total national health expenditures and population downloaded from the CMS website <http://www.cms.hhs.gov/NationalHealthExpendData/downloads/nhe2007.zip> and data on the CPI all urban consumers series downloaded from the BLS website <http://www.bls.gov/cpi/#data>, each downloaded on June 25, 2009.

hospital. Hospitals that belonged to large systems (with more than 15 members) increased their prices by 34% more than non-system hospitals. Those in small systems (with up to 15 members) increased their prices by 17% more than non-system hospitals.

Using data from California from 1993 to 2001, Zwanziger and Bamezai (2006) find that the increase in inpatient net revenues of private payers after 1999 is associated with a decrease in net revenues from Medicare patients. Using a multivariate hospital fixed-effects analysis, they conclude that controlling for costs, every 10% decrease in Medicare price is associated with a 1.7% increase in prices to private payers.

The increase in hospital prices was not restricted to California. Strunk et al. (2005), report that hospital prices (both inpatient and outpatient) increased significantly from 1994 to 2004. Using price data from the Bureau of Labor Statistics (BLS) “all other payers” Producer Price Index (PPI) series for general and surgical hospitals they find that the annual percent change per capita for hospital prices decreased by 1.5 percentage points (from 4.0 to 2.5) from 1994 to 1999 and increased by 4.5 percentage points (from 2.5 to 7.0) from 1999 to 2004. The three studies highlighted above all confirm the increase in prices we see in our data. The time period covered in the data used in the first two studies end before the significant increase we observe after 1999. The price reported by Strunk et al. is a noisy measure of hospital price and includes both inpatient and outpatient prices. However, it also confirms the general price trend we observe in California.

In this paper, we document the rapid escalation in the price of inpatient services in California and offer possible explanations for it. We find that the usual factors mentioned in the literature as reasons for hospital price increases do not adequately explain the magnitude of the price increase we observe in the data. The sharp price increase we observe does not seem to be correlated geographically with the change in hospital market concentration. In addition, changing case mix does not seem to explain the increases we observe. California imposed cost-increasing regulation over the period of time we observe the rapid price changes (nurse staffing requirements and seismic retrofit requirements), but neither of them seem adequately to explain the run up in prices<sup>2</sup>. There is evidence that after 1999, the influence of managed care organizations weakened and hospitals were able to exploit this weakness to demand significantly higher payments from health insurers.

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<sup>2</sup> It is possible that increasing costs account for a large percent of the run up in prices we see in our data. Our measure of hospital cost does not separate out costs for each payer, thus it is possible that overall cost has grown steadily but a cost related to the care of private paying patients has increased rapidly.

## Data

We use data from the California Office of Statewide Health Planning and Development (OSHPD) covering the 15 year period from 1992-2006. Every non-federal hospital in California is required by law to file a report to OSHPD on various aspects of their operations. These reports include un-audited quarterly financial data, audited annual financial data, and inpatient discharge abstracts. OSHPD creates a number of standardized data products depicting California's hospital industry from these reports.<sup>3</sup> In our work, we use three of these data products: the quarterly financial data, the annual financial data, and the inpatient discharge abstracts. Throughout our analysis, we restrict our sample to short-term, general, non-Kaiser hospitals.

The submission of an annual financial report including a detailed income statement, balance sheet, statements of revenue and expense, and supporting schedules, as well as a quarterly hospital financial report is required of all non-federal California hospitals. The annual financial data contain extensive information on revenue by payer and revenue center, expenses by cost center, staffing levels and wages, property, plant, and equipment, and the like. The annual data is on a fiscal year basis and is therefore somewhat cumbersome. OSHPD does, however, provide a calendar year version of the data for the years 1995-2005. We use this data for some of our analyses. The quarterly financial data is synchronized to calendar quarters but is less informative.

Saliently for our purposes, from 1992 onwards the quarterly data contain fairly detailed revenue and quantity information by payer. For each of six payer types (Medicare, Medicaid, County, Indigent, Third Party Private, and Other), the data contain gross charges (charges before deducting contractual discounts) for inpatient and outpatient care. For the same payer groups, the data contain net revenues overall (aggregating inpatient and outpatient).<sup>4</sup> For the same six groups, the data contain counts of inpatient discharges, inpatient days, and outpatient visits.

Many California hospitals belong to systems; we take common ownership into account in our analyses using the panel ownership data collected by Glenn Melnick and colleagues as part of the California Hospital Data project.<sup>5</sup> This data permits us to calculate concentration measures through 2003.<sup>6</sup>

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<sup>3</sup> OSHPD data can be obtained from its website at: <http://www.oshpd.ca.gov/>.

<sup>4</sup> The availability of net revenues disaggregated by payer types makes the California data unusual and attractive.

<sup>5</sup> See <http://www.usc.edu/schools/sppd/research/healthresearch/research-resources.html>.

<sup>6</sup> We have ownership data through 2002, but we lead the data one year to reflect contracting delays.

