COMPETITION AMONG HOSPITALS

BY

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I. Introduction

Hospital competition is generally perceived to differ from that observed in other industries, where price competition and profit maximization govern firm behavior. Various characteristics of the hospital industry may alter normal incentives and reduce constraints on prices charged. Hospital competition may instead focus on quality[1] in order to attract patients and physicians. Since quality is costly, those factors that increase competition may, by raising the average level of quality, lead to higher prices (per unit of output not adjusted for quality).[2]

This study attempts to determine the extent, form, and effect of competition among hospitals. Is it true that quality is the only dimension that matters, or does price competition also exist? What structural factors of the hospital industry are most important in affecting competition? Do concentration and entry barriers, for example, have the same significance in the hospital industry as in other industries? What influence do for-profit firms have in this primarily non-profit industry? What role do physicians play?

Both hospital price and expense data are used to identify the independent effects of price and quality competition. The price data should be particularly enlightening.

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[1] For now, the term "quality" is used to refer to all non-price aspects of competition. An increase in "quality" is not necessarily welfare-enhancing. Inefficient increases in quality, i.e. increases in services or equipment that are purely redundant, will be discussed below, in section II.B. The data available to this study do not permit the separate identification of beneficial and wasteful, or inefficient, "quality" competition.

[2] Indeed, in Federal Trade Commission cases challenging hospital acquisitions under the antitrust laws, hospital chains have argued that hospitals do not engage in traditional price competition. The Commission, however, has rejected this argument. (Hospital Corporation of America, 106 F.T.C. 361, 482 (1985), aff'd 807 F.2d 1381 (7th Cir. 1986); American Medical International, 104 F.T.C. 1, 202 (1984).

Since they represent charges for particular disease categories, many of the case-mix aggregation problems found in other studies are mitigated here. Moreover, most studies have relied on expense data, which, while useful for analyzing quality competition and efficiency issues, are not helpful in addressing the subject of price competition. Since the expense data are not as disaggregated as the price data, however, direct measurement of the effects of competition on hospital profits is not feasible.

Reduced form equations describing price, which hold constant exogenous demand and cost conditions, are estimated to determine the effects of market structure, ownership, and the extent of regulation. The price regressions measure the net effect of any price and quality competition that may exist. Since it is impossible to control completely for quality, one cannot isolate price competition from these regressions alone. Therefore, we also estimate reduced form equations for expenses to study the influence on expenses of the variables thought to affect price. Their effects on expenses should reflect quality, efficiency and scale economy factors, but not the primary effects of price competition. Differences between the price and expense regressions suggest the existence of price competition.

The regression results described below suggest that a reduction in concentration leads to an increase in both price and quality competition. It appears that increased quality competition, resulting from the reduction in concentration, causes expenses to rise by a statistically significant amount. While the effect of a modest reduction in concentration seems to be small in percentage terms, when concentration is measured using a dummy variable to identify those markets where concentration is below a certain level, more substantial effects appear. Despite this increase in expenses when concentration is reduced, prices (per unit of output, not adjusted for quality) are prevented from rising by a concomitant increase in price competition. This result implies that, for a given level of quality, price is lower in areas

with less concentrated markets.[3] Since hospitals appear to compete on both price and quality dimensions, the hospital industry can be analyzed, for the most part, like other industries when, for example, applying the antitrust laws.[4]

Where entry into a market is regulated by a Certificate of Need (CON) law, both prices and expenses are higher than in areas without such regulations. Prices appear to increase by slightly greater, and perhaps more significant, in a statistical sense, amounts than expenses. Since these results imply higher margins, a CON law may function as an entry barrier. Its primary effect, however, is to lead to less efficient resource utilization and higher costs. There is no evidence that CON laws have resulted in the resource savings they were purportedly designed to promote. Therefore recent plans and decisions to repeal CON laws in some states should increase consumer welfare.

The effects of for-profit hospitals on prices and expenses are also examined. Consistent with other literature on this issue, this study finds that for-profit institutions charge higher prices but incur similar expenses. Since their input usage is lower, there is no evidence that they produce higher quality services. The results suggest that for-profit hospitals' pricing decisions generate higher profits than those

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[3] This result taken alone might be consistent with a positive correlation between concentration and efficiency, the benefits of which are not passed on to consumers. Other results, discussed below in Section IV.A, suggest that efficiencies do not fully explain the negative relation between concentration and expenses.

[4] The results of this study do suggest that an increase in concentration reduces expenses, presumably because of a reduction in quality competition. Since prices remain unchanged, however, consumers do not benefit. In fact, unless all costly quality competition is wasteful, consumers are harmed. What happens to the social welfare depends on the tradeoff between the reduction in wasteful competition (and increase in efficiency) and the deadweight loss generated by supra-competitive pricing and possibly a non-optimal level of quality as well.

of their non-profit competitors. The presence of outside investors in for-profit hospitals may constrain the pricing behavior of hospital administrators and physicians, who both may have objectives apart from profit maximization that would lead them to set non profit-maximizing prices.[5]

Hospitals that are managed under contract with an independent company that manages several hospitals also appear to charge higher prices, but their expenses are even higher in percentage terms. The pattern for hospitals that belong to a system of several commonly owned hospitals is similar, although less pronounced. This study provides no evidence that these types of arrangements enhance efficiency. However, the time period studied here predates the time when the major for-profit hospital chains and management enterprises became prominent.

Public (state, county and municipal) hospitals appear to charge lower prices and incur higher expenses. Their higher expenses likely result from a clientele that is sicker or average, since anecdotal evidence suggests that they do not offer higher quality service. In any event, these results shed light on why public hospitals have financial difficulties.

High physician - hospital bed ratios also lead to higher prices and expenses. This may result because physicians enhance the demand for hospital services since they make most of the admitting decisions and strongly influence the

[5] To the extent that some for-profit hospitals are owned by physicians, the theory that outside investors exert more control over the medical staff than do the administrators or boards of non-profit hospitals is clearly inappropriate. While many for-profit hospitals were founded by physicians, by the late 1970s when the data for this study were collected, the majority of for-profit hospitals in the sample were not physician-owned. Certainly, since physician-owned hospitals tended to be small, only a small minority of the for-profit beds were controlled by physicians.

type of care that patients receive once in the hospital. In addition, it is possible that greater usage of physicians relative to beds indicates higher quality services. The results provide no evidence that physicians lower the demand for hospital care by functioning primarily as substitutes to hospital care.

The results of this study imply that, while hospital markets may have several important distortions, almost a decade ago they were not immune to standard competitive forces, including price competition. Much anecdotal evidence suggests that consumer sensitivity to hospital care prices has increased in recent years. Therefore, since evidence of hospital price competition is found in the 1977-1978 data used in this study, it is reasonable to speculate that even more exists today.

Section II presents a review of the literature discussing hospital behavior and the role of various organizational forms and regulations. Section III develops a model to derive the price and expense regressions used in the empirical estimation. The data are described as well. Section IV presents empirical results. Section V provides a conclusion and discusses some implications for the current, apparently more competitive environment.

II. Literature Review

To formulate theories useful in predicting hospital responses to competition, it is helpful to outline certain characteristics specific to the hospital industry as well as various economic models that explain hospital behavior. While these theories vary in their choice of relevant decision makers and objective functions, most predict that, due to the nature of the hospital industry, price competition is not the primary force governing hospital behavior and implicitly assume hospitals to be price setters.[6]

A. Characteristics of Hospitals

Many unusual facets of hospital behavior are generally attributed to some special characteristics of the industry. First, since the vast majority (about 90%) of hospital bills are paid by third parties, consumers (patients) may lack incentives to shop around, and, if so, price competition is not directly encouraged. Since, until recently, public and private insurance companies have paid hospitals on a cost reimbursement basis, little restraint has been generated by the direct payors either. Prices are presumably prevented from rising infinitely by less than total insurance coverage and some resistance to high premiums.[7] [8]

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[6] Salkever (1978) at 192.

[7] Lynch (1986) has shown the remarkably stable relationship between out-of-pocket health care expenditures and take home wages over the last 65 years. While both total health care expenditures as a percent of GNP and the proportion of them covered by third parties have risen dramatically, the number of weeks of wages necessary to pay for direct health care expenditures has a coefficient of variation of only 7% from 1929 to 1983.

[8] The extent of price sensitivity is an empirical question which has not been settled definitively. An early study by Martin Feldstein (1971) estimated aggregate demand elasticities with respect to price net of insurance payments of .4 to .6 at then prevailing levels of net prices. Newhouse and Phelps (1976) noted flaws in the derivation of his insurance variable and, using a superior measure,

Second, physicians play an important role in determining both the supply of and demand for hospital services. On the supply side, they influence hospital input and production decisions. Physicians may often act as patients' agents and thus affect the demand for hospital services as well. Patients generally do not admit themselves to hospitals. Moreover, since information about the nature and total price of the product consumed is difficult for patients to understand, and risk aversion with respect to outcome is probably common, consumers in general grant their physicians considerable decision-making authority. Since physician objectives may not coincide with hospital profit maximization, their influence may alter hospital behavior, particularly since competition among physicians is itself imperfect.[9]

Finally, the hospital industry is composed primarily of non-profit firms. The incentives of such firms are not clearly understood, but profit maximization is by definition not the explicit goal.[10] Discussion below will focus on the

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measured an elasticity very close to zero. They also found that the existence of insurance coverage had a strong effect on price sensitivity. A later paper by Feldstein (1977) found a long run admissions elasticity with respect to price of .21 and a short run elasticity of only .10. Mean stay elasticities were insignificantly different from zero. A very recent study by the Rand Corporation on emergency room use (O'Grady, Manning, Newhouse and Brook (1985)) showed that emergency room use was 90 percent higher for minor ailments and 30 percent higher for more serious diagnoses by those with complete coverage than by those who had to pay 25-95 percent of the bill themselves. For less urgent care, the existence of coinsurance was more important than the amount, while for more serious cases, usage decreased with increases in cost sharing.

[9] See Kessel (1958), Friedman (1962), Hyde & Wolff (1952), and Noether (1986).

[10] Fama and Jensen (1983 a and b, 1985) distinguish non-profit firms as those without any residual claimants such as the stockholders of corporations. This lack of residual claimants assures potential donors that their gifts will not

recent growth in the proprietary (for-profit) segment of the hospital industry.

B. Models of Hospital Behavior

Two broad classes of models exist to describe hospital behavior. Since several summaries of this literature exist,[11] only a brief discussion is included here to focus on the models' competitive implications. The first scenario, suggested by Newhouse (1970), Feldstein (1971), and Lee (1971), posits a group of trustees and administrators with a preference function in quality and, sometimes also, quantity, both of which enhance the prestige of the hospital and hence of the utility maximizers as well. In these models, the hospital is faced with a budget constraint that leads to a trade-off between quality and quantity. The budget constraint itself, however, is assumed to be somewhat fluid due to extensive third party coverage.

The implication of increased competition on these models is not clear. To the extent that quality is important because it enables hospitals to attract more and better physicians who enhance the prestige of the hospital and increase demand for its services,[12] competition results in greater quality with higher prices per bundled unit of output. Moreover if consumers are fairly insensitive to price and, at the same time, they value quality, increased competition can be expected to arise primarily along quality rather

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be expropriated. Thus non-profit organisations often receive a high proportion of their funds from donations. For non-profit hospitals, however, this is no longer the case, and the change may explain the emergence of a growing for-profit sector. On the other hand, the government still "donates" resources to non-profit hospitals by granting them tax-exempt status.

[11] See, for example, Davis (1972), Jacobs (1974) or Sloan and Steinwald (1980).

[12] The Lee model discusses this most directly.

than price dimensions.[13] This market can also be compared to that of regulated airlines which, since prices were fixed, dissipated profits through costly service competition.[14]

The second set of models, exemplified by Pauly and Redisch (1973), focuses on the importance of the physician in hospital decision making. These models view the hospital as a "physicians' cooperative." Physicians maximize their collective incomes subject to constraints imposed by the costs of other inputs, but cooperate imperfectly and hence use too many hospital inputs.[15]

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[13] A large economics literature discusses the impact of market structure on product quality. Schmalensee (1979) provides a good summary of this literature. Using durability as a proxy for quality, under a set of general assumptions, Swan (1970, 1971) showed that market structure has no impact on a producer's optimal quality decision. A crucial assumption implicit in Swan's result, however, is that no demand exists for durability per se; using durability as the paradigm for quality assumes that consumers are interested only in a service flow, e.g. a ten-shave-blade costing $1.00 is equivalent to a fifty-shave-blade costing $5.00.

Demand for quality hospital care cannot be treated this simply; two low quality operations generally do not produce the same output as one high quality one. Lehvari & Peles (1973) and Leffler (1982) develop more general models. They show that when quality increases the demand for a product, but is not a substitute for quantity, i.e. does not affect durability, then the effect of market structure on quality depends on the shape of the cost function as well as the interaction of the effects of quality and quantity on demand. Without specific formulations of demand and cost functions, the relation between quality and market structure is ambiguous.

[14] See Douglas & Miller (1974).

[15] Pauly (1980), working in the context of a two factor (physicians and other hospital inputs) model of hospital output, concludes that physicians' incentives do not produce the cost-minimising mix of their own time and other inputs. While the resulting profit is shared among all of the physicians affiliated with the hospital, each bears the full cost of his/her own input. Since neither physicians nor patients face the marginal cost of complementary hospital inputs,

Since in this scenario, physicians are the relevant decision makers, more competitive hospital markets are the result of greater competition among physicians. While greater physician competition should certainly imply lower physician incomes, the appropriate prediction about hospital fees is not downward. First, these models assume, consumers are only concerned about the total price of hospital services which includes both the physician and hospital components. If this is true, then increased competition among physicians may permit the hospital, to the extent that its owners/ managers have interests distinct from the medical staff, to gather some of the rents formerly earned by physicians. In this case, the hospital component of prices may rise while total prices either fall or remain constant depending on consumer price sensitivity. Second, as physicians become less organized, their tendency to overutilize hospital inputs may

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Pauly suggests that physicians overutilise hospital inputs. Therefore he predicts that the total cost of a hospital visit, including the physician and hospital components, exceeds the efficient level. After estimating a hospital production function he concludes that hospital expenses could be reduced by eight percent on average by moving to the optimal (efficient) physician-hospital input ratio. In a related study, Pauly (1978) also determines that hospital costs are negatively related to the concentration of output (admissions) among the physician staff. Shalit (1977) extends the two factor model of physicians and other hospital inputs in a different direction. He explicitly assumes that the medical staff enforces a cartel through maintenance of a closed staff. While a monopolist would wish any complementary input to be supplied competitively, since each physician has an incentive to cheat by using an "excess" of hospital-supplied inputs, the well-organized physician cartel also restricts the supply of such complementary inputs. Therefore he predicts that more organised physician groups better restrict the supply of hospital inputs and that, therefore, a positive relation should exist between physician prices and physician/hospital input ratios. Empirically, Shalit finds that an index of prices for various medical procedures is significantly negatively related to the bed/physician and other hospital personnel/physician ratios. Such evidence contradicts the notion that physicians are paid the value of their marginal product, which should decrease as their usage relative to other inputs increases. Shalit recognizes, as does Pauly, that if hospital inputs were priced appropriately, such input restriction would be unnecessary.

increase. This would also lead to higher expenses and prices with increases in competition.