Finally, we obtained information on seismic risk—specifically maximum ground acceleration expected with a 10 percent probability in the next 50 years—from the U.S. Geological Survey (USGS) web site<sup>7</sup> and linked it to hospital location to determine each hospital’s seismic risk. See Chang and Jacobson (2008) for an excellent discussion of California’s seismic retrofit program and the use of USGS data to assess its effects.

### Variables

Our principal price measure is net revenue per discharge for third party private payers, aggregated across the population of community hospitals. This measure is constructed from the quarterly financial data beginning with gross inpatient revenue for third party private payers. We multiply this figure by the ratio between overall net revenue for third party private care and overall gross revenue for third party private care. Here, we assume that average discounts are equal for inpatient and outpatient care. We make this assumption since net revenue is not separately disaggregated for inpatients and outpatients. Finally, this estimated net revenue for third party private inpatients is divided by the number of discharges to create our price measure: estimated net revenue per discharge for third party private patients.<sup>8</sup>

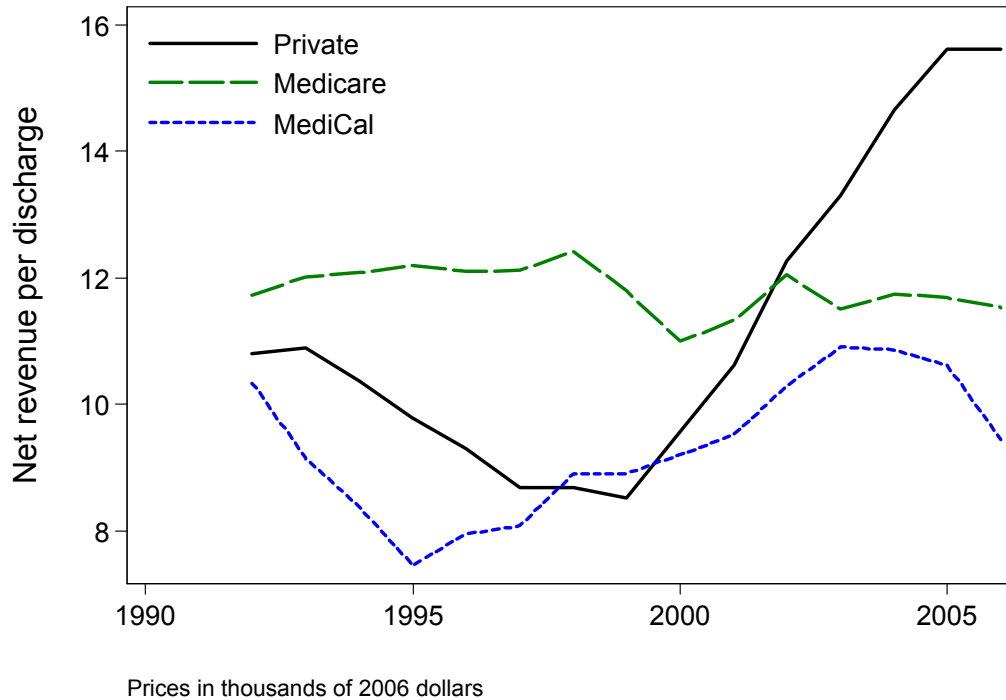
We perform some sensitivity analyses on this price definition. First, we divide by inpatient days rather than inpatient discharges, and this produced results very similar (in terms of the patterns among markets and over time) to those reported below. Second, we go through an extensive case-mix adjustment process to ensure that our results are not driven by changing case-mix over time. The case mix adjustment uses the inpatient discharge data in addition to the financial data and considers primary and secondary diagnoses, age, sex, and race of the patient. The methodology for adjusting for case mix is discussed in detail in Gaynor and Vogt (2003) and in Akosa-Antwi, Gaynor, and Vogt (2008). We measure concentration in local hospital markets by the county Herfindahl-Hirschman Index (HHI). This index is the most common way of characterizing the degree of concentration in markets. It is defined as the sum of the squares of the market shares of the competitors in a market. A market with many competitors each with negligible market share would have an HHI near 0. In general, the HHI of a market is equal to  $10,000 \times \frac{1}{n} + nV(s)$ . In this equation,  $n$  is the number of firms in the market, and  $V(s)$ , is the variance of market share among firms. This implies

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<sup>7</sup> [http://earthquake.usgs.gov/research/hazmaps/products\\_data/2002/data2002.php](http://earthquake.usgs.gov/research/hazmaps/products_data/2002/data2002.php)

<sup>8</sup> Since all of our calculations involve quantities which are aggregates across all the hospitals each year, we are implicitly calculating a discharge-weighted rather than hospital-weighted average price. A hospital with twice as many discharges counts twice as much in the average..

Figure 1: California hospital prices



that the concentration index for equal sized firms is equal to  $10,000/n$ : a monopoly has an HHI of 10,000, a duopoly has an HHI of 5,000, and a triopoly has an HHI of 3,333.

### Inpatient Hospital Prices

Figure 1 illustrates the movements in California hospital prices during our study period of 1992-2006. As can be seen from the Figure, private prices declined steadily from 1992 through 1999. They fell from \$10,800 in 1992 to \$8,500 in 1999 (a decline of 11%). Beginning in 2000, these prices began a rapid increase, increasing ultimately in 2006 to an average of \$15,600 per discharge. This represents, over the period 1999-2006, an 84% increase or an annual average increase of 10.6%.

The private price changes differed among ownership classes. The real price decrease from 1992 to 1999 was larger for for-profit hospitals (38%) than it was among not-for-profits (24%). Over 1999-2006, the price increase among for-profits (69%) was smaller than the corresponding increase among not-for-profits (103%). The price pattern for government hospitals was similar to that for not-for-profits.

In contrast to the growth in private prices, inpatient price for Medicare and MediCal patients did not increase rapidly after 1999. This is not surprising since the price setting mechanism for Medicare and MediCal is different from that of private patients.<sup>9</sup> Medicare prices declined sharply after 1997 most likely due to reduced reimbursement rates associated with Balance Budget Act of 1997. After years of decline, MediCal prices increased steadily from 1995 to 2003 and then declined afterwards. The uptrend in MediCal prices coincides with state legislation that expanded MediCal managed care enrollment by making it easier for MediCal recipients to switch from Fee for Service (FFS) plans to managed care plans. The increase in observed MediCal price in the late 1990's is most likely due to this expansion. Duggan (2004), for instance, finds that the expansion of managed care enrollment for MediCal recipients was associated with a substantial increase in spending (with no corresponding increase in quality).

### **Possible Explanations**

We consider in turn the following candidates: mergers and increases in concentration, increasing case mix, a legislated increase in nurse staffing, seismic retrofitting, and the backlash against managed care.

#### Mergers and Concentration

During the second half of the 1990's, a dramatic wave of hospital consolidation occurred in the United States. Levin and Associates<sup>10</sup> estimate the total number of hospital mergers from 1994 to 2005 at over 1,000 deals on a base of approximately 6,100 hospitals. Figure 2 shows the number of mergers and acquisitions increased sharply from 1994 to 1997 and then steadily declined afterwards. This wave of mergers was national in scope and affected all hospital markets in the United States including California.

As a result of this consolidation, many local markets, including large cities such as Boston, Minneapolis, Pittsburgh, Philadelphia, Saint Louis, and San Francisco have come to be dominated by two or three large hospital systems, where six to twelve independent firms used to be typical. At the same time, exit has led to a decrease in the total number of hospitals from 5,229 community hospitals in 1994 to a little over 4,897 in 2007 (American Hospital Association, 2009).

This wave of consolidation has led to a dramatic increase in the level of concentration in local hospital markets. The average resident of a metropolitan

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<sup>9</sup> Medicare and MediCal prices are set by the federal and states while price for private paying patients is set by the market.

<sup>10</sup> See <http://www.kff.org/insurance/7031/print-sec5.cfm>



Figure 2: Hospital M&amp;A



area<sup>11</sup> in 1990 faced a hospital market with an HHI of 1,574, considered moderately concentrated by the antitrust authorities<sup>12</sup>. In 2003, this average metropolitan resident lived in a market with a hospital concentration index of 2,323: highly concentrated by U.S. antitrust standards<sup>13</sup> (Vogt and Town, 2007).

There is an extensive literature documenting the correlation between concentration and price in California's hospital market. The evidence suggests that hospital consolidation leads to substantial price increases, with the biggest increases accruing to merging hospitals which are in close geographic proximity to one another (Capps and Dranove, 2004; Dafny, 2005; Gaynor and Vogt, 2003; Sacher and Vita, 2001).

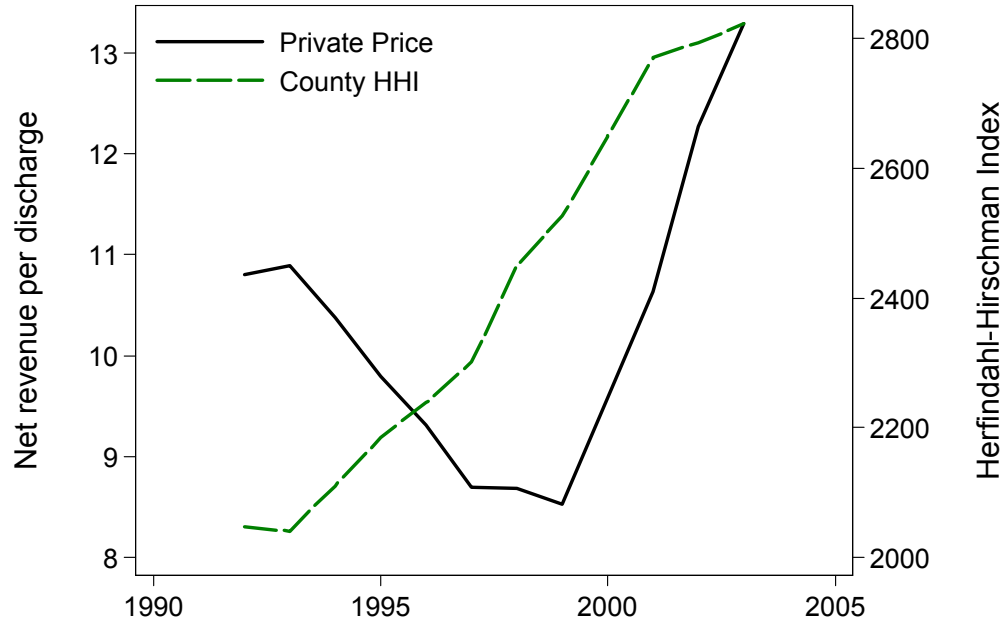
Given the extensive merger wave of the 1990s, the obvious explanation for the run-up in prices is the decrease in the competitiveness of California's hospital market. Thus, if there was a substantial increase in hospital concentration