While both the administrator and physician decision maker models imply that, all else constant, higher hospital prices may result from increased competition, the cause differs across the models. In the administrator model, increased competition leads to higher quality output which is costly to produce. On the other hand, in the physician maximization model, the hospital component of prices rises either because output is produced less efficiently or because more rents accrue to hospitals (at the expense of physicians). The two models are by no means mutually exclusive; the objectives of physicians and administrators do not necessarily diverge according to these models.[16]

The market imperfections discussed above cause two departures from efficient resource allocation. First, at a given level of quality, output is produced inefficiently due to the inappropriate pricing of different inputs. Second, the level of "quality" is itself altered. As mentioned earlier, the term "quality" has been used to describe the complexity of the bundle of output produced. Such complexity results from the usage of more costly inputs, particularly technologically advanced capital, but also more specialized personnel. While, in one sense, such medical care can be termed high quality, it is not clear that such care always produces better health outcomes. In other words, some of the quality competition discussed above may indeed be wasteful as the Lee model

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[16] Harris (1977), for example, views the hospital as two separate organisations, one composed of the medical staff and the other, the administrators. Physicians, as patients' agents are the effective demanders, while administrators arrange for the supply and determine the capacity level of most of the necessary inputs. The patient has two separate contracts, one with the physician and the other with the hospital.

suggests.[17] Various empirical studies suggest that a wide range exists in the type of care given in different locations for comparable illnesses.[18]

Since medical care costs do not consume total GNP, some restraint on hospital prices obviously does exist. While increased competition may lead to the usage of more inputs to create a more complex output, it seems likely that some pressure on price is also manifested. Even if prices rise due to "quality competition", price per unit of quality, and, hence, margins, the difference between prices and costs, should fall as the degree of competition increases. In other words, competition may have two opposing effects on prices. Production of a more costly output bundle pushes prices upward, while standard competitive pressures lower them.

Which effect is stronger is an empirical question. It is difficult, however, to test these models of hospital competition for at least two reasons. First, the definition and measurement of quality or complexity is elusive. There are many unpriced product attributes, such as response time, precautions taken, excess capacity, and amenities. Moreover, to account for quality appropriately, output should be measured rather than inputs. In many studies, quality is proxied by the number of diagnostic and therapeutic procedures completed per day or by poorly measured health outcomes.[19] Unadjusted hospital output is also difficult to

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[17] If some hospital competition is in fact totally wasteful, it presumably results from the risk aversion and paucity of information possessed by consumers. In other situations where quality competition is important such as the regulated airline industry, the increased services offered, while not welfare maximizing in a first-best sense, at least provide some utility to consumers. This may not be the case for some hospital competition; only physicians and/or hospital administrators may benefit.

[18] "Medical Practice: Why Does it Vary so Much?" Hospitals 59, 3/1/85, at 88.

[19] Sloan (1984) at 83-84.

define since, even within a given disease category, no two cases are identical. Second, these models imply that hospital markets are differentiated oligopolies. Such a market structure is notoriously difficult to model.

Most researchers have postulated that "quality" competition is more important than "price" competition in hospital markets, but few have studied the net effect on prices. The effect of quality competition should be seen most clearly on expenses where the offsetting effects of price competition do not exist.[20]

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[20] As noted above, hospitals may produce their output inefficiently. If this is so, then if price competition exists, it should create incentives for greater efficiency. In this case price competition will affect expenses as well as price and may offset some of the impact of costly quality competition.

Wilson and Jadlow (1982) attempt to measure the effect of competition on efficiency. They estimate a production function for nuclear medical services and use it to measure the divergence of each of 922 sample hospitals from the production frontier. They find that higher values of their measure of competition (a strange measure equalling the product of hospital density, population density and referral radius) are associated with greater divergence from the efficient frontier. They suggest that increased competition takes the form of purchases of redundant inputs complementary to physician services (the Lee model) and that production efficiency is therefore reduced. They also find that government hospitals are less efficient while proprietary hospitals are more efficient, relative to non-profit institutions.

III. The Model and Data

This study attempts to measure the type and magnitude of competition among U.S. hospitals. In particular, it will try to determine whether price competition exists. The effects of various measures of market structure on prevailing prices and total expenses are examined, after holding constant other exogenous factors that would affect demand and input cost, and hence prices and expenses.

As discussed above, most economists conjecture that since consumers are not particularly sensitive to price, hospital competition does not center around price. Since hospitals are thought instead to compete by offering costly services and capital, it is believed that a market structure that fosters greater rivalry may actually result in higher prices per unit of output unadjusted for input use. However, if price also affects consumers' demand for hospital services, then at least some hospital interaction should concern price. Therefore, a more competitive market should result in lower price per unit of service-adjusted output as margins fall.

A. The Model

In order to estimate the effect of market structure on prices for various hospital treatments, a reduced form equation to explain price is derived. Reduced form equations are used to simplify the analysis, particularly since it is not always clear that the effects of certain factors on supply and demand, for example those of physicians, can be separated. The potential endogeneity of various variables will be tested in the empirical analysis. Demand (x^d) is specified as related to price (P), quality (q), and a vector of exogenous demand characteristics (M),

$$(1) \qquad x^d = f(P,q,M)$$

where $x^d_P < 0$, $x^d_q > 0$ and $x^d_M > 0$.

Hospital markets are generally (and probably, correctly) characterized as differentiated oligopolies where each firm

faces a downward sloping demand curve. While a complete analysis of such a market would require the development of a model of conjectural variations across firms, a sort of market supply curve[21] can be posited that depends on price and on costs, which in turn are a function of quality (q), output (x), and a vector of exogenous factor costs (N). Moreover, output will depend on the industry market structure, determined by the vector S, as will quality if quality competition is relevant. The "supply" curve is written as

$$(2) \qquad x^s = h(P,q(S),N,S)$$

where $x^s_P > 0$, $x^s_q < 0$ since quality increases costs, and $x^s_N < 0$. Measuring S, for the moment, as a concentration ratio or Herfindahl statistic,[22] the sign of x^s_S (where $X^s_S = \partial x/\partial S + (\partial x/\partial q)(dq/dS)$) is indeterminate. While the direct effect of S on output is negative, if quality competition also exists, the indirect impact through its effect on quality is positive. A more concentrated market would have less quality competition, lower quality, and hence, all else constant, higher output.

Equating (1) and (2),[23] a reduced form equation for

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[21] While it is theoretically incorrect to posit the supply curve of a monopolist independent of the demand curve facing it, such an assumption underlies much of the empirical work measuring the relation between concentration and profits. This formulation, where output is an explicit function of market structure, can be justified by a Cournot model. In the Cournot model, output depends, in addition, on costs and demand, which is a function of price.

[22] In our estimation, S will actually be more broadly defined to contain a vector of variables that potentially influence competition, such as hospital ownership, regulation, physician presence, substitutes and complements.

[23] We assume that hospital markets clear. Some of the literature considers permanent excess demand, attributable to the discrepancy between private and social costs resulting from extensive third party coverage, to be a more

price is derived

(3) $P = P(q(S),M,N,S)$

where $P_q > 0$, $P_M > 0$, and $P_N > 0$. P_S is uncertain because of offsetting effects of price and quality competition.

A similar expense (E) regression can be written as

(4) $E = E(q(S),M,N)$

Expenses depend on quality and exogenous input costs.[24] To the extent that demand accounts for otherwise unmeasured quality variables, and if expenses are affected by output, demand variables are also important. Expected signs are the same as in the price regression with one exception. The effect of concentration (S) on expenses is unambiguously negative since it only exerts a single influence through its effect on quality.

For this reason, any difference between the effects of the market structure variables on prices and expenses should be illuminating as to the type of competition present in the market. Since the price regressions measure the effects of both price and quality competition and since it is difficult to hold constant all dimensions of quality, it might be impossible to isolate the existence and effects of price competition from the price regressions alone.[25] Since the only major effect of

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appropriate assumption. See Feldstein (1971). Such an assumption predicts constant upward pressure on prices.

[24] It is assumed that higher quality costs more than lower. This assumption is commonly made in the economic literature on quality. See Scott and Flood (1985) for a summary of many studies that support the relation between changes in medical technology and increases in hospital costs.

[25] From data available to this study it is impossible to generate profit data since the price data and expense data are measured differently.

market structure on the expense regressions will be through its influence on quality competition,[26] any differences between the coefficients in the two sets of regressions should suggest the existence of price competition.[27] If both price and quality competition are in fact relevant, they will to some extent offset each other in their measured impact in the price regressions, while in the expense regressions where only quality competition is measured, the effect of market concentration should be significantly negative.

B. Measures of Competition

The vector S contains the many determinants of the degree of competition in any hospital market. The number and distribution by size and ownership of hospitals, as well as substitutes and complements to hospitals, may be important. In this study, the market is assumed to include all short term general hospitals that are not federally operated (primarily VA). Potential substitutes include long term hospitals, nursing homes, and, indirectly, HMOs that rely on outpatient care.[28] The geographic area is defined as an SMSA. Since hospital markets exhibit some unusual characte-

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[26] It may have an indirect effect on costs through its effect on output. However, economies (or diseconomies) of scale have never been shown to be important in the hospital industry. Moreover, hospital size and occupancy rate variables are included in the regressions.

[27] Since the industry is composed primarily of non-profit firms, it may be appropriate to wonder whether differences exist between total revenues and expenses. Numerous studies have shown that even non-profit hospital firms do earn a return. (See, for example, Davis (1972), Sloan & Vraciu (1983), Hill (1978), and "Most Hospitals Quickly Learn to be Profitable," Wall Street Journal, 8/28/85 at 6)

[28] Freestanding emergency centers and ambulatory care centers did not exist at the time of this study.

ristics, this study tries to determine the form and scope of their competition. This section will discuss various factors that potentially affect competition among hospitals and that will be included in the regressions as explanatory variables. Table 1 summarizes these variables and their predicted signs according to the various theories.

1. Structure

A Herfindahl statistic (HERF), calculated with beds as the measure of each hospital system's market share,[29] is used to describe the number and size distribution of firms in an industry.[30] As discussed earlier, if market structure is important to competition and if price competition dominates, the coefficient in the price regressions should be positive. If in addition price competition leads to greater efficiency, expenses should also be positively related to HERF. If quality competition is most important, HERF should show a negative sign in the expense regressions and probably in the price regressions as well. If both types of competition exist, the sign in the price regressions is indeterminate while that in the expense regressions should still be negative unless efficiency factors reduce costs more than quality competition

[29] If a hospital system owns more than one hospital in a given SMSA, the multiple hospitals are treated as a single firm in the calculation of the Herfindahl. Measures such as patient days and revenues are highly correlated with the bed capacity measure used and, when tested, produced nearly identical results.

[30] A Herfindahl statistic is calculated by summing the squared market shares of all the firms in the market. It is generally considered a better measure than a simple concentration ratio because it takes account of all firms in the market rather than just the top four or eight. Therefore it provides a measure of firm size dispersion in addition to concentration. The Department of Justice Merger Guidelines released June 14, 1984 base their structural criteria on the Herfindahl index.

increases them.[31] It is, of course, possible that market

[31] Several studies have attempted to measure the effect of hospital concentration on quality, price and costs. Salkever (1978) describes two such studies. Watts (1976) found positive, albeit insignificant, effects of the number of hospitals in a county, the physician-hospital bed ratio and the physician-population ratio on hospital revenues. It is not clear what else is held constant in her regressions. Similarly, Davis (1971 and 1974) noted that a hospital's share of county beds and the number of hospitals per square mile in a county had an insignificant effect on price-average cost ratios, while the active physician staff-bed ratio had a positive effect on costs.

Joskow (1980) posits that since demand for hospital care is stochastic, one measure of quality is the hospital reserve margin or probability that space is available for any potential patient. He measures this probability by assuming that the average daily census (occupancy) of hospitals follows a Poisson distribution. He finds that market concentration, as measured by a Herfindahl index calculated at the SMSA level, is negatively related to his measure of quality, the reserve margin. He also finds a weakly negative relationship between the number of physicians per hospital and the reserve margin, and suggests that where relatively more physicians exist, hospitals do not need to compete for physician affiliations as much. Alternatively, however, it is possible that where more physicians exist, admissions are greater (because of physicians' influence) and that hospital occupancy rates are higher as a result.

Farley (1985) examines the more general question of what differences exist between various characteristics of hospitals in "monopolistic" versus in "competitive" markets. He finds little difference in profit rates but finds both expenses and revenues to be higher in competitive markets. He also finds length of stay, number of operations per short-term admission, number of services available, and assets and employees per admission all to be greater in competitive markets. These results support the facility and service competition hypothesis. They are limited, however, by their lack of control for any other factors that may affect hospital usage.

Most recently, in two papers, Luft et al. (1986) and Robinson and Luft (1985) examine the effect of concentration on total cost per admission, total admissions, average length of stay and on the provision of specialised clinical services. Concentration is measured as the number of hospitals within a 5 or 15 mile radius. Holding constant case mix, demand conditions, and exogenous cost factors, they find that costs increase with their measure of competition as do

TABLE 1

Predicted Effects of Competition Measures

VARIABLE	THEORY	EFFECT	
		Price	Expense
Herfindahl and concentration ratio	1. "quality", but little/no price competition (adminstrator prestige and/or competition for physicians models)	-	-
	2. price, but little/no "quality" competition (normal competitive market)	+	0[1]
	3. both price and "quality" competition	?	-
For Profit Hospitals (share)	1. Investors want return on their capital (more concerned with and able to maximize profits)	+	0
	2. Reduces market power of physicians	+	0
	3. Are more efficient	-	-
	4. Different incentives	?[2]	+/0
	5. Cream-skimming	+	+
	6. Enter into already profitable markets	+ and/or -	
(dummy)	1, 2, 3, and 4	same as share	
	5 and 6	0	0
Multihospital and Managed Hospitals	1. More efficient	-	-
	2. More concerned with profit maximization	+	0
	3. Cheaper access to capital	?	-
	4. Facilitate Collusion	+	-

[1] Assuming no important scale effects.

[2] Depends on relative importance of price and quality competition.

		+	0
Occupancy relative to average	1. More market power	+	+
	2. Reverse Causation: higher occupancy results from higher quality product		
Physician/ Bed Ratio	1. Physician Visits substitute for Hospital Stays	-	?
	2. Physicians complement hospital stays	+	?
	3. Physicians control hospitals, but cooperate less perfectly when there are more of them	+	+
	4. Hospitals compete for physicians by providing costly inputs	-	-
HMO membership	1. Enter first into costliest areas	+	+
	2. Provide efficient competition	-	-
	3. Diminish hospitalisation of less ill or more price-sensitive patients	+	+
Change in HMO market share	1. Grow by offering cheaper alternative	-	-
	2. Increasingly attract less ill patients	+	+
Nursing Home Beds	1. Provide competitive substitute to hospital beds	-	-
	2. Leave most costly patients to hospitals	+	+
Entry Regulations (CON & S1122)	1. Prevent wasteful quality competition	-	-
	2. Enforce cartel through entry barrier	+	-
	3. Lead to inefficient resource allocation	+	+
	4. Have no effect	0	0
Rate Regulations	1. Effectively control prices	-	?[3]
	2. Have no effect	0	0

[3] Depends on whether affect expenses or just margins.

structure, as crudely measured by a Herfindahl statistic, does not affect competition. Certainly the literature on the relation between concentration and profits in other industries finds that simple structural variables often have no effect when other variables are held constant.[32] If this is the case, the Herfindahl variable should be insignificant in both the price and expense regressions.

Regressions are also run substituting a four-firm concentration ratio (CR4) for the Herfindahl statistic. As the results section discusses, this change does not affect the results significantly.

Structure may only matter when it reaches some benchmark level. Therefore, in a second set of regressions, a dummy variable, equalling one when concentration is high, is substituted for the linear measure discussed above. It is also possible that structure affects competition only when accompanied by some form of entry barrier. As will be discussed below, however, interaction variables prove to be insignificant.

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admissions and length of stay. The effect of market structure on the provision of clinical services varies across services. Services such as emergency rooms, mammography and cardiac catheterization units are more prevalent in more competitive areas, suggesting that they are used to attract either patients or physicians. On the other hand, services that are demanded rarely and are unlikely to attract admissions, such as cobalt therapy are supplied in a complementary fashion, i.e., their availability at neighboring hospitals lowers the probability that a given hospital supplies the service.

[32] See Weiss (1974) for a summary of the older literature.