<sup>11</sup> A market in this context is defined as a Metropolitan Statistical Area.

<sup>12</sup> Antitrust enforcement agencies consider a market with HHI between 1,000 and 1,800 as moderately concentrated. (Federal Trade Commission, 1997)

<sup>13</sup> A market with an HHI greater than 1,800 is considered highly concentrated. (Federal Trade Commission, 1997)

Figure 3: Price and concentration trends



Prices in thousands of 2006 dollars

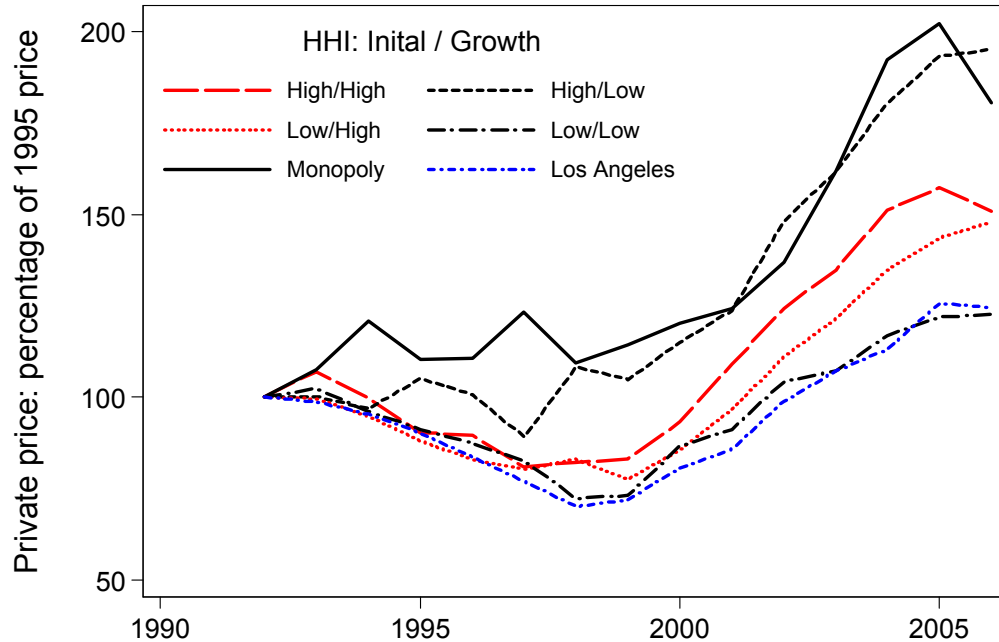
in California as a result of the merger wave, this could provide an explanation for the increase in prices.

Over the period 1992-2003, we find a substantial increase in hospital market concentration in California. The average<sup>14</sup> county HHI for a California hospital rose from 2,046 to 2,824. This is approximately equivalent to a decrease from five to four equally sized firms. The national run up in average HHI over 1990 to 2003 was from 1,576 to 2,323 (Vogt and Town, 2007). In each case, HHI rose by about 800 points, and, in each case, these are increases which would be considered large by the articulated standards of the US antitrust enforcement authorities (Federal Trade Commission, 1997) which describe a 100 point increase in HHI as representing a substantial lessening of competition.

In Figure 3, we graph the evolution of average HHI and average inpatient hospital price over time. The increase in HHI echoes and reinforces the message of Figure 2. There was a substantial wave of hospital consolidation in California in the 1990s, shown in Figure 3 by the steep increase in average HHI over that time period. The increase in price is also again visible in this figure, and the two lines do have a vaguely similar shape. One might imagine interpreting this graph

<sup>14</sup> In taking average HHI across hospitals, we weighted each hospital equally. If we weight instead by the number of discharges, the increase in HHI is from 1,534 to 2,201.

Figure 4: Concentration changes and prices



as showing that the increase in hospital concentration created the increase in price, but with a lag. The lag necessary to justify this explanation is on the order of six years, however. Given that hospitals normally contract with insurers for one or a very few years, this seems, to us, to be a very long lag.

Another way to explore the association between rising hospital market concentration and rising prices is geographically. If rising concentration is leading to rising prices, then presumably we should expect to observe that hospital prices rose the fastest in geographical areas in which concentration was rising fastest. In Figure 4, we graph such an analysis. We classify each county in California which contains a hospital over the 1992 to 2003 period into one of four categories: monopoly, high concentration, low concentration, and Los Angeles. Monopoly counties are those which had a single hospital over 1992-2003. Low concentration counties are defined to be those with HHI below 2000 in 1992. High concentration counties are defined as those with HHI was above 2000 in 1992.

The high and low concentration counties were further subdivided into those whose concentration rose quickly over this time period, by more than 300 points and those whose concentration rose slowly over this time period, by less than 300 points. Finally, Los Angeles County was singled out because it is so

different from the other counties. It contains about a quarter of all California's general hospitals, and it experienced a very large number of closures and mergers over this time period. Its HHI was 344 in 2002 and it rose to 589 by 2003. If Los Angeles were to be classified like the other counties, it would be low concentration and low growth.

Figure 4 shows the evolution of prices, relative to their level in 1992, over the period 1992-2006 for the hospitals in the six groups of counties. The black solid line corresponds to hospitals in monopoly counties. The red lines correspond to hospitals in the counties whose concentration grew quickly. The black dashed lines correspond to hospitals in the counties whose concentrations grew slowly. The blue line shows prices in Los Angeles County hospitals.

The lines fall into three groups. Hospitals in the monopoly counties and hospitals in the high concentration, low concentration growth counties had the fastest price increases over this period. Hospitals in counties with the highest growth in concentration (the low-concentration, high-growth, and high-concentration, high-growth counties) had the moderate price increases. Finally, hospitals in the low concentration, low concentration growth counties and hospitals in Los Angeles County experienced the slowest growth in prices.

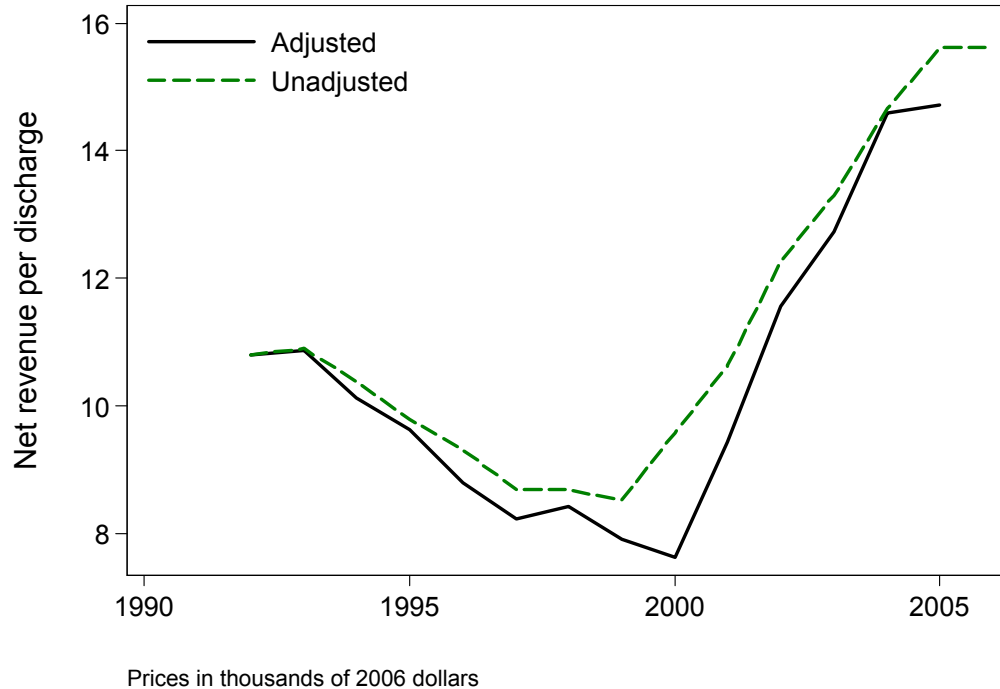
These results do not seem, at least on the surface, consistent with a story that growth in hospital concentration led to growth in prices. The highest price increases were in counties with monopoly hospitals or very few hospitals—concentrated, unchanging markets had the fastest price growth. The markets one might expect to have the fastest price growth, the red lines in Figure 4, had only moderate growth. The slow price growth in less concentrated and slowly changing markets does seem to be consistent with the story, however.