2. The Importance of Different Organizational Forms in the Hospital Industry

a. For-Profit Hospitals

While voluntary (non-profit) hospitals still operate the majority of all beds in the United States, the market share controlled by proprietary institutions has increased substantially in recent years.[33] In addition, a growing number of both non-profit and proprietary hospitals either belong to multihospital systems or are managed by an outside contractor. Have these changes in organizational structure affected competition among hospitals? What changes in market conditions explain the recent increase in entry of for-profit hospitals after many years of exit?[34]

Many of the advantages facing non-profit hospitals have disappeared or declined in the last few years.[35] Both

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[33] In 1983, 9% of all short-term non-federal beds were in for-profit hospitals, and from 1970 to 1983, a period during which the number of short-term non-federal beds increased by 20% and total beds declined in number, short-term proprietary beds increased by 77%. (Hospital Statistics, 1984)

[34] In 1910, 56% of all hospitals were for-profit. (Sloan (1984) at 83-84) Most were established and operated by physicians, primarily in rural areas where few other hospital facilities were available. However, the proprietary form subsequently became less important. By 1940, 70% were non-profit, controlling 90% of all beds. By 1946, only 3% of all hospital beds were in proprietary institutions.

[35] Several institutional features, in the past, encouraged non-profit institutions. Proprietary hospitals' capital costs were higher: they did not receive private philanthropy nor did they qualify for government subsidies. (All Hill-Burton funds were for non-profit hospitals.) Their labor costs were also higher since preferential treatment was accorded non-profit hospitals in the benefit laws (e.g., workmen's compensation). Non-profit institutions do not pay taxes. They also were at least somewhat immune from lawsuits. Finally,

government funding and private philanthropy have almost disappeared since the advent of Medicare and Medicaid.[36] On the other hand, proprietary firms have the ability to raise capital by issuing equity. Many recent takeovers of non-profit, particularly county and municipal, hospitals by proprietary hospitals have been attributed to the non-profit hospitals' inability to raise necessary funds for renovations. Since non-profit hospitals are restricted to the debt markets for capital, many have amassed high debt-equity ratios and are therefore unable to find further capital at reasonable prices.[37] Moreover, public and private insurance plans now reimburse proprietary hospitals for their capital costs quite generously.[38] The growth of systems of many hospitals has also been attributed to access to capital. The diversification and larger scale created by a hospital system allegedly reduce the risk potential investors perceive.[39]

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for-profit institutions were subject to more stringent Certificate of Need regulation, and both public and private insurance reimbursement rates were lower. (Bays (1983) at 367, P. Feldstein (1977) at 160.)

[36] Between 1968 and 1979 the percentage of short-term general hospital construction financed by the government fell from 23.2% to 3.2%. Similarly, philanthropy's share dropped from 21.2% to 5.6% Debt financing assumed a more important role, rising from 38.7% to 70.5% over the same period. ("Hospital Capital Financing Debated," American Medical News, 3/23/84, at 1.)

[37] "Investor Owned Chains Continue Expansion, 1985 Survey Shows," Modern Healthcare, 6/7/85 at 84; Brown & Saltman (1985) at 124; Hill (1975) and Siegrest (1983). A new move by non-profit hospitals is to issue stock in a for-profit subsidiary. ("Not-for-profits Competing for Capital by Selling Stock in Alternative Ventures," Modern Healthcare, 8/16/85 at 90)

[38] Current legislative proposals would make Medicare's capital cost reimbursement program considerably less generous in the future. ("HCFA Proposal Would Tie Occupancy to Medicare Payments for Capital," Modern Healthcare, 10/11/85 at 106)

[39] Siegrest (1983), Ermann & Gabel (1984).

Explaining the growth of proprietary or system hospitals by access to capital does not lead directly to a prediction on what effect their entry will have on competition. It seems likely, however, that if the physician-control-of-hospitals theory is valid, the presence of outside investors, who are concerned about a return on their investment, may lead to different hospital behavior.[40] In a hospital perfectly controlled by physicians, hospital services are priced at marginal cost so that physicians can extract all monopoly rents in the fees that they charge. In a non-physician-owned for-profit hospital, outside investors and/or hospital executives should not permit such pricing behavior; if economic profits are available, physicians would be required to share them with the hospital's investors. Thus while the total price of a hospital stay, which includes both physician and hospital fees, should be lower or the same at a for-profit hospital relative to a non-profit institution, the hospital portion of the total price (which is what this study analyzes) may be higher at the for-profit hospital. Accounting measures of expense, which do not include a return on equity, should not be different for for-profit hospitals except to the extent that hospital owners make different decisions about input use than physicians do.

On the other hand, the recent growth in proprietary hospitals may be due to their greater ability to respond to new demand-based pressures on price generated by an increased cost consciousness that has appeared in recent

[40] In fact Pauly & Redisch (1973) suggest that it is easier for the medical staff to maintain control of a non-profit hospital. (It is not clear why they cannot own their own hospital, however.) Moreover, not only the American Hospital Association, but also the American Medical Association supported passage of the Hill-Burton Act, which provided investment financing to nonprofit hospitals.

years.[41] If the physician-administrator utility maximization models of hospital behavior have some validity, then perhaps the presence of outside shareholders is necessary to generate more efficient resource utilization.[42] Under this explanation, the entry of proprietary hospitals into a market should ultimately result in lower prices and perhaps lower quality as well if that is what consumers prefer.

For-profit hospitals may also have different incentives than non-profit hospitals. These different incentives might make some forms of active or tacit collusion between for-profit and non-profit hospitals more difficult. This could lead to higher quality or lower prices depending on the relative importance of price and quality competition. If any form of collusion is lessened, lower prices per unit of quality should result.

On the other hand, it is often alleged that for-profit hospitals engage in cream-skimming behavior; that is, they may specialize in those services which non-profit hospitals have priced above average cost in order to subsidize other services. Extensive cross-subsidization itself may result from the predominance of comprehensive third party payors that do not consider the costs of individual treatments.[43]

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[41] In very recent years, a greater awareness of and concern over costs seems to have emerged. Company insurance plans have altered policies to make subscribers more sensitive to costs. The concluding section provides some evidence of and discusses some of the ramifications of these changes on hospital competition.

[42] Rosett (1974) suggested that the for-profit hospital industry declined initially because of an increase in the difficulty of being efficient with growth in size, implying that non-profit institutions are less concerned with efficiency.

[43] Non-profit hospitals' prices for various services reflect extensive cross-subsidization. Jeffrey Harris (1979) and Karen Davis (1971) report revenue-cost ratios ranging from about .9 for major surgery and delivery room services to over 4 for some laboratory procedures. This policy is often suggested to be optimal

For-profit hospitals may also lure away those patients who subsidize others (the wealthy, routine care, low cost) by charging slightly lower prices, or by providing higher quality service or more amenities[44] to patients who are less sensitive to price (the comprehensively insured and wealthy), and still earn positive profits if they can also turn away the more costly cases. They are often accused of refusing to treat

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(in a second best sense), either to serve the self interest of an organized medical staff, or to allocate limited inputs. Carson Bays (1983), at 72, citing the Harris study, suggests that hospital prices for services most directly related to physician activities, such as surgery and intensive care, are heavily subsidized so that physicians can raise their own fees, since payors are only interested in the total price. However, if total price is really the only relevant variable, then it is not clear why payors are not concerned that hospital beds and diagnostic procedures can be priced far above marginal cost. Paul Feldstein (1977), at 144, notes that the customary low, sometimes negative, markup on maternity services is rational in the framework of economic price discrimination: young couples having children typically are relatively poor (and insurance may not provide complete coverage of obstetrical services), and they also have sufficient time to shop around. A recent study found that one quarter of all women of childbearing age in the U.S. lack any health insurance that would pay for the hospital bill. ("Many Not Insured for Maternity Costs," Washington Post, 7/3/85 at A6) Interestingly, proprietary hospitals offer little obstetrical care. (Goldsmith (1981), at 117.) Harris suggests that crosssubsidisation in hospital pricing corrects inequities in standard insurance contracts that overinsure routine care and inadequately insure catastrophic care and the working poor. He fails to note, however, how the particular pattern of crosssubsidisation that exists rectifies these inequities.

Non-profit hospitals also use other forms of cross-subsidisation. Poorly (or non) insured patients are subsidised by more completely covered (and wealthier) patients. Given average cost-pricing, low cost patients subsidise high cost patients. Moreover, by maintaining excess capacity without using peakload pricing, hospitals cause routine care to subsidise emergency treatment.

[44] Competition on amenities such as better food, private rooms, or cable TV has become popular.

indigent patients.[45] If for-profit hospitals cream-skim lucrative patients by offering a higher quality product, they can cause average prices and costs to rise.[46] If cream-skimming takes the form of offering only those services that had been priced above marginal cost to subsidize other services at non-profit hospitals, then the prices of some services will actually fall while others rise as all prices move closer to marginal cost.[47]

If proprietary hospitals only enter profitable markets, but neither affect the degree of price competition nor cream-skim, a positive correlation between their market share and prices and/or a negative correlation between market share and expenses will exist. Since it is unlikely that supply and demand are always in equilibrium in growing markets, it should not be surprising to find large for-profit

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[45] Sloan & Vraciu (1983) find no difference in the percentage of all patient days accounted for by Medicaid and Medicare patients or in the types of services available at the two types of hospitals. Moreover, Bromberg (1985) notes that both proprietary and voluntary hospitals wrote off about 4.4 percent of gross patient revenues to charity care and bad debt.

[46] Even if they cream skim by offering slightly lower but still economically profitable prices, average prices will rise if non-profit hospitals set their cross-subsidising prices so that they just break even in aggregate and if the budget constraint facing the industry as a whole is not completely binding. Since non-profit hospitals must now raise the prices they charge formerly subsidized patients while proprietary hospitals are earning positive profits, total revenue collected must increase. If non-profit hospitals had been at a price-constrained equilibrium prior to the entry of for-profit institutions, presumably some exit would occur. Given cost-based insurance programs, in the past it was probably possible for them just to raise their prices. The current prospective reimbursement (DRG) system for Medicare makes this less feasible, and exit is indeed becoming more common.

[47] Watt et al. (1986) find no evidence of differences between the case-mixes of for profit and non-profit hospitals, their ratio of Medicare or Medicaid days to total days, or in their ratio of intensive care days to total days.

hospital market shares associated with high prices. In this case, however, causation would run from price to market share rather than vice versa. For-profit hospitals have been established primarily in southern and western states where union activity and average labor costs are low, population growth is high, regulations are loose, and reimbursement systems are generous.

In summary, the effect of for-profit hospitals on market prices depends on which theory correctly explains their behavior. If their entry is explained by their efficiency, it should result in lower costs, lower prices and possibly lower quality. Similarly, if their entry makes collusion more difficult, it should lower margins, but it has an indeterminant effect on prices. If proprietary hospitals enter to take advantage of cream-skimming opportunities, they may offer higher quality, and higher prices and costs may result.[48] Alternatively, prices may be pushed closer to marginal cost[49] while expenses do not change if cream-skimming reduces cross-subsidization.[50] Finally, if for-profit hospitals are able to extract rents otherwise accruing to physicians, while the total price for hospital services may decline or remain unchanged, the entry of proprietary hospitals may lead to a higher charge for the hospital portion of those services, holding constant the degree of physician competition.

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[48] Prices for fully insured patients at non-profit hospitals would fall and less covered patients' fees would rise. Since Medicare coverage is not as generous as some private programs, we might expect Medicare fees (our data) to rise.

[49] This would make some rise and others fall.

[50] Expenses rise if for-profit hospitals offer a higher quality product to those patients less sensitive to price that they lure away. As a result of the change in case-mix, expenses also rise for voluntary hospitals that are left with only sicker patients.

Two types of variables are used to measure the effects of ownership structure on hospital prices and expenses. First, in all the regressions, one explanatory variable measures the share of beds operated by for-profit hospitals in the SMSA (SFP). In addition, in the individual hospital regressions, dummy variables indicate whether a particular hospital observation is for-profit (FP). Under most theories, the share and dummy variables should show similar effects. One exception is the entry-into-profitable-markets hypothesis. If that is the sole explanation, the share variables will reflect profitable markets while the individual dummies should have no influence.

Evidence on differences in for-profit and non-profit hospital behavior is mixed. Lewin et al. (1981) note that for-profit hospitals have higher costs and prices. Bays (1979) finds that once an adjustment is made for case mix, no difference exists. Sloan & Vraciu (1983) also find no significant difference in costs, but find that net operating funds of proprietary hospitals are slightly larger than for non-profit hospitals, suggesting that the former charge higher prices. Becker & Sloan (1985) find that ownership does not significantly affect costs or profits.[51] Watt et al. (1986) find that in 1980 investor-owned hospitals charged 22 percent more per admission after adjusting for case mix. This difference primarily reflected higher prices for ancillary services. Total costs of proprietary hospitals, on the other hand, were only insignificantly higher. The after-tax margin of investor-owned hospitals was double that of non-profit hospitals.

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[51] They find that "independent profit-seeking hospitals are slightly more efficient, but chain owned profit-seeking hospitals appear less efficient than independent, nonprofit hospitals and no more efficient than government hospitals run by chains. Government hospitals tend to be less profitable than either private nonprofit or for-profit hospitals...." (at 31)

b. System and Managed Hospitals

The development of for-profit hospitals may not be that significant by itself. Rather, there has been a concomitant increase in the number of for-profit hospitals affiliated with chains or systems or that are managed by outside parties.[52] Many of the same theories posited to explain the potential effects of proprietary hospitals can be applied to chain hospitals. They may be more efficient, or at least have access to cheaper capital, and they may have more traditional profit maximization incentives, even when they are non-profit. On the other hand, their more unified structure may ease collusion which could raise prices (per unit of quality) and/or lower quality.

Studies of multi-hospital systems and management-run hospitals (Ermann & Gabel (1984) and Wheeler, Zuckerman, and Aderholdt (1982) respectively) suggest that they take advantage of managerial economies of scale in, for example, dealing with third party payors, as well as in bulk purchases of inventories. Most studies dispute that they otherwise operate more efficiently.[53] Finally, several note that both for-profit and non-profit managed and system hospitals set higher prices to increase profitability.[54]

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[52] In 1982, one third of all community hospitals, accounting for 36% of the beds, belonged to a hospital system containing three or more owned or managed hospitals. 39% of the system hospitals were investor-owned, 34% were affiliated with religious institutions, and the remainder were private non-profit or municipal (Ermann & Gabel (1985) at 412).

[53] Becker & Sloan (1985) note that proprietary chains in particular are less efficient, and the summary by Ermann & Gabel (1985) notes several other studies that find no efficiencies accruing to chain hospitals.

[54] Ermann & Gabel (1984, 1985) survey the literature. See also, Wheeler, Zuckerman & Aderholdt (1982).

The regressions account for affiliations across hospitals. SMAN measures the proportion of each SMSA's beds that are controlled by an outside management organization. SMHS represents the proportion of beds that are part of a system or chain of multiple hospitals that are both commonly owned and managed. Individual hospital dummy variables (MAN) and (MHS) measure the effects of affiliation on the individual hospitals.

c. Public Hospitals

The effects of the share of beds accounted for by county, municipal and state hospitals (SGOV) as well as that of individual government hospitals (GOV) are also measured. Since county and municipal hospitals generally treat most indigent, non-insured patients, their presence should reduce the need for remaining hospitals to cross-subsidize these patients through their insured consumers. Therefore, a generally negative impact on prices of the government share variable is expected. The government dummy variable might have a positive or insignificant effect depending on the extent to which other funds are available to subsidize indigent patients.

3. Substitutes for Hospitals

The greater the potential for using substitutes for hospitals, the more competitive hospitals have to be. Health Maintenance Organizations (HMOs), which provide comprehensive care, have been shown to have significantly lower hospital utilization rates than the population at large.[55] In areas where HMOs are more prevalent we should expect to find hospitals acting more competitively. It is possible, of course, that this competition takes the form of quality competition. HMOs may draw off consumers who are most

[55] Harold Luft (1978 and 1981). The above average health status of HMO enrollees explains some, but not all, of the reduction in utilization.

price sensitive and leave those who are more concerned about quality to private hospital insurance plans. Therefore it is not clear what effect HMO presence should have on hospital prices.[56] It is also possible that HMOs entered first into those markets where cost was highest.[57] A variable that measures the percent of the population belonging to HMOs in 1977 (HMOMEM) is used along with another that measures the change in HMO market share from 1977 to 1978 (DHMO).