### Case Mix and Other Mismeasurement

As we discuss above, our principal measure of price is net revenue per discharge for third party payers. One potential difficulty associated with this measure is the possibility that the patients are different—an increase in this measure of price might reflect a sicker, more costly patient pool which consumes more hospital output per stay rather than a true increase in price. To examine the possibility of changing case mix explaining our results, we extensively case-mix adjusted using the inpatient discharge data, accounting for differences in age, sex, race, and primary and secondary diagnoses using methods we have described elsewhere. (Gaynor and Vogt, 2003; Akosa-Antwi, Gaynor, and Vogt, 2007)

We plot the crude private price of Figure 1 against this extensively adjusted private price (scaled to be equal to the crude price in 1992). The result is displayed in Figure 5. It shows that, as expected, the adjusted private price lies below the crude private price for years after 1992. This shows that case mix did get less favorable over time and that this change accounted for some of the

Figure 5: Effects of casemix adjustment



apparent price run-up. However, as is immediately apparent, the difference between the growth in crude and adjusted prices is very small. The crude price grew by 84% over 1999-2005 while the adjusted price grew by 86% over the same period. Thus, the worsening of case mix mostly occurred from 1992 to 1999, and, in any event, the case mix effect was small.

Another potential difficulty is that, even for a fixed population of patients, the average amount of care delivered in each stay may have evolved over time—an increase in our measured price might reflect an increasingly intensive style of care perhaps including the deployment of more or more expensive technologies. Addressing this objection completely would be a significant undertaking. However, we can crudely measure the intensity of treatment by counting the number of procedures performed on average using the procedure codes in the OSHPD discharge data. For each year, we calculate the average number of procedures from the discharge data. For the years 1992-1999, there are 0.84 procedures per discharge, and for 2000-2007 there are 0.77. We include a graph of the average number of procedures per discharge in the appendix as Figure A1. While there is an uptick after 2000, the increase in number of procedures per discharge over 2000-2005 is less than 9%.

Since hospitals' patient volumes are changing over time and since we are using discharge-weighted rather than hospital-weighted averages, it is possible for composition to affect our price measures. For example if patients over time were becoming more likely to go to higher priced hospitals, this would appear, in our measure, to be a price increase even if each hospital's price were to be unchanging. To ensure that this does not explain our results, we fix each hospital's number of discharges at its 2000 level,<sup>15</sup> and we adjust its gross and net revenues by the ratio of its year 2000 discharges to its current year discharges.<sup>16</sup> Then we performed the same overall price calculation described above. The results are that prices calculated this way fell from \$11,400 in 1992 to \$8,900 in 1999 and then rose to \$15,600 in 2006. The price increase from 1999 to 2006 (76%) is similar to the 83% calculated earlier, and the price decline from 1992 to 1999 (32%) is similar to the 31% decline observed using the earlier methods.

### Nurse Staffing Ratio Mandate

In 1999, state legislation was passed (AB 394) that mandated minimum nurse staffing ratios for certain hospital units. The final nursing staffing ratio regulation was announced in 2002 and was implemented in January 2004. Perhaps this regulation, in concert with other changes in California's labor market (such as the run-up in nurse wages), raised the costs of providing care enough to explain the growth in hospital prices.

This possibility is explored in Figure 6. To draw that figure, we have taken operating expenses and labor expenses for California hospitals and allocated them between inpatient and outpatient care on the basis of total gross charges for inpatient and outpatient care. Then, we have divided the allocated inpatient costs by discharges. Because we are using data from the annual (rather than the quarterly) reports for this analysis and because California has only rationalized these data to calendar years for 1995-2005, those are the years we present. The quarterly data also contain information on the value of capital projects at a hospital in a given year, and we have graphed the average value of reported capital projects also in Figure 6.

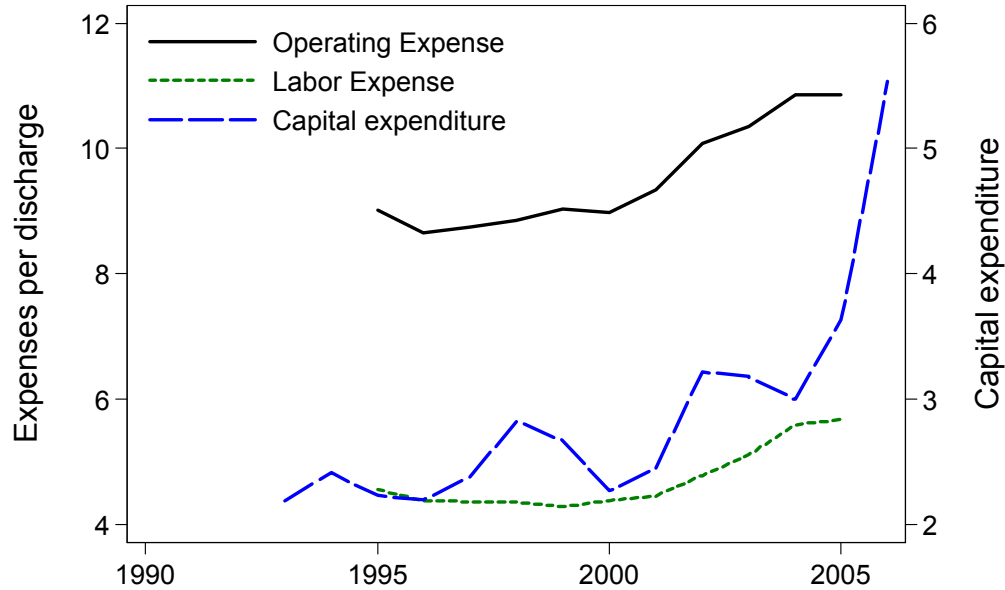
Hospital costs rose between 1995 and 2005. Capital expenditures especially have risen, apparently due to California's seismic mandate legislation (discussed below and in Chang and Jacobson, 2008). However, the per-discharge