Nursing homes, at least to a certain extent, substitute for hospitals. If this effect predominates, their presence should lower hospital prices.[58] On the other hand, if they draw those patients primarily requiring maintenance services rather than more costly medical services, they may raise the average cost of treating hospital (particularly elderly Medicare) patients. The nursing home bed-population ratio

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[56] In recent years, the anecdotal evidence suggests that HMOs have become large enough to cause hospitals to bid for their contracts by offering price competitive packages. About 67% of large metropolitan hospitals now have some relationship with an HMO, and another 28% plan to implement one within the next year. ("Most Metropolitan Hospitals will Link with HMOs, Hospitals, 9/1/85 at 44) In 1977-78, however, it is unlikely that HMOs were large enough to elicit much of this behavior.

[57] Carl Schramm, director of the center for Hospital Finance and Management of the Johns Hopkins Medical Institutions, has stated: "We do know, however, that in states where more competitive environments exist, largely characterized as such because of the presence of HMOs, the hospital sector is overcapitalized while at the same time high profit margins exist." Washington Post, 6/20/85 at A19. Studies have found HMO growth to be positively related to hospital expenditures, and it is quite possible that the two are jointly determined. (Frank and Welch (1985))

[58] While not applicable to the sample period, the recent move toward fixed prospectively determined payments for hospitals (DRGs) has been correlated with a reduction in lengths of stay. This may very well be leading to greater nursing home utilization.

(NHBED) describes their influence.[59]

4. The Effect of Physicians on Hospital Behavior

Since the supply of physicians is probably jointly determined with the supply of hospital services, inclusion of variables measuring physician supply in the reduced-form hospital regressions may lead to biases. Therefore the results initially reported omit measures of physician influence. Since, however, the role of physicians is important, regressions were also run including various measures of their effect. Since those variables have little effect on the other variables in the regression, serious biases probably are not present and those results are also reported.

The patient care physician - short term hospital bed ratio (MDBED) is used to account both for shifts in demand caused by physicians acting as substitutes or complements to hospital services and for the impact of physicians on hospital operating decisions. The physician-bed ratio may have offsetting effects of decreasing demand, if physician office visits substitute for hospital stays, and increasing demand if physicians make the decisions to hospitalize patients. If the Pauly and Shalit theories are correct, larger groups of physicians are less able to control individual and collective output and the hospital component of costs may rise with the number of affiliated physicians. High physician-bed ratios may also reflect higher quality care in markets where hospitals have attracted a large number of physicians through

[59] To take account of other hospitals in the market, a variable measuring the ratio of beds in the included market (those in short term, general, non-federal hospitals) to all other hospital beds in the SMSA was included in some preliminary regressions. If the other hospitals in the area exert some competitive pressure on price, the coefficient on this variable should be positive, since high values of this variable imply few hospital beds other than the ones located in our measured sample. The variable's sign shifted across regressions, however, and was insignificant. Therefore it was omitted from subsequent regressions.

provision of advanced (costly) technology. One could also argue, as does Joskow (1981), that the causality is reversed. In markets more saturated with physicians, hospitals may not have to compete as much for physician affiliations through provision of expensive facilities. In that case, in areas with high physician density, hospital prices should be lower.

MDBED could also pick up supply effects since relatively high values indicate relatively low values of beds. The physician-population ratio (MDPOP) which should measure only the effect of physicians as substitutes or complements is also included to sort out the various possible effects.

GPMD measures the proportion of all patient care physicians who are general or family practitioners. Given the physician/bed ratio, it should have a negative impact on hospital prices, since GPs are more apt to substitute for inpatient hospital services.

5. Hospital Occupancy Rates

Holding constant a hospital's occupancy rate, the higher its occupancy rate is relative to the market average, the less it may need to compete. Its higher occupancy may be indicative of some local market power related to, for example, a beneficial location.[60] If this is true, that market power should be manifested in higher prices if the hospital market is anything like a normal economic market. It is also possible that the higher relative occupancy may result from higher relative demand due to a higher quality

[60] The geographic market used in this study is defined at the SMSA level. In some cases this may be too large, particularly for fairly routine treatments that every hospital provides. Convenience is often thought to be a fairly important facet of a hospital's characteristics, so a particular hospital may be able to charge slightly higher prices than others within the SMSA and not lose many patients.

(and costlier) product produced by the hospital. If this is the case, then a hospital's relative occupancy rate (ROCC) should be positively correlated with both prices and expenses. If the market power story is correct, only prices should be positively correlated with ROCC. Finally, hospitals may achieve relatively higher occupancy rates by charging lower prices (per unit of quality.) In this case, ROCC should be negatively correlated with prices or positively correlated with expenses.

6. Regulations Affecting the Hospital Industry

Two major forms of regulation control the hospital industry. Entry regulations require approval for construction and for some other major capital expenditures. In a few states, rate regulations affect the prices hospitals may charge.

Two government programs control entry. Certificate of Need (CON) regulations, implemented by most states during the 1970s,[61] require that any hospital that wishes to enter and/or expand obtain approval from a state regulatory authority. Similarly, Section 1122 (of the Social Security Act Amendments of 1972) authorizes state planning agencies to review hospital expansion plans and to recommend that the Department of Health and Human Services disallow associated interest and depreciation expenses paid under public insurance programs if the plans are not approved. Since CON regulation is broader but serves essentially the same purpose, many states abolished their Section 1122 programs upon

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[61] Federal law mandated their enactment by 1980 in order to qualify for federal health funds. This requirement, however, has been eliminated. Texas, Minnesota, Arizona, Utah, California, Kansas, New Mexico, Idaho, and Louisiana have recently dismantled their CON programs or plan to phase them out in the near future, although some of these states still have Section 1122 regulations. In at least two states, a surge in notices of intent to build has been noted since abolition of the entry review program.

enacting CON legislation.

Three theories predict differing effects of entry regulation. The first, which is based on the common belief that any expansion in hospital bed supply creates its own demand[62] and that, left unregulated, hospitals compete for physicians and patients through "unnecessary" expenditures on facilities and equipment, posits that entry regulation reduces costs and hence prices. Alternatively, Posner (1974) and Joskow (1981) have suggested that CON regulation can foster cartelizing behavior by hospitals: it hinders rent dissipation through quality/amenity competition as well as preventing entry. Under this view, it is not surprising that the American Hospital Association supported the mandatory enactment of CON programs.[63] This cartel theory predicts that entry regulation leads to higher prices with constant or lower costs, i.e., higher margins. Finally, the third hypothesis suggests that regulation of beds and certain large equipment expenditures merely redirects purchases to other forms of capital (Salkever and Bice, 1979). Total capital expenditures remain constant while operating costs may rise since production using the regulated mix of capital is less efficient.

Most analyses of the effect of entry regulation programs suggest that, several years after their enactment, they reduce expansion of bed supply but encourage greater utilization of the existing bed stock as well as other inputs. Empirical studies suggest that aggregate costs increase or remain unchanged.[64] The effect of entry regulation on price

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[62] This concept, known as Roemer's Law, was first suggested by Milton Roemer (1961).

[63] American Hospital Association (1985).

[64] Sloan (1981), Sloan & Steinwald (1980), Salkever & Bice (1979), Misek & Reynolds (1976), Joskow (1981).

has not been carefully examined. This study analyzes this effect as well.

The effect of certificate of need regulation is initially measured as the number of years a law has been in effect in the state (CONAGE), since CON regulation is designed to reduce expenditures on durable goods and therefore can be expected to become effective only with a lag.[65] CONAGE ranges from 0 to 13 for the year, 1977, that is studied. A second formulation assumes that once a CON law is well-established, its age does not matter. This specification defines a dummy variable as equal to one when the CON law is at least three years old and zero otherwise. Section 1122 (S1122) is measured as a dummy variable which takes a value of one in those states having Section 1122 review boards.[66]

Prospective Rate Review regulation has also been instituted by some states in the last decade. This form of regulation attempts to control hospital costs by establishing in advance maximum allowable rates either based on past costs or to cover proposed total budgets.[67] State hospital associations have generally opposed rate regulation. Evidence on the effect of such programs is mixed. While most recent studies find a negative effect on costs in those states with

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[65] Previous studies, e.g., Sloan & Steinwald (1980), have shown this to be true.

[66] Section 1122 is not measured by its age because all section 1122 statutes were enacted in the relatively short period between 1972 and 1974. Alternatively specifying S1122 as the proportion of the population that is enrolled in Medicare or Medicaid in those states with Section 1122 review boards did not change the results significantly. Since S1122 regulations often duplicate CON laws, another alternative variable was formulated as a dummy equalling one only when a S1122 program existed by a CON law did not. The results did not change.

[67] See Morrisey et al. (1984) for an interesting theoretical discussion explaining why effective rate review lowers "quality" of hospital inputs when the hospital objective is to maximize physician incomes.

mandatory rate setting programs, older studies find no significant effect.[68]

Prospective Reimbursement (PR) probably does not directly influence market competition. However, if it favors one type or size of hospital over another, or affects case mix, it may have an indirect effect. Programs differ according to whether they are voluntary (PRV) or mandatory (PRM), whether they use a formulary or budget review approach, and who they cover. Mandatory programs are more likely to be effective.

C. Data

1. Price Data and Regressions

This study uses price data for various individual disease categories. As noted in the introduction, studying prices for specific disease categories has at least two advantages. While most previous studies of hospital competition have measured quality competition using expense data, price data are essential to determine the effect of competition on consumer welfare. Second, since hospital services are a highly differentiated product, focusing on individual disease categories is necessary to avoid serious production function aggregation problems. While case mix variation still exists within a given disease category, such variation should be much smaller than that found in the aggregate hospital

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[68] Sloan (1983), Joskow (1981), Morrisey et al. (1983), Wortherington and Piro (1982), Dranove and Cone (1984), Melnick et al. (1981), and Sloan (1981) found prospective rate regulation reduced hospital costs significantly while Sloan and Steinwald (1980), Misek and Reynolds (1982), and Elnicki (1975) found no effect from such regulation. The difference can primarily be attributed to the time period analysed as well as the way in which the variable measuring the regulation was characterised.

revenue or expense measures used in many studies.[69]

Both average market prices, where the market area is defined to be a Standard Metropolitan Statistical Area (SMSA), and individual hospital level observations are examined. Implicit in the market level analysis is a model of individual hospital behavior that yields equilibrium market prices dependent on various characteristics of the market such as demand, structure, and regulatory environment.[70] Using SMSA-defined markets, it is straightforward to define each hospital's competitors.

There are two disadvantages to working with data aggregated to the SMSA level. First, only about 2800, or less than 50% of all community hospitals[71] are located in SMSAs. Therefore only half of the available sample of all community hospitals is used. Moreover, hospitals located in SMSAs are not drawn from the distribution applicable to all community hospitals. Hospitals located in SMSAs are more apt to be large: while 44% of the SMSA-hospitals contain more than 200 beds, only 27% of all community hospitals do. Likewise, less than 9% of SMSA-located hospitals have fewer than 50 beds, while 24% of all community hospitals are that small. Second, by aggregating all the individual hospital

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[69] One very recent study (Eskos & Peddecord, 1985) avoids this major problem by using profit data by individual hospital service (e.g., pharmacy, medical & surgical, obstetrics, clinical laboratory) to determine the effect of ownership on margins for different services. The data are still subject to case mix problems, however, and the study does not examine the effect of market structure.

[70] Maddala (1977) discusses the econometric advantages and disadvantages of data aggregation. Information is lost through aggregation, but to the extent that errors exist in the microdata or the microrelations are inadequately specified, aggregated data are more appropriate.

[71] Community hospitals are defined as "non-federal short-term general and other special hospitals - excluding hospital units of institutions - whose facilities and services are available to the public." (Hospital Statistics, 1977, p. vii)

data, we lose potentially valuable information about differences across hospitals that may affect their pricing decisions. Therefore it will also be useful to study prices at the individual hospital level.[72]

Both the SMSA and individual hospital level regressions include the same explanatory variables belonging to the vector S discussed in the previous section as well as measures to control for exogenous demand and cost factors listed below and discussed in the appendix. In addition, dummy variables to reflect the ownership status of each individual hospital will be included in the individual hospital regressions.

Eleven disease categories are studied. Four categories of explanatory variables are discussed: those that measure demand, those that account for cost, regulation variables, and proxies for the degree of market competition. In the price regressions, the dependent variable is the average price (charge) per case for the particular disease category for all the hospital services except for the physicians' fees. In the

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[72] For several disease categories examined, the coefficient of variation of the aggregated price data has been compared to the average coefficient of variation (cv) of the disaggregated data. The results, shown below, show minor differences between the two types of averages.

Disease Code	Aggregate CV	CV of Individual Hospitals	
		Mean	Range
250	.270	.230	.01 - 1.24
374	.228	.181	.01 - .57
410	.266	.215	.002 - .55
427	.256	.235	.002 - .67

aggregate regressions, the unit of observation is an SMSA.[73] In these regressions the price variables are weighted (by number of cases) averages across the sample hospitals in a given SMSA.

The price data come from Health Care Financing Administration (HCFA) files of average charges for the most frequent diagnoses for Medicare inpatient diagnoses for 1977 and 1978. They are derived from the Medicare Provider Analysis and Review (MEDPAR) data which "are a 20% sample of all Medicare hospital inpatient bills submitted to HCFA for payment under Title XVIII [Medicare] of the Social Security Act."[74] Individual patient data are aggregated to the hospital level to preserve confidentiality.[75] Also, since a small number of very high charges created substantial differences between means and medians, the top 7% of all patient records for each diagnostic category was deleted by HCFA. HCFA cautions users of the data to remember that they are "for the Medicare enrolled population only" (emphasis in original), but also notes that persons over the age of 65 account for one quarter of all hospital discharges and for one third of all patient days. Other studies have also shown a strong correlation between the pattern of Medicare charges and other prices across hospitals. Even though the levels may vary, the data "can be considered reasonable indicators of the overall relative differences in prices charged by

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[73] In some cases, the SMSA average hospital data are not based on all hospitals in the SMSA. Regressions were run using only those SMSA observations that take account of more than 75% of the beds in the SMSA (201 observations), and no significant differences were found.

[74] Information on the data set is derived from the Bureau of Health Planning's Program Information Letter No. 81-28, March 31, 1981 (U.S. Department of Health and Human Services). Other studies of the data cited in this report are Wennberg (1980) and the Program Information Letter 80-38 of August 13, 1980.

[75] Disease categories at a given hospital with fewer than five observations are deleted by HCFA.

hospitals for similar types of diagnoses."

The data have one problem. Because of the nature of Medicare (and most private insurance plans), the price for a hospital visit is divided into two components: a charge representing all of the hospital inputs (e.g., bed, nursing services, operating room, drugs, physical therapy) which is paid by Part A of Medicare, and a physician fee, generally billed directly by the physician, which is covered under Part B of Medicare.[76] Ideally, the effect of various features of the hospital market on total hospital service price should be studied. Unfortunately, as is true for almost all studies of hospital competition, only data for the hospital component of this price are available. The hospital price may not always react in the same fashion as the total charge would to differences in market conditions, particularly if physicians have some control over the production process for hospital services. It will be particularly difficult to test the Pauly-type model of hospital behavior.

2. Expense Data and Regressions

As discussed earlier, since it is difficult to hold constant all dimensions of quality in the price regressions, and since profit data by disease category do not exist in the available data set, it is necessary also to examine expense data.

The American Hospital Association's annual survey of United States hospitals provides the expense data. They are matched to the price data by hospital before any aggregation is done to the SMSA level. These data represent total hospital accounting expenses, including salaried personnel, their benefits, professional fees, depreciation, interest,

[76] Most private insurance works the same way. For example, in most states Blue Cross covers hospital costs while Blue Shield reimburses for physician charges.

supplies and purchased services.[77] Tax payments by for-profit hospitals are included.[78]

The expense data are not disaggregated to the disease category level. This implies that unlike the price data, the expense data may be subject to substantial case mix variation. Several hospital characteristics are thought to affect case mix. To the extent possible, these are held constant in the expense regressions to minimize the case mix problem. Teaching hospitals and large urban hospitals, which may attract more complicated cases, are accounted for by various dummy variables in the regressions. In addition, as mentioned earlier, it is alleged that proprietary hospitals treat a simpler, less diversified, case mix than do non-profit institutions. Bays (1979) found this to be true for unaffiliated for-profit institutions, but reported insignificant differences between the case mixes of proprietary chain and non-profit hospitals. Over 50% of the proprietary hospitals in the sample used in this study are chain-affiliated. Measures of the special facilities possessed by hospitals (a common indicator used to measure quality) were incorporated in earlier regressions but had totally insignificant effects on prices and expenses. Since maternity visits tend to be relatively low cost, a variable measuring the ratio of births to admissions is also included in the expense regressions.

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[77] According to Becker and Sloan (1985, at 32), system overhead or "home office" costs are charged to individual hospitals, but not on a fee-for-service basis. Percentage of revenue is one method commonly used. It is difficult to determine what bias this may create.

[78] Data delineating the tax payments of individual hospitals are not available to this study since tax payments are included in an aggregate category of "other nonpayroll expenses" by the American Hospital Association. Becker and Sloan (1985, at 31) estimate that proprietary hospitals expenses were on average 3.5 percent higher in 1977 because of tax payments. They also note that higher interest costs payable on corporate debt financing (as opposed to municipal or other tax-exempt) led to a further 1 percent cost disadvantage accruing to proprietary hospitals.

Regressions are run on expense per admission (EXPAD), which corresponds most closely to the price per case measure used in the price regressions. Admissions are adjusted to take account of outpatient visits. Since factor usage is in part determined by the form of competition, variables such as labor inputs and assets per bed are not exogenously determined in the expense regressions. Therefore regressions are run omitting such variables. Regressions of the input measures on the competition variables are also run to determine how input usage is determined by competitive factors. Once again regressions are run both at the SMSA and individual hospital levels.

3. Demand and Cost Variables

Several variables are used to control for different demand conditions across SMSA markets. These include income, insurance coverage, percentage of the population on welfare or unemployed, population density and growth, the percentage of the population that is white and the death rate. Also included is a dummy (or share, depending on the level of the regression) variable indicating hospitals located in cities with population equal to or exceeding one million. This variable accounts for the more complicated case mix typically found in urban hospitals. Motivation for their usage and the results are discussed in the appendix.

Since many hospital costs cannot be viewed as exogenous determinants of price, it is inappropriate to include them in the reduced-form regressions. Rather, only those variables that cannot be affected by the hospital decision-makers, the physicians or administrators, are used. Results for these variables are also described in the appendix.

The next section outlines results for the price and expense regressions. In order to present the complete story, the results from all four sets of regressions are described

simultaneously.[79] The discussion focuses on the variables thought to affect market competition among hospitals. These variables include the structure and ownership descriptors, measures of substitutes and complements, and the forms of various regulations. Table 2 presents a complete list of variables, their definitions, and descriptive statistics.[80] [81]

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[79] SMSA level price and expense, and individual hospital level price and expense, regressions.

[80] As is apparent from the table, for some variables the SMSA level mean varies considerably from the hospital level average. For example, the concentration measures are considerably greater at the SMSA level. This is due to different weights placed in calculating grand means. While the SMSA level values are calculated as weighted averages of all the hospitals in the SMSA, in the "grand mean" each SMSA is given equal weight. At the hospital level, since each hospital is weighted equally in calculating the mean, SMSAs with more hospitals receive a greater weight. Since those SMSAs have lower concentration, the average concentration level appears lower. Similarly, average prices at the hospital level appear higher, because hospitals in large urban areas are likely to offer a more sophisticated, higher priced product. Since such hospitals are not evenly distributed across SMSAs, they do not receive as much weight in the overall SMSA averages.

[81] A correlation matrix of all 70 independent and 28 dependent variables is available from the author.

TABLE 2

Variable List

NAME	DESCRIPTION	SMSA LEVEL mean	SMSA LEVEL s.d.	HOSPITAL LEVEL mean	HOSPITAL LEVEL s.d.
	Market Structure and Ownership Variables				
HERF	Herfindahl statistic, computed by hospital bed capacity	.30	.20	.15	.14
CR4	Four firm Concentration ratio, computed by bed capacity	80.4	23.5	54.8	28.4
CDUM	Dummy variable denoting Herfindahl $\geq$ .3	.41	.49	.13	.34
SFP	Share of beds owned by for-profit hospitals	.07	.12	.10	.14
SGOV	Share of beds owned by public hospital[1]	.21	.26	.18	.17
SMAN	Share of beds in hospitals managed by a third party	.02	.08	.02	.05
SMHS	Share of beds in hospitals that are part of multi-hospital system	.21	.22	.25	.18

[1] Federal hospitals are not included in the data set because of their restricted clientele.

FP	Dummy variable denoting individual for-profit hospital (used in individual hospital level regressions only)	...	...	.17	.37
GOV	Dummy variable denoting public hospital	...	...	.18	.38
MAN	Dummy variable denoting outside managed hospital	...	...	.03	.18
MHS	Dummy variable denoting hospital that is part of system	...	...	.22	.41
NHBED	Nursing home bed - population ratio	.73	1.75	.93	3.08
HMOMEM	Percentage of SMSA population who are HMO members	1.02	4.51	2.73	7.41
DHMO	Change in HMOMEM from 1977 to 1978	1.60	7.69	2.54	11.54
MDBED	Physicians in Patient Care - Short Term Bed ratio	.31	.12	.36	.12
GPMD	Proportion of Physicians who are General Practitioners	.20	.08	.16	.07

NAME	DESCRIPTION	SMSA LEVEL		HOSPITAL LEVEL	
	Regulation Variables				
CONAGE	Age (in 1977) of CON law in state	3.13	3.36	4.05	3.99
EDUM	Dummy variable denoting CONAGE $\geq$ 3	.48	.50	.56	.50
S1122	Dummy variable indicating state covered by Section 1122 law	.77	.42	.74	.44
PRM	Dummy variable indicating existence of mandatory prospective reimbursement in state	.22	.42	.30	.46
PRV	Dummy variable indicating existence of voluntary prospective reimbursement in state	.21	.41	.16	.36
	Demand Variables				
PCY	Per capita income (nominal $)	5623	759	6009	745
NETINS	Proportion of population with private insurance coverage, net of duplicate coverage, measured at state level	.79	.06	.78	.06
ENROLLA	Percentage of population enrolled in Part A (hospital insurance) of Medicare	10.43	3.52	10.40	3.04

WELFARE	Percentage of population on welfare	3.35	4.68	5.43	8.08		
UNEMPLOY	Percentage of population who are unemployed	6.83	2.06	7.08	1.86		
WHITE	Proportion of population who are white	.86	.10	.83	.10		
DENS	Population Density	424	939	937	1608		
INCPOP	Percentage increase in population between 1970 and 1978	10.51	11.49	8.70	11.53		
DEATHS	Death rate	.86	.21	.87	.19		
	<u>Cost Variables</u>						
WAGES	Nominal wages of hospital industry workers	9464	1253	9780	2027		
COTH	Share of beds in hospitals that are members of the Council of Teaching Hospitals in SMSA regressions; Dummy variable denoting individual hospital membership in COTH in individual hospital regressions	.13	.20	.11	.31		
SIZE	Average number of beds (SMSA regressions); particular hospital's number of beds (hospital regressions)	250	90	253	203		
RSIZE	Individual hospital size relative to average hospital size in SMSA			.99	.73		

NAME	DESCRIPTION	SMSA LEVEL		HOSPITAL LEVEL	
POPDUM	A dummy variable indicating those SMSAs with population exceeding one million.	.13	.34	.48	.50
AOCC	Average occupancy rate of SMSA or hospital depending on regression)	74.45	6.57	72.27	13.32
ROCC	Individual hospital occupancy relative to average hospital occupancy in SMSA			.97	.16
ALS	Average length of stay for SMSA or hospital (In price regressions, ALS is specific to disease category.)	8.61	1.07	7.52	1.97
	Dependent Variables				
P250	Price - Diabetes Mellitus	1371	352	1592	623
P374	Price - Cataract (w/ surgery)	933	203	1060	317
P410	Price - Acute myocardial infarction	2637	593	2957	998
P427	Price - Congestive heart failure	1563	391	1766	644

P436	Price - Acute, but ill-defined Cerebrovascular disease	1975	508	2294	907
P486	Price - Pneumonia, unspecified	1801	447	2066	763
P519	Price - Other diseases of the respiratory sytem (pulmonary collapse, acute edema)	1809	462	2056	766
P550	Inguinal Hernia (w/ surgery)	1173	224	1341	397
P562	Diverticula of intestine	996	265	1122	408
P600	Hyperplasia of Prostate (w/ surgery)	1818	362	2115	659
P820	Fracture of Neck and Femur (w/ surgery)	3663	787	4249	1356
EXPAD	Total expenses/total adjusted (for outpatient) admissions	1191	286	1299	532
ASSETB	Asset (net of depreciation) - Bed ratio (for SMSA or hospital)	61.36	17.04	59.64	38.27
FTEB	Full time equivalent personnel per bed (for SMSA or hospital)	2.645	.36	2.562	.73

IV. Results

The results of the SMSA level price regressions are hown in Table 3, while those for the individual hospital rice regressions appear in Table 4. The expense regression esults for both the SMSA and individual hospital levels are lepicted in Table 5. Results using input measures as lependent variables are shown in Table 5 as well.

A. Price and Expense Regressions

Both at the SMSA and individual hospital levels, the price regressions show that the Herfindahl (HERF) as calculated is never significant. By itself, this could indicate that market structure has no effect on hospital competition. The expense per admission (EXPAD) regressions exhibit uniformly negative and significant Herfindahl coefficients, however. The negative correlation between market concentration and expenses suggests that competition occurs along costly service and facility dimensions. The significance of the Herfindahl in the expense regressions combined with its insignificance in the price equations suggests that while competition does increase the quality or complexity of the bundled output termed a hospital stay, it does not affect price. This implies that the price of a quality-adjusted bundle of output (which we cannot measure) falls with reductions in the level of concentration, and that some price competition therefore does exist.[82]

It could be argued that the negative relation between concentration and expenses indicates that hospitals in more concentrated markets have taken advantage of economies of scale and are, as a result, more efficient. Such a view lies behind the arguments that suggest that regional planning

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[82] A squared Herfindahl was also included in an earlier stage of the regressions to test a possible non-linear relation between price or expense and concentration. It did not yield significant results. Similarly, when the Herfindahl was constructed to view hospitals managed by a common company as a single firm, the results did not change.

TABLE 3

SMSA Level Price Regressions
(t-statistics in parentheses)

	250	374	410	427	486	496	519	550	602	600	620
HERF	-14.38 (-.20)	-19.37 (-.31)	-245.6 (-1.68)	-149.0 (-1.51)	-15.82 (-.15)	-44.36 (-.39)	-131.2 (-1.16)	-40.24 (-.63)	32.45 (.51)	-13.70 (-.15)	-197.4 (-.98)
SFP	247.8 (2.14)	164.4 (1.67)	248.9 (1.10)	295.4 (1.88)	611.5 (3.69)	505.9 (2.74)	555.4 (3.18)	224.0 (2.25)	230.8 (2.38)	327.3 (2.21)	878.7 (2.72)
SGOV	-157.2 (-2.89)	-24.96 (-.53)	-222.2 (-2.09)	-121.3 (-1.67)	-283.0 (-3.62)	-267.4 (-3.15)	-241.9 (-2.92)	-65.74 (-1.40)	-87.71 (-1.90)	-72.13 (-1.04)	-391.8 (-2.64)
SMAN	339.8 (2.30)	218.0 (1.72)	258.9 (.89)	161.7 (.82)	14.85 (.07)	232.4 (1.00)	237.6 (1.08)	-96.06 (-.76)	27.55 (.28)	-174.0 (-.92)	112.7 (.28)
SMHS	-12.55 (-.22)	-46.23 (-.97)	247.8 (2.26)	110.7 (1.46)	15.52 (.19)	-4.042 (-.05)	70.92 (.85)	26.97 (.57)	15.68 (.33)	30.77 (.43)	131.6 (.86)
HMOMEM	2.166 (.80)	.6195 (.27)	2.747 (.52)	-.1151 (-.03)	2.273 (.58)	.3212 (.08)	.2841 (.07)	-.5927 (-.26)	3.566 (1.59)	1.108 (.32)	3.095 (.42)
DHMO	-.8076 (-.53)	-.5828 (-.44)	.4345 (.14)	-.0622 (-.03)	-3.448 (-1.55)	-1.877 (-.78)	-1.139 (-.50)	-1.740 (-1.32)	-.2826 (-.21)	-3.414 (-1.73)	-3.112 (-.74)
NHBED	-.3623(-03) (.00)	4.058 (.73)	10.27 (.80)	.6335 (.07)	3.174 (.34)	.0428 (.00)	-.0478 (-.01)	.9708 (.18)	-2.546 (-0.47)	-1.293 (-.16)	-.2120 (-.01)
CONAGE	11.63 (2.22)	5.919 (1.32)	49.00 (2.93)	19.08 (2.72)	13.80 (1.83)	17.81 (2.17)	16.48 (2.10)	4.881 (1.09)	3.506 (.79)	7.276 (1.08)	29.36 (2.05)
S1122	28.48 (.89)	44.46 (1.61)	27.93 (.50)	16.80 (.39)	51.72 (1.11)	-7.589 (-.15)	-6.456 (-.13)	61.38 (2.23)	-13.82 (-.50)	56.37 (1.37)	84.57 (.96)
PRM	-95.22 (-2.67)	-73.66 (-2.41)	-257.7 (-3.71)	-188.5 (-2.90)	-197.4 (-3.83)	-183.2 (-3.28)	-201.7 (-3.79)	-63.11 (-2.07)	-44.59 (-1.49)	-98.65 (-2.16)	-314.1 (-3.23)
PRV	-25.55 (-.81)	-19.44 (-.70)	-73.82 (-1.20)	-52.09 (-1.23)	-46.87 (-1.03)	-60.02 (-1.21)	-53.92 (-1.14)	-37.68 (-1.40)	-21.37 (-.81)	-46.05 (-1.14)	-98.46 (-1.14)
PCY	.0539 (2.54)	.0102 (.56)	.0485 (1.15)	.0505 (1.78)	.0457 (1.49)	.0817 (2.43)	.0623 (1.95)	.0260 (1.37)	.0286 (1.56)	.0554 (2.03)	.0507 (.87)
NETINS	282.4 (0.87)	173.6 (.64)	1427. (2.29)	599.0 (1.88)	-13.82 (-.03)	-51.59 (-.10)	280.7 (.60)	122.8 (.45)	-29.61 (-.11)	115.7 (.29)	314.1 (.37)