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<sup>15</sup> Obviously, this can only be done for the 330 hospitals which existed in 2000. The price history of these 330 hospitals is highly representative of the overall price movements over this time period. Their average prices fell from \$10,900 in 1992 to \$8,500 in 1999 and then rose to \$15,700 in 2006, almost exactly the same price history as the overall sample.

<sup>16</sup> For example, if a hospital's discharges in 2001 were 5% higher than its discharges in 2000, then we would reduce its discharges in 2001 by 5% (to bring them back to the same level as in 2000), and we would reduce gross revenues and net revenues for that hospital by 5% in 2001.

Figure 6: Hospital expenses



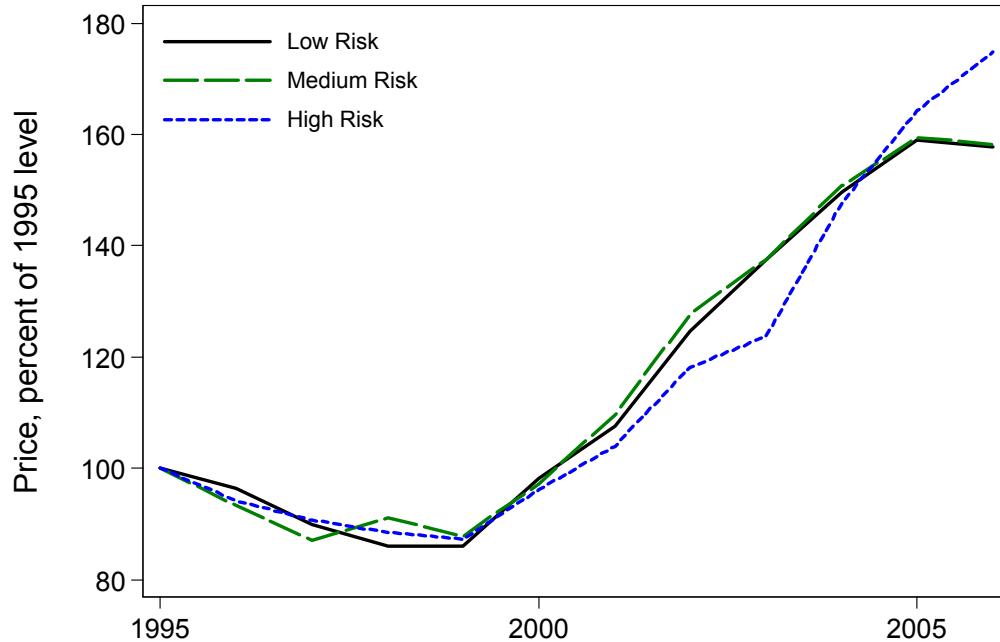
Expenses are in 1,000s of 2006 dollars  
 Capital expenditures are in millions of 2006 dollars

increases in operating expenses and in labor expenses are dwarfed by the price increases over this period. For example, from 1999 to 2005, operating expenses rose from about \$9,000 per discharge to about \$10,800 per discharge (a difference of \$1,800). Over that same period, private third-party prices rose from \$8,500 per discharge to \$15,600 (a difference of \$7,100). Similarly, compensation expense rose from about \$4,600 per discharge to \$5,700. Thus, increasing costs are insufficient, at least on their face, to explain the rise of hospital prices. It is important to note, however, that the hospital expenses reported here are the total of all expenses for a given hospital. Perhaps expenses pertinent only to private payers were increasing much more rapidly than were overall expenses. Our data are insufficient to disentangle this possibility.

#### Seismic Retrofitting Mandate

California's seismic retrofit law (passed in 1998) requires retrofitting or complete reconstruction of California hospital buildings to make them more earthquake tolerant. This regulation is expected to be expensive to comply with, but the expense depends on, among many other things, the degree of earthquake risk as assessed by the U.S. Geological Survey (USGS).

Figure 7: Seismic risk and prices



The seismic retrofitting mandate represents a fixed-cost shock to a hospital's budget. If hospitals are profit maximizers, then as economic theory predicts, we do not expect any changes in a hospital's resource use, services provided and consequently, their pricing behavior. Chang and Jacobson (2008) find that consistent with economic theory, for-profit hospitals in California did not change their resource use or service mix in response to the seismic retrofitting mandate. Not-for-profit hospitals however, responded to the legislation by increasing the provision of profitable services. It is possible that the increase in the provision of profitable services led to an increase in labor expenses and price. Government owned hospitals responded to the mandate by decreasing their provision of charity care. As noted previously, not-for-profit hospital increased their prices much faster than government and for-profit hospitals.