ENROLLA	-11.20 (-1.11)	-5.427 (-.63)	9.261 (.47)	6.556 (.49)	9.713 (.67)	-12.73 (-.81)	-4.301 (-.29)	-14.60 (-1.70)	-8.789 (-1.05)	-9.348 (-.73)	-2.832 (-.10)
UNEMPLOY	21.90 (3.02)	11.99 (1.91)	24.58 (1.74)	24.10 (2.49)	34.92 (3.36)	29.73 (2.62)	40.50 (3.65)	9.549 (1.51)	18.56 (3.01)	31.96 (3.46)	35.13 (1.76)
WELFARE	2.261 (.68)	-2.406 (-.85)	-4.791 (-.64)	-1.584 (-.36)	-.6062 (-.13)	8.222 (1.58)	6.749 (1.35)	.5079 (.18)	3.714 (1.33)	.7043 (.17)	-6.071 (-.67)
INCPOP	3.667 (2.53)	.7928 (.64)	3.900 (1.35)	3.663 (1.85)	2.557 (1.22)	7.646 (3.33)	6.135 (2.72)	2.202 (1.75)	2.282 (1.82)	4.102 (2.19)	9.814 (2.43)
DENS	.0282 (1.96)	.0040 (.33)	.0299 (1.06)	.0217 (1.12)	.0292 (1.41)	.0284 (1.36)	-.0032 (-.15)	.0241 (1.94)	.0059 (.49)	.0490 (2.65)	.0538 (1.36)
WHITE	-326.1 (-1.99)	-102.1 (-.70)	-284.9 (-.86)	-286.3 (-1.30)	-543.5 (-2.30)	-125.5 (-.49)	-290.2 (-1.19)	-44.69 (-.32)	-58.16 (-.42)	-195.1 (-.93)	-521.7 (-1.14)
DEATHS	167.4 (.99)	78.24 (.55)	-333.9 (-1.02)	-175.4 (-.78)	-288.5 (-1.20)	233.7 (.90)	34.75 (.14)	308.8 (2.15)	-148.3 (1.07)	211.5 (.98)	35.21 (.08)
ALS	121.4 (10.78)	115.6 (9.43)	145.6 (8.31)	136.4 (7.07)	152.6 (16.07)	140. (8.01)	181.6 (9.83)	124.6 (9.03)	142.1 (12.25)	159.8 (12.95)	151.6 (12.27)
AOCC	-2.664 (-1.27)	-2.966 (-1.71)	-9.191 (-2.30)	-.4838 (-.17)	-5.619 (-1.91)	-2.924 (-.90)	-2.884 (-.93)	-2.216 (-1.27)	-.5190 (-.28)	-5.095 (-1.92)	-16.17 (-2.87)
SIZE	-.0041 (-.02)	-.0427 (-.30)	-.0034 (-.01)	-.1035 (-.46)	.1726 (.73)	-.0106 (-.04)	.1408 (.54)	-.1804 (-.87)	.1136 (.80)	-.2198 (-1.00)	-.2011 (-.44)
HWAGE	.0923 (5.65)	.0695 (4.94)	.1647 (5.13)	.0960 (4.39)	.1380 (5.87)	.0847 (3.30)	.1074 (4.39)	.0714 (5.07)	.0664 (4.87)	.0891 (4.24)	.2335 (5.21)
COTH	191.1 (2.68)	-9.771 (-.16)	237.7 (1.74)	317.0 (3.31)	247.5 (2.41)	419.4 (3.73)	236.4 (2.23)	154.2 (2.55)	62.41 (1.04)	136.3 (1.51)	292.1 (1.50)
POPDUM	101.8 (2.49)	50.33 (1.43)	121.9 (1.51)	89.73 (1.63)	122.3 (2.07)	139.6 (2.17)	105.5 (1.72)	62.49 (-2.07)	46.66 (1.36)	103.6 (1.97)	156.0 (1.39)
CONSTANT	-999.1 (-3.32)	-182.1 (-.77)	-1357. (-2.53)	-1042. (-2.87)	-776.7 (-1.99)	-832.3 (-1.96)	-1214 (-2.94)	-547.1 (-2.21)	-776.9 (-3.32)	-690.7 (1.96)	-617.1 (-.83)
R^2	.791	.537	.717	.697	.792	.682	.731	.625	.751	.676	.668
S.E.	170.16	146.13	334.82	228.15	245.48	267.20	254.52	145.53	140.83	218.19	466.18
n	247	247	245	247	247	247	244	245	238	247	247

TABLE 4
Hospital Level Price Regressions

	250	374	410	427	436	486	519	550	562	600	820
HERF	-55.22 (-.70)	24.38 (-.43)	-230.7 (-1.45)	-167.2 (-1.84)	-96.22 (-.81)	-143.2 (-1.21)	-152.8 (-1.29)	-112.8 (-1.71)	33.51 (.58)	-96.36 (-.97)	-263.0 (-1.23)
FP	179.8 (6.09)	131.6 (5.94)	396.5 (6.45)	216.2 (6.60)	267.1 (5.78)	330.5 (7.43)	331.7 (7.67)	135.1 (4.77)	106.2 (4.36)	281.9 (7.19)	666.8 (7.40)
SFP	40.23 (.43)	-34.14 (-.48)	-4.594 (-.02)	11.34 (.11)	396.3 (2.80)	76.81 (.57)	200.7 (1.53)	-69.85 (-.85)	144.9 (1.99)	-91.99 (-.77)	351.2 (1.32)
GOV	-34.92 (1.41)	-60.57 (-3.13)	-133.8 (-2.80)	-62.00 (-2.28)	-69.14 (-1.88)	-45.92 (-1.30)	-118.5 (-3.32)	-29.21 (-1.24)	-21.97 (-1.00)	-69.40 (-2.10)	-167.6 (-2.35)
SGOV	-247.4 (-4.04)	-93.18 (-2.06)	-284.2 (-2.31)	-187.6 (-2.69)	-424.0 (-4.58)	-322.8 (-3.56)	-269.0 (-2.98)	-127.7 (-2.41)	-141.6 (-3.05)	-165.9 (-2.12)	-587.0 (-3.38)
MAN	39.45 (.79)	12.61 (.32)	292.1 (2.84)	156.3 (2.94)	215.6 (2.93)	137.7 (1.87)	157.5 (2.17)	55.33 (1.08)	51.01 (1.03)	116.0 (1.72)	271.7 (1.79)
SMAN	414.3 (2.28)	59.24 (.45)	563.4 (1.60)	227.0 (1.12)	-92.00 (-.34)	487.5 (1.87)	377.1 (1.48)	-140.1 (-.89)	142.0 (1.06)	-216.0 (-.96)	-9.501 (-.02)
MHS	41.27 (1.87)	-3.574 (-.23)	44.66 (1.03)	57.24 (2.34)	29.40 (.90)	9.296 (.29)	14.06 (.45)	9.830 (.52)	27.03 (1.54)	-20.36 (-.74)	-24.68 (-.41)
SMHS	-59.38 (-1.10)	-12.97 (-.33)	57.47 (.83)	-26.70 (-.44)	-103.3 (-1.27)	-73.04 (-.90)	10.29 (.13)	33.14 (.71)	-78.86 (-1.82)	53.27 (.76)	.4192 (.003)
HMOMEM	3.998 (2.69)	1.571 (1.63)	7.062 (2.49)	3.211 (2.02)	5.707 (2.64)	2.627 (1.27)	2.752 (1.33)	2.355 (2.04)	4.405 (3.36)	2.156 (1.24)	11.89 (3.11)
DHMO	-3.112 (-4.11)	-2.239 (-4.32)	-3.812 (-2.63)	-2.490 (-2.98)	-5.071 (-4.65)	-3.032 (-2.80)	-3.928 (-3.78)	-2.936 (-4.70)	-1.617 (-2.83)	-5.109 (-5.57)	-9.863 (-4.67)
NHBED	-5.790 (-2.08)	2.582 (1.23)	5.135 (.92)	-3.174 (-.66)	-4.393 (-.97)	-.1962 (-.04)	-2.131 (-.52)	1.231 (.48)	-3.556 (-1.55)	1.081 (.31)	-8.517 (-1.13)
ROCC	329.6 (3.26)	67.56 (.65)	981.7 (3.46)	389.3 (2.36)	545.3 (2.53)	862.7 (4.04)	432.2 (2.09)	108.8 (.89)	70.69 (.62)	526.3 (2.85)	953.0 (2.33)
CONAGE	3.962 (1.05)	5.842 (2.11)	22.12 (2.92)	6.929 (1.58)	11.16 (1.93)	11.17 (1.95)	8.983 (1.59)	3.491 (1.08)	5.276 (1.72)	6.008 (1.25)	18.83 (1.78)

S1122	-13.26 (-.54)	24.67 (1.40)	-36.50 (-.76)	-45.93 (-1.69)	8.082 (.22)	-62.98 (-1.78)	-60.15 (-1.72)	20.85 (1.03)	31.39 (1.63)	11.80 (.39)	3.755 (.06)
PRM	-45.53 (-1.81)	-56.23 (-3.11)	-136.1 (-2.71)	-61.06 (-2.13)	-146.0 (-3.85)	-90.31 (-2.38)	-141.4 (-3.83)	-45.62 (-2.17)	-50.51 (-2.47)	-95.26 (-3.05)	-196.8 (-2.86)
PRV	-38.59 (-1.50)	-30.07 (-1.56)	-72.82 (-1.40)	-58.49 (-1.98)	-36.74 (-.93)	-52.81 (-1.36)	-20.74 (-.55)	-65.75 (-2.96)	-45.36 (-2.33)	-72.61 (-2.22)	-186.9 (-2.59)
PCY	6.137(-02) (3.43)	4.035(-02) (3.13)	8.750(-02) (3.52)	6.194(-02) (3.08)	8.764(-02) (3.31)	8.014(-02) (3.10)	1.012(-01) (3.91)	4.259(-02) (2.79)	2.494(-02) (2.47)	9.990(-02) (4.50)	9.716(-02) (1.96)
NETINS	536.6 (3.46)	962.8 (5.29)	2554. (5.20)	1221. (4.45)	1526. (4.22)	1191. (3.37)	1385. (3.92)	812.2 (3.83)	257.5 (1.34)	909.5 (2.92)	3442. (5.01)
ENROLLA	6.268 (.67)	-.7504 (-.11)	26.90 (1.47)	17.38 (1.63)	20.30 (1.46)	-4.509 (-.33)	9.425 (.70)	-1.023 (-.13)	3.793 (.55)	.5095 (.05)	27.39 (1.47)
UNEMPLOY	36.24 (6.00)	22.78 (5.09)	59.16 (5.00)	40.50 (6.01)	59.67 (6.65)	48.31 (5.49)	68.29 (7.79)	27.96 (5.47)	21.18 (4.44)	62.09 (8.37)	83.41 (4.98)
WELFARE	3.055 (1.47)	-.6053 (-.41)	-1.963 (-.49)	1.274 (.55)	-1.311 (-.43)	3.060 (1.00)	4.273 (1.42)	.1696 (.10)	2.884 (1.65)	-.4269 (-.17)	-6.016 (-1.07)
INCPOP	5.497 (3.95)	3.230 (3.14)	6.691 (3.43)	6.490 (4.16)	5.933 (2.87)	10.11 (4.98)	6.165 (3.05)	4.175 (3.53)	2.498 (2.43)	7.397 (4.27)	14.18 (3.65)
DENS	.0342 (3.99)	3.397(-03) (1.37)	.0317 (1.93)	.0110 (1.11)	.0355 (2.75)	.0181 (1.37)	-4.708(-03) (-.38)	.0233 (3.16)	.0270 (3.50)	.0352 (3.31)	.0733 (3.11)
WHITE	-463.5 (-3.30)	-445.2 (-4.36)	-763.4 (-2.71)	-679.7 (-4.18)	-1169. (-5.46)	-623.1 (-2.95)	-814.8 (-4.00)	-343.4 (-2.77)	-160.1 (-1.48)	-624.6 (-3.45)	-2204. (-5.56)
DEATHS	-187.9 (-1.19)	45.96 (.41)	-738.3 (-2.37)	-340.3 (-1.87)	-565.8 (-2.39)	-21.87 (-.09)	-308.5 (-1.33)	91.01 (.68)	-127.3 (-1.06)	33.16 (.17)	-733.0 (-1.70)
ALS	158.5 (28.91)	131.5 (23.40)	184.1 (25.88)	180.9 (29.56)	171.1 (40.97)	208.8 (29.75)	230.2 (31.42)	166.7 (27.62)	167.5 (33.67)	195.6 (33.97)	173.0 (28.95)
OCC	-3.192 (-1.73)	-2.164 (-1.66)	-12.74 (-3.53)	-3.136 (-1.48)	-6.379 (-2.35)	-9.464 (-3.46)	-6.968 (-2.63)	-2.258 (-1.49)	-.9000 (-.63)	-8.470 (-3.69)	-17.67 (-3.49)
SIZE	-.0644 (-.67)	-.1256 (-1.94)	-.1854 (-1.02)	-.1879 (-1.72)	-.0136 (-.10)	-.0999 (-.73)	-.3205 (-2.37)	-.1166 (-1.57)	.0334 (.48)	-.2177 (-1.93)	-.3093 (-1.26)
RSIZE	57.26 (2.27)	14.28 (.83)	121.5 (2.54)	93.69 (3.26)	68.85 (1.88)	68.10 (1.89)	101.1 (2.87)	23.87 (1.23)	19.33 (1.07)	13.19 (.44)	94.49 (1.48)

	250	374	410	427	436	486	519	550	562	600	820
HWAGE	.0555	.0274	.1006	.0591	.0625	.0615	.0582	.0393	.0390	.0565	.1283
	(9.71)	(6.91)	(9.18)	(9.67)	(9.87)	(7.28)	(7.32)	(8.06)	(8.33)	(8.24)	(8.37)
COTH	366.9	136.7	604.4	407.1	459.1	510.2	434.2	281.6	157.2	339.3	816.1
	(12.04)	(6.76)	(10.24)	(11.71)	(10.26)	(11.56)	(10.21)	(11.73)	(6.38)	(9.40)	(10.63)
POPDUM	106.9	56.66	181.4	104.2	132.8	155.5	153.0	69.98	71.35	131.5	215.4
	(4.38)	(3.21)	(3.81)	(3.79)	(3.65)	(4.31)	(4.33)	(3.46)	(3.80)	(4.34)	(3.25)
CONSTANT	-1497.	-555.4	-2755.	-1530.	-1884.	-2119.	-1894.	-1031.	-829.2	-1566.	-2156.
	(-6.61)	(-3.19)	(-6.07)	(-5.95)	(-5.45)	(-6.38)	(-5.70)	(-4.95)	(-4.62)	(-5.22)	(-3.26)
R^2	.693	.512	.579	.608	.699	.584	.610	.615	.737	.640	.628
SE	347.94	224.02	653.73	406.05	502.30	496.57	482.70	249.42	212.13	399.38	836.29
n	1959	1584	1776	2080	1815	1814	1783	1396	1207	1632	1493

TABLE 5

EXPENSE AND INPUT REGRESSIONS
(SMSA and Hospital Levels)

	EXPAD		FTEB		ASSETB	
	SMSA	HOSP	SMSA	HOSP	SMSA	HOSP
HERF	-322.3 (-5.30)	-219.9 (-3.20)	-.2000 (-1.76)	-.2842 (-2.65)	3.741 (.58)	-12.33 (-1.64)
FP	...	-17.74 (-.75)	...	-.3055 (-8.33)	...	-17.91 (-6.96)
SFP	62.23 (.64)	-86.90 (-1.14)	-.5555 (-3.03)	-.5365 (-4.52)	-23.15 (-2.21)	-8.973 (-1.08)
GOV	...	34.24 (1.69)	...	.2229 (7.07)	...	-3.833 (-1.73)
SGOV	25.12 (.56)	-11.79 (-.23)	-.0574 (-.69)	-.1406 (-1.77)	-4.661 (-.98)	-2.088 (-.37)
MAN	...	115.3 (3.01)	...	.0102 (.17)	...	8.027 (1.92)
SMAN	3.313 (.03)	47.10 (.31)	.2485 (1.02)	.4824 (2.04)	24.54 (1.77)	26.61 (1.60)
MHS	...	68.71 (3.78)	...	.1029 (3.65)	...	4.634 (2.34)
SMHS	80.98 (1.75)	30.82 (.68)	.2275 (2.62)	.0823 (1.17)	3.221 (.65)	-7.355 (-1.49)
HMOMEM	-.7598 (-.34)	-.0388 (-.03)	-.7183(-3) (-.17)	-2.144(-3) (-1.18)	-.0757 (-.32)	-.0415 (-.33)
DHMO	-1.722 (-1.36)	-2.814 (-4.42)	-1.22(-3) (-.51)	-4.718(-3) (-4.76)	-.0535 (-.40)	-.2373 (-3.41)
NHBED	-.1689 (-.03)	3.562 (1.47)	9.07(-3) (.91)	9.386(-3) (2.48)	.0341 (.06)	.1908 (.72)
ROCC	...	182.5 (1.49)	...	.6241 (3.37)	...	45.79 (3.42)
CONAGE	9.064 (2.10)	3.800 (1.18)	.0121 (1.55)	5.289(-3) (1.06)	.5438 (1.18)	.0946 (.27)
S1122	.0859 (.00)	-84.41 (-4.19)	-.0317 (-.64)	-.1344 (-4.29)	-1.658 (-.58)	4.328 (-1.97)
PRM	-41.66 (-1.42)	-5.524 (-.36)	-.0896 (-1.64)	.0628 (1.89)	-2.031 (-.65)	3.318 (1.42)
PRV	1.762 (.07)	15.55 (.70)	-.0425 (-.88)	.0362 (1.04)	.1467 (.05)	-.5961 (-.24)
PCY	-.0060 (-.34)	.0171 (1.14)	4.916(-5) (1.61)	2.623(-5) (1.14)	-3.333(-4) (-.18)	1.086(-3) (.66)

	EXPAD		FTEB		ASSETB	
	SMSA	HOSP	SMSA	HOSP	SMSA	HOSP
NETINS	110.6 (.41)	761.5 (3.80)	.9161 (1.97)	.9553 (3.10)	31.13 (1.07)	49.81 (2.28)
ENROLLA	16.33 (1.97)	15.63 (1.94)	.0079 (.52)	.0226 (1.79)	-1.133 (-1.28)	.4574 (.52)
UNEMPLOY	-4.813 (-.81)	7.764 (1.55)	8.48(-3) (.79)	7.393(-3) (.96)	-1.130 (-1.78)	-.5939 (-1.09)
WELFARE	3.710 (1.36)	-3.071 (-1.76)	-5.15(-3) (-1.02)	-3.045(-3) (-1.13)	-.6458 (-2.23)	-.2270 (-1.19)
INCPOP	.6665 (.54)	3.439 (2.94)	2.68(-3) (1.17)	3.468(-3) (1.91)	.3284 (2.49)	.1999 (1.57)
DENS	.0146 (1.21)	.0138 (1.86)	1.989(-5) (.90)	1.584(-5) (1.38)	5.662(-4) (.44)	.5447 (.68)
WHITE	-227.4 (-1.68)	-504.3 (-4.20)	-.1338 (-.53)	-.3510 (-1.88)	-3.148 (-.22)	-23.47 (-1.79)
DEATHS	-164.9 (-1.18)	-166.8 (-1.22)	-.1589 (-.61)	-.2909 (-1.36)	16.41 (1.10)	1.817 (.12)
ALS	31.81 (2.14)	115.1 (25.77)	-.1006 (-3.62)	-.0698 (-10.04)	-.2774 (-.18)	-2.587 (-5.30)
AOCC	-.5086 (-.29)	-6.448 (-4.04)	.0226 (6.96)	.0207 (8.32)	.3256 (1.76)	.1899 (1.09)
SIZE	.3643 (2.57)	.1199 (1.40)	-3.617(-4) (-1.36)	-1.337(-4) (-1.00)	-.0449 (-2.97)	-4.485(-3) (-.48)
RSIZE	...	53.39 (2.41)	...	.1223 (3.58)	...	3.319 (1.37)
HWAGE	.0921 (6.82)	.0835 (18.53)	...	...	4.0(-3)* (2.78)	6.356(-4) (1.29)
COTH	375.3 (6.35)	444.7 (16.58)	.8417 (7.72)	.7305 (17.25)	29.55 (4.69)	24.70 (8.43)
POPDUM	99.72 (2.96)	68.76 (2.85)	.0790 (1.25)	.0877 (2.74)	3.115 (.86)	2.583 (1.15)
BIRTHR	-1300. (-2.52)	-678.1 (-5.64)	.4347 (.45)	.3122 (1.67)	-40.23 (-.73)	-41.13 (-3.13)
CONSTANT	227.3 (.95)	-518.3 (-2.71)	.9294 (2.08)	.2207 (.74)	-3.032 (-.12)	-8.038 (-.38)
R^2	.788	.649	.516	.551	.319	.191
S.E.	139.98	317.44	.2621	.4946	14.93	34.68
n	247	2301	247	2301	247	2301

should limit the number of hospitals allowed to maintain certain types of costly equipment. It could be argued that such an efficiency is not passed on in the form of lower prices because of the lack of price sensitivity on the part of consumers.

If this explanation were correct, however, one would expect that hospital size would also be negatively related to expenses. Instead, as is evident from Table 5 and detailed in the appendix, expenses are positively related to size, perhaps because larger hospitals tend to offer more sophisticated treatment to a more complex case mix.[83] Since the expense data are aggregate, rather than by disease code, it is possible that, despite the presence of other variables discussed below, the size measure is accounting for some dimensions of case mix.

Interestingly, prices are negatively, albeit for the most part insignificantly, related to size. Thus if there are economies of scale, they appear to be passed on in the form of lower prices. Therefore, the argument that the different effects of concentration on prices and expenses merely reflect size economies that are not passed on to consumers appears to be incorrect.

Similarly, while higher concentration might reflect efficiencies due to higher occupancy rates, hospital and SMSA occupancy rates are specifically held constant in the regressions. It seems, therefore, unlikely that the estimated negative correlation between concentration and expenses can be explained fully by standard efficiency arguments.

This discussion does not imply that none of the "quality" competition among hospitals is wasteful, or that no efficiencies result from increases in hospital concentration. Rather, it appears that increased efficiency may be one of

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[83] Quadratic measures of hospital size were also included in earlier regressions, but did not have any significant effect on hospital expenses.

many effects of increased concentration, but, if present, does not directly benefit consumers. Unless all quality competition is wasteful, increased competition appears to give consumers higher quality for the same price as the lower quality care offered in more concentrated markets.[84]

Alternatively, since the expense data may not hold case mix entirely constant, the observed negative relation between concentration and expenses could merely reflect the fact that urban hospitals (whose markets are generally less concentrated) tend to offer more sophisticated care and take care of sicker people. Once again, these factors have been accounted for; population density as well as location in a large city are included as explanatory variables. Moreover, as Section III.C.2 explained, variables measuring the effect of teaching status and the proportion of cases that are births are also included to account for case mix variations. Several of these variables are significant. It seems unlikely that remaining unexplained case mix differences are sufficiently larger in the expense regressions than in the price regressions alone to cause the difference between the price and expense results.

Regressions in which the four firm concentration ratio (CR4) is substituted tell essentially the same story.[85] Table 6 shows the CR4 coefficients from regressions identical to those shown in Tables 3-5 except that CR4 has been substituted for HERF. Since none of the remaining coefficients change substantially, the other results are not reported. The SMSA level results have a similar pattern to those using

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[84] This contrasts with regulated airlines, which, when allowed to compete on price, lowered prices as well as quality.

[85] A two-firm concentration ratio was also tried, with very similar results to those using CR4. The total number of hospitals in the market area was also substituted for the Herfindahl statistic. It did not produce particularly significant results.

TABLE 6

COEFFICIENTS FROM OTHER RELATED REGRESSIONS
(as described in the text)

A. SMSA LEVEL

Disease Code	CR4	Regressions with Physician Variables HERF	MDBED	GPMD
250	-.6021 (-.70)	4.107 (.06)	647.5 (4.20)	-468.9 (-2.64)
374	-.3803 (-.52)	-17.38 (-.28)	-33.44 (-.24)	-116.9 (-.72)
410	-2.556 (-1.49)	-213.3 (-1.50)	699.6 (2.20)	-974.8 (-2.71)
427	-1.615 (-1.39)	-117.8 (-1.27)	880.2 (4.27)	-778.1 (-3.29)
436	-1.348 (-1.09)	-.1147 (-.00)	600.5 (2.61)	-653.2 (-2.45)
486	-1.842 (-1.37)	-24.94 (-.23)	1032. (4.30)	-722.7 (-2.60)
519	-2.445 (-1.90)	-119.6 (-1.10)	872.9 (3.66)	-431.6 (-1.57)
550	-.7117 (-.94)	-27.44 (-.44)	313.0 (2.20)	-343.2 (-2.16)
562	-.1280 (-.18)	36.01 (.57)	234.6 (1.69)	-225.5 (-1.41)
600	-1.170 (-1.06)	-2.397 (-.03)	365.2 (1.72)	-332.4 (-1.38)
820	-2.048 (-.87)	-185.1 (-.94)	1009. (2.21)	-1049. (-2.08)
EXPAD	-2.659 (-3.61)	-305.7 (-5.29)	484.9 (3.69)	-442.5 (-2.86)

B. INDIVIDUAL HOSPITAL LEVEL

Disease Code	CR4	Regressions with Physician Variables HERF	MDBED	GPMD
250	-1.726 (-2.79)	52.80 (.67)	1004. (8.40)	115.8 (.70)
374	-1.289 (-2.89)	-11.06 (-.19)	169.7 (1.97)	103.6 (.81)
410	-4.282 (-3.48)	-84.13 (-.53)	1351. (5.78)	58.86 (.18)
427	-2.524 (-3.57)	-13.86 (-.15)	1119. (8.42)	-221.3 (-1.16)
436	-3.343 (-3.58)	40.31 (.34)	1094. (6.15)	-119.7 (-.48)
486	-3.458 (-3.73)	21.14 (.18)	1357. (7.71)	-144.0 (-.58)
519	-3.325 (-3.67)	-19.15 (-.16)	1141. (6.65)	114.6 (.46)
550	-2.059 (-3.88)	-43.90 (-.66)	465.4 (4.56)	-152.8 (-1.06)
562	-.4798 (-1.02)	80.80 (1.39)	420.5 (4.32)	-89.75 (-.71)
600	-3.190 (-4.07)	-21.84 (-.22)	618.4 (4.06)	17.40 (.08)
820	-6.242 (-3.64)	-50.69 (-.24)	1798. (5.45)	-230.1 (-.48)
EXPAD	-1.962 (-3.69)	-145.2 (-2.08)	551.2 (1.67)	-77.50 (-.54)

HERF. In the individual hospital regressions, the coefficient on CR4 is generally significantly negative. However, its magnitude relative to the dependent variable is usually much smaller than in the expense regression.[86] From these results, it again appears that price competition offsets at least partially the effects of costly quality competition.

In no case, however, does the magnitude of the Herfindahl coefficient suggest that market structure, as measured by a Herfindahl or concentration ratio, is a substantial determinant of price or expense. As Table 7 shows, a .01 point increase (100 points when the Herfindahl is measured on the familiar 1-10,000 scale) in HERF[87] leads to .09 to -.03 percent decrease in price and a .17 to .27 percent decrease in expenses. The effect measured using CR4 is still smaller, ranging from a .008 decrease to a .001 increase in prices and a .008 to .011 percent decrease for expenses when CR4 is increased by 5 points.

The share of proprietary hospitals (SFP) shows a uniformly positive and often significant coefficient in the price regressions at the SMSA level and a generally insignificant (but also positive) effect at the individual hospital level. The expense regressions indicate no significant relation between for-profit market share and hospital costs. This suggests that cream-skimming is not the primary force raising prices in markets with large proprietary market

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[86] No direct statistical comparison of the coefficients across price and expense regressions is meaningful since the price regressions concern individual diseases while the expense equations are more aggregate. Aggregating a representative price variable across disease categories is not possible because the data set contains observations on every disease category only for the largest hospitals.

[87] A 100 point increase is the cutoff under the 1984 Department of Justice guidelines for when one must seriously investigate a merger if the level of the Herfindahl index is in the range of the average market studied here.

TABLE 7

PERCENTAGE EFFECT OF COMPETITION MEASURES ON PRICES AND EXPENSES

Variable and Change	SMSA LEVEL			HOSPITAL LEVEL		
	Price		Expense	Price		Expense
	Range	Mean		Range	Mean	
HERF - 100 point increase[1]	-.09 - +.03	-.035	-.27	-.09 - +.03	-.053	-.17
CR4 - 5 point increase	-.007 - +.001	-.0034	-.011	-.008 - -.002	-.0067	-.008
FP - equals 1 SFP - 10% increase	.07 - .22	.15	.04	9.5 - 16.1	12.9	1.4
GOV - equals 1 SGOV - 10% increase	-.31 - -.06	-.20	.04	-5.8 - -2.0	-3.5	2.6
MAN - equals 1 SMAN - 10% increase	-.02 - +.05	.02	.0005	1.2 - 9.4	6.1	8.9
MHS - equals 1 SMHS - 10% increase	-.11 - +.20	.05	.14	-1.0 - +3.2	1.0	5.3
ROCC - 10% increase				.64 - 4.2	2.1	1.4
MDBED - 10% increase	-.11 - +1.77	1.02	1.26	.58 - 2.37	1.64	1.53
CONAGE - 1 year increase	.35 - 1.87	.83	.77	.25 - .74	.44	.30

[1] Increases, in all cases, are from the mean levels of the values.

shares.[88] Rather, for-profit hospitals either enter into already profitable markets or higher prices represent less physician control.[89]

The ownership dummy variables in the individual hospital regressions provide additional information useful in distinguishing the two remaining theories. For-profit hospital (FP) status has a highly significant positive impact on price and an insignificantly negative effect on costs. These results suggest that proprietary hospitals charge prices that are, on average, 13 percent higher than those of non-profit hospitals. This result confirms previous work showing that for-profit hospitals are able to generate larger margins.[90] It also implies that the positive coefficient on for-profit market share is attributable not only to the fact that proprietary hospitals enter the most profitable markets, the effect of which should be measured by the for-profit market share variable, but also to their own pricing policies. If the services offered by non-profit and proprietary hospitals were priced identically, the dummy variable denoting the proprietary institutions would be insignificant. This suggests that physicians may have less control over pricing in proprietary hospitals and therefore must share the rents with hospital

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88 Since prices for all disease categories rise, the reduction of cross-subsidization explanation of cream-skimming does not hold. While cream-skimming of less price-sensitive patients might produce uniformly higher prices, it would also lead to higher expenses.

89 A study by Mullner and Hadley (1984) found that the change in market share of proprietary chain hospitals between 1973 and 1982 was significantly positively related to the change in non-profit hospitals' revenue-cost margins. They also found population growth and the for-profit chains' 1973 market share to have significant positive effects on change in proprietary chain market share.

90 For example, a recent study by Lewin and Associates found that investor-owned hospitals charged 21% more than not-for-profit hospitals. ("Investor-owned Hospitals Charge 21% More: Study," Modern Healthcare, 7/5/85 at 11)

owners. While the physician charge for hospital services may be lower when a for-profit hospital is involved, there is no indication, from these results, that the entry of for-profit hospitals leads to lower prices for the hospital-based component of service.

Total expenses of proprietary hospitals are insignificantly different from those of non-profit hospitals. When a crude estimate of average tax payments made by proprietary hospitals is subtracted from each for-profit hospital's aggregate expenses, the coefficient on FP becomes, not surprisingly, significantly negative.[91] This suggests that for-profit hospitals have lower input costs. This will be tested below.

As expected, the share of government beds (SGOV) has a generally negative impact on prices. The effect on expenses is insignificant.

The uniformly negative coefficients on the individual hospital dummy variables (GOV) suggest that government run hospitals themselves charge lower prices. Public hospital expenses may exceed those of private non-profit institutions, although the coefficient is insignificant at standard levels. If these results are correct, it is not surprising that many county and municipal hospitals are currently facing bankruptcy and selling out to proprietary hospital chains.

The effects of both managed and system hospitals shares (SMAN and SMHS) on price are not particularly significant. The results show the coefficients on the SMAN variables to be generally positive, albeit rarely significant, while those on SMHS are more frequently insignificantly negative at least at the individual hospital level. Managed hospitals may have

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[91] See note 78, supra.

the same effect as for profit hospitals.[92] At the time the data were collected (1977-78) most system hospitals were non-profit and religiously affiliated institutions, and their negative coefficient may reflect special characteristics of subsidies or clientele of such hospitals. The expense regressions show insignificantly positive coefficients on both SMAN and SMHS. Any areawide efficiencies that obtain from chain management or ownership appear to be at least offset by increases in service-facility use perhaps generated by a growth in quality competition.

The individual hospital variables show that the effect of outside management (MAN) on price is positive and sometimes significant, while that of membership in a multi-hospital system (MHS) is generally smaller and insignificant. Expenses of managed and system hospitals are significantly higher than those of unaffiliated hospitals, and, as Table 7 shows, the magnitude of the effect caused by affiliation is greater on expenses than on prices. This may partly result from the fact that many financially troubled hospitals are taken over by management companies or system hospitals. It is difficult, however, to justify the efficiency arguments made by these hospitals.[93] These results are fairly consistent with the research outlined in section II above that suggested that if managed and system hospitals generate higher profits (which my results do not suggest), they do so through higher prices rather than lower costs.