As Chang and Jacobson point out, the location of a hospital is an important determinant of its response to the mandate. We examine the relationship between a hospital's location and its pricing behavior.

The regulation's requirements are based, to a significant degree, on earthquake risk as measured by the USGS. This risk varies across California broadly (San Francisco and Los Angeles are higher risk, San Diego and Sacramento lower). The risk also varies at much smaller geographical levels, and



Chang and Jacobson demonstrate that hospital spending on property, plant, and equipment increases with higher seismic risk (and, presumably, greater required modifications to achieve the regulated degree of safety).

Using the USGS measure of maximum ground acceleration expected with a 10 percent probability in the next 50 years (hereafter,  $g$ ) to measure seismic risk, we divide hospitals into three categories. The low risk category consists of hospitals with a below-median value of  $g$ . The medium risk category consists of hospitals with a value of  $g$  above the median but below the 90<sup>th</sup> percentile. The high risk category consists of hospitals with  $g$  above the 90<sup>th</sup> percentile. As is evident in Figure 7, the price increases of hospitals in these three categories are very similar over the period 1995 to 2006, with the high risk hospitals showing a price increase of 75% vs. 58% for the other two risk groups.

### Managed Care Backlash

The early literature examining managed care and hospital competition finds that price and concentration are positively associated and that this effect is strengthened by high HMO penetration. (Dranove et al., 1993; Keeler et al., 1999; Melnick et al, 1992; Simpson and Shin, 1998; and Zwanziger and Melnick, 1988). Managed care may play an important mediating role in the relationship between concentration and price. One way managed care reduces costs is by reducing hospital prices by playing one hospital off against another. Since this strategy is likely to work best with many independent hospitals, one might expect to see a larger effect of concentration on price in markets with high managed care penetration.

After the turn of the millennium, numerous commentators reported a “managed care backlash” in which consumers were demanding broader provider networks from insurers. This would be expected to reduce the ability of insurers to extract discounts from hospitals by playing them off against one another. Dranove et al (2008) find that the association between concentration and price was positive in the 1990s, strongly positive around the turn of the millennium, but substantially weaker by 2003. In related work, Shen et al. (2008) find that the ability of HMOs to contain costs was significantly weakened during the managed care backlash period of 2000-2005.

White et al. (2004) provide anecdotal evidence of a shift in power with respect to contract negotiation between hospitals and insurance providers, particularly HMOs. After conceding to deep discounts in the 1990’s, most hospitals systems have turned the tables on HMOs. A case in point happened in 2000 in Orange County, California where St. Joseph Health System terminated its contract with PacifiCare after the latter refused to accept a new agreement in which St. Joseph proposed significant increases in the payments it received. This dispute reportedly affected about 100,000 people in Southern California.

According to White et al., PacifiCare was the loser in this dispute as three-quarters of its patients switched to other health plans and stayed with St. Josephs Health System. After this public showdown, most health insurers recognizing the new clout that hospitals wielded accepted their demands of rate increases. In fact, PacifiCare's operation was so badly affected that it returned to St. Joseph two years after the separation.

The studies discussed above provide evidence that managed care organization's ability to contain hospital prices waned after 1999. This provided hospitals with the ability to extract significantly higher payments. It is possible that the significant price increases we see after 1999 reflects the ability of hospitals to demand significantly higher payments because of the perceived weakness of HMOs.

## **Conclusion**

In this paper we document the trend in inpatient hospital prices before and after the wave of mergers in the mid 1990's using California hospital discharge and financial data from 1992 to 2006. We find a downward trend in price for private pay patients in the 1990s and a sharp increase beginning in 1999. Prices to private pay patients almost doubled from 1999 to 2006, while Medicare and MediCal prices showed little trend. This trend remained after we corrected for differences in case mix over time.

In addition, we document a rapid increase in hospital market concentration in California during the merger wave of the 1990s. Surprisingly, the price run up does not seem to be explained by this increase in concentration. The price increase occurred about six years after the increase in concentration. Furthermore, the run up does not seem to have been larger in areas which experienced a larger increase in concentration.

The escalation in prices does not seem to be associated with either California's nurse staffing regulation or with its seismic retrofit mandate. The increases over this period in overall costs and in staffing costs are dwarfed by the price increases to private payers. Furthermore, the price run up does not seem to be concentrated among hospitals in areas with the greatest earthquake risk. There is some evidence that, after 1999, hospitals were able to exploit the weakness of managed care to demand significant increases in payments. A detailed analysis of whether this accounts for the increase in prices documented here is left to future work.

## Appendix

Figure A1: Procedure Intensity



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