The percent of the population belonging to HMOs (HMOMEM) exhibits a generally insignificant coefficient in the SMSA level price and expense regressions. It is signifi-

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[92] Almost 40% of all managed hospitals in the sample were for-profit. In 1984, the percentage of managed hospitals that are proprietary is 56% with 66% of the beds. ("Investor Owned Chains Continue Expansion 1985 Survey Shows," Modern Healthcare, 6/7/85 at 76)

[93] It is possible, of course that managed and system hospitals provide higher quality service, but this seems unlikely since their prices are not uniformly higher.

cantly positive in the individual hospital level regressions.[94] On the other hand, the change in HMO market share from 1977 to 1978 (DHMO) shows a uniformly negative and often significant coefficient. From this set of results, it appears that HMOs may indeed enter first into the most costly areas, but that their entry subsequently leads to lower costs and prices.

The nursing home bed-population ratio (NHBED) generally produces insignificant coefficients in both the price and expense regressions, except for the individual hospital price regressions where the coefficients are mostly negative and sometimes significant as predicted under the competition-to-hospitals theory. Overall though, nursing homes do not appear to be good substitutes to hospitals.[95]

When the physician-bed ratio (MDBED) is included in the price regressions, its effect is always positive, and mostly highly significant in both the SMSA and individual level regressions as shown in Table 6.[96] The significantly positive

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[94] It should be noted that while HMOs existed in 64 of 249 SMSAs in 1977 and were spread across over 30 states, most were found in the West Coast States. The positive coefficient may be explained partially by the geographic location of HMOs. Inclusion of regional dummy variables eliminates the significance of the HMOMEM variable while the west coast dummy variable is highly significant. Since many HMOs are located in California, particularly during the sample period, this is not surprising.

[95] Ambulatory care facilities and outpatient surgi-centers have also developed in recent years to compete with hospitals at least for simple procedures. They were not common, however, at the time the data for this study were collected.

[96] These results come from regressions identical to those shown in Tables 3-5 except that MDBED and GPMD have been added. The same SMSA-wide average physician-bed ratio is used in both the aggregate and individual hospital regressions. Ideally a hospital-specific measure (of the ratio of all physicians

coefficient on the physician-bed ratio in the expense regressions as well suggests that more hospital inputs are used when more physicians are present, but it is impossible to distinguish whether higher quality or less physician control over input use produces this result. It is clear though that physicians do not act primarily as substitutes for hospital beds.[97]

The proportion of physicians who are general practitioners (GPMD) has a universally negative and often significant coefficient in the SMSA level price and expense regressions as expected. In the individual hospital regressions on both prices and expenses, the coefficients are always insignificant, albeit sometimes unexpectedly positive.

Inclusion of the physician measures in the regressions has little effect on the other variables' coefficients. In the individual hospital regressions it tends to reduce the magnitude and significance of the structure variables' coefficients if they are negative. This suggests that, as hypothesized, some competition among hospitals is for physicians.

The relative occupancy rate of a hospital (ROCC) has the expected positive and significant effect on prices in most cases. Holding constant the hospital's own occupancy rate which presumably affects costs, the higher its occupancy relative to the average in the local market, the more power

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with admitting privileges at the particular hospital to the number of beds at the hospital) would be used in the individual hospital regressions. Data are not available to this study, however, to compute such a variable.

[97] Inclusion of a physician-population ratio (MDPOP - not in the reported regressions) not surprisingly tends to reduce (but not eliminate) the significance of the physician-bed ratio. (The correlation between MDBED and MDPOP is .59.) MDPOP itself is always positive and generally significant, sometimes more so than MDBED. If only MDBED were significant, it could be measuring only a relative shortage of hospital beds; the additional significance of MDPOP implies that physicians themselves influence hospital prices and expenses.

it appears to have over price. While the positive relation between ROCC and price, by itself, could also be explained by a reverse causality wherein a hospital's higher quality leads to higher relative demand, the relative insignificance and lower magnitude of the effect on expenses does not support this alternative theory.

Entry regulations (CONAGE and S1122) do not appear to reduce hospital expenditures. The coefficients on CONAGE are generally significantly positive in the price regressions, particularly at the SMSA level, while those on S1122 are insignificantly negative in most instances. The SMSA-level expense regression shows a significant positive coefficient for CONAGE. S1122 has a negative effect on expenses, but is only significant at the individual hospital level. The significantly positive coefficients at both the price and expense level on CONAGE suggest that such regulation does not serve to control expenditures, but rather leads to a costlier reallocation of resources. Using the mean level of CONAGE, the results suggest that states with CON laws on average had prices and expenses that were 1.8 to 2.6 and 1.2 to 2.4 percent higher, respectively, than those without. The cartel story, which predicts higher prices and/or lower expenses, is not strongly supported by these regressions since both prices and expenses appear higher. These results are consistent with most of the literature on hospital entry regulation.

On the other hand, both mandatory and voluntary prospective rate regulation programs (PRM and PRV) frequently have significantly negative impacts on prices. Not surprisingly, the effect of mandatory programs is generally larger and more significant. The effect of both on expenses is insignificant. It appears, therefore, that the primary effect of such rate regulation is to reduce margins, but not to encourage more efficient operation.

In all cases the residuals have been plotted and at least briefly examined. Scatter plots appear random. The

esiduals do not seriously violate normality assumptions; if anything, their pattern exhibits slightly thin tails. Log transformations of the data removed any semblance of non-normality but did not change any of the results substantially.

Price per day, rather than per case, has also been used as a dependent variable. While thorough testing of this specification has not been undertaken, the results do not appear significantly different.

Inclusion of dummy variables to measure nine geographical regions in the U.S. does not change most of the remaining variables' effects significantly. Of the regional variables, only the one representing the Pacific states[98] has a significant (positive) effect. The size and significance of HMOMEM is reduced with the regional variables; since many HMOs are located in California, this is not surprising given the significance of the Pacific dummy variable.

B. Alternative Specification of Concentration and Entry

The linear specifications of concentration and entry regulations may be inappropriate. Concentration may not matter until some threshold is reached, and the effect of a CON law may not be noticeable until it is well-established. With this in mind, two dummy variables were substituted for the linear measures discussed in the previous section. The concentration dummy was set at one when the Herfindahl index equalled at least .3 (3000 on the familiar 1-10,000 scale) and 0 otherwise. Similarly, an entry dummy was defined to equal one only when the CON law was at least

[98] Washington, Oregon, California, Alaska, and Hawaii. New England is the benchmark.

TABLE 8

COEFFICIENTS ON CONCENTRATION AND ENTRY BARRIER DUMMY VARIABLES

Disease Code	HERF > .8 Dummy		CONAGE > 8 Dummy	
	SMSA	HOSP	SMSA	HOSP
250	15.01	14.57	72.90	42.92
	(.56)	(.55)	(2.60)	(2.06)
374	21.78	11.44	18.99	43.57
	(.95)	(.60)	(.78)	(2.79)
410	11.59	23.86	256.1	183.3
	(.22)	(.45)	(4.59)	(4.33)
427	16.86	-1.327	107.6	62.17
	(.47)	(-.04)	(2.84)	(2.59)
436	59.36	60.69	99.12	109.3
	(1.55)	(1.51)	(2.46)	(3.42)
486	-1.325	-9.014	129.3	103.8
	(0.03)	(-.23)	(2.95)	(3.31)
519	-23.39	-27.25	116.7	90.65
	(-.58)	(-.69)	(2.78)	(2.90)
550	24.11	12.74	28.41	47.33
	(1.04)	(.57)	(1.18)	(2.58)
562	17.15	18.43	14.65	22.16
	(.76)	(.94)	(.62)	(1.33)
600	40.55	18.00	41.10	66.18
	(1.18)	(.54)	(1.14)	(2.46)
820	-4.845	10.82	174.0	197.5
	(-.07)	(.15)	(2.25)	(3.32)
Average % Price Effect	1.1	.7	4.9	4.0
EXPAD	-48.21	-46.66	47.84	43.15
	(-2.08)	(-2.06)	(1.94)	(43.15)
% Exp. Effect	-4.0	-3.6	4.0	3.3

three years old (in 1977).[99]

The coefficients on these two variables and the percentage effects they represent are shown in Table 8. These results mostly confirm those discussed previously. Since the coefficients on the remaining variables did not change significantly, they are not reported. The regressions using the dummy variables appear to fit the data about as well as the previous linear specifications.

Once again concentration appears to have no significant net effect on prices but is significantly negatively related to expenses. The price coefficients suggest that prices are .7 to 1.1 percent higher (albeit insignificantly), while expenses are 3.6 to 4.0 percent lower, when the Herfindahl equals or exceeds .3.

A CON law that is at least three years old raises both prices and expenses significantly. Since prices may increase by a greater percentage than expenses (4.0 to 4.9 percent on average for the eleven prices versus 3.3 to 4.0 percent for expenses), margins appear to increase slightly, and CON laws may therefore restrict entry. Still, CON's strongest effect is that it creates cost-raising inefficiencies which are passed on in higher prices. If CON's primary impact was as a cartelizing device, expenses should not increase as much. Interestingly, high concentration and a well-established CON law appear to have effects on expenses that are identical in magnitude but opposite in sign. This suggests that when both conditions exist, the reduction in quality competition just offsets the lessening of efficiency. In this case, expenses are unchanged from the state where neither condition is present. Since prices are higher, however, margins have increased.

Various other specifications were also tried. Rather

[99] Alternative cutoffs for both variables were tried; these seemed to fit the data best.

than simple one-zero dummy variables, alternative measures were defined to equal the actual levels of concentration and the age of the CON law above the dummy variable cutoffs (.3 and 3) and 0 below. Interactions of the price and CON regulation dummy variables were accounted for as well. These variables were used to test whether the existence of an entry restriction that would prevent the erosion of supra-competitive prices was necessary for high concentration to have an effect. Interaction of the level of concentration above the .3 cutoff with the existence of a well-established CON law was also tested. As mentioned earlier, alternative cutoffs were also tried. None of the interaction variables were significant. Since none of these alternative specifications proved superior to those discussed above, their results are not reported.

C. Input Regressions

If quality competition is important, input use is in part determined by the degree of competition. Therefore, it would be inappropriate to include input measures as explanatory variables in the price or expense regressions. Instead, to focus directly on the effect that our measures of competition have on inputs, regressions were run with inputs as dependent variables. Table 5 reports results where full-time-equivalent personnel per bed (FTEB) and assets per bed (ASSETB) are the endogenous variables. The regressions are similar in form to those run on prices and expenses.[100] Only the more interesting variables are discussed.

Structure, as measured by the Herfindahl statistic,

[100] Under the assumption that input use is determined by competitive factors, regulations, other exogenous cost factors, and a derived demand from the demand for hospital services, such a specification seems appropriate. The wage variable is omitted from personnel regression since it is likely to be endogenous; no price of capital exists in any of the regressions in this study.

appears to have a negative effect on input use, but is only significant in the individual hospital personnel regression. If quality competition is important, as is suggested by the expense regressions, it is surprising that this variable does not exert a more important influence in the input regressions. Perhaps other unmeasured inputs are also important.

For-profit hospitals clearly use fewer labor and capital inputs per bed than do non-profit hospitals. These results suggest that they may engage in less wasteful input competition. It also suggests that they do not offer a higher quality product. Tax payments and additional financing costs appear to offset any reduction in input cost.

Public hospitals appear to use more personnel than non-profit hospitals. This may be due to their, on average, older, less efficient physical plants. Since assets are measured net of depreciation, the negative coefficient in the asset equation probably reflects this age.

System hospitals, and perhaps managed ones as well, appear to use more inputs per bed. This explains their higher overall expenses and confirms the initial suspicion that they are not more efficient (at least in terms of input use) than their independent counterparts.

Growth in HMOs apparently reduces hospital input use, perhaps by creating pressures for cost reduction. A relatively high number of nursing home beds in the market, on the other hand, leads to greater use of personnel by hospitals. This may reflect a sicker clientele in the hospital.

The higher a hospital's own occupancy rate relative to the market average, the larger its use of inputs. Moreover, the larger a hospital's absolute occupancy (OCC) (or the average occupancy in the SMSA), the greater is the use of personnel per bed. These results are plausible: the more intensively used are the beds (as reflected by their rate of occupancy), the greater the demand for complementary inputs. Asset usage does not appear to depend significantly on absolute occupancy. If the occupancy rate of any given

hospital fluctuates over time, it may be easier to adjust input use by shifting personnel than by changing the amount of physical assets.

On average, regulations do not appear to affect input usage significantly.

Finally, teaching hospitals use substantially greater amounts of both labor and capital inputs per bed.

V. Conclusion

The empirical work described in this study suggests that hospital market structure in 1977-1978 affected competition in the hospital industry. A linear regression including Herfindahl or concentration ratio measures of market structure indicates that these measures have no significant impact on prices. They do, however, have a significant negative relation to expenses, where the effects of facility-service (quality) competition and/or efficiency are isolated. The apparent lack of a relation between market concentration and prices combined with the negative effect of concentration on expenses suggests that the price of a quality-adjusted bundle of output (if it could be measured) does fall with reductions in the degree of market concentration as measured by a Herfindahl or concentration ratio statistic. The coefficients, however, suggest that the magnitude of any effect of concentration, by itself, was small in 1977-1978. Regressions that substitute a dummy variable denoting markets where the Herfindahl is at least .3 (as measured in this study, or 3000 as measured on the conventional 1-10,000 scale) for the linear measure discussed above confirm that concentration has no net effect on prices but negatively influences expenses.

This research shares with other work in the field the inability to measure quality accurately, and it is therefore difficult to isolate price competition. The evidence collected in this study, however, suggests that in 1977-1978 price and quality competition did exist and were greater in less concentrated markets. The results suggest that hospital margins rise and expenses fall with increases in hospital industry concentration, where expenses are interpreted as reflecting quality. It, therefore, appears that normal competitive forces affect the hospital industry. While it might be suggested that the negative correlation between expenses and concentration reflects economies of scale that are not passed on to consumers, as Section IV.A above discusses, such efficiencies do not provide the full explanation for the estimated correlation. Since standard economic conditions seem to influence both price and quality competition among hospitals, it seems reasonable, for the most part, to use

criteria appropriate to other industries in applying the antitrust laws in the hospital industry.

It is not clear that "quality competition" always results in net improvements in consumer welfare. While the prevalence of costly equipment across many hospitals certainly lowers the risk that a particular patient at a particular hospital might not have immediate access to the most up-to-date technology, this benefit comes at a high cost.

Entry-type regulations such as Certificate of Need laws appear to have led to higher prices. Higher expenditures have also resulted. These results are more significant in the dummy variable specification than in the linear measure, but in both cases the relevant coefficients are positive. The regressions using a dummy variable suggest price increases of 4.0 to 4.9 percent and cost increases of 3.3 to 4.0 percent resulting from the existence of a well-established CON law. These results suggest that CON programs have at least led to inefficient resource allocations and may additionally have permitted supra-competitive pricing through their entry-restricting effects. This study provides no evidence to suggest that CON laws have reduced resource utilization. Rate review regulation appears to have reduced prices but not expenses.

Hospitals appear to earn the highest margins in areas with both high concentration and a well-established CON law, even though there does not appear to be a direct interaction between concentration and entry regulation. Since high concentration yields relatively low expenses, while a well-established CON law is related to higher prices, the combination produces higher margins than in areas where only one or neither condition holds.

This study also examined the behavior of new ownership and organizational forms in the industry, such as proprietary or chain hospitals. The evidence suggests that for-profit

ospitals have not increased price competition, but appear nstead to be better able to profit-maximize in markets where lemand curves are relatively inelastic, as well as perhaps educe the market power of physicians. While their expenses ire insignificantly different from those of non-profit nospitals, they charge substantially higher prices. The regressions also provide no evidence of greater efficiency on the part of for-profit hospitals. It is possible that for-profit hospitals are more efficient but offer a higher quality service so that on balance their expenses are the same as those of non-profit hospitals. Since their input use is lower, however, this seems unlikely.

This study also provides no evidence to support the conjecture that managed and system hospitals are more efficient than independent ones. Expenses for both former types appear to be greater. The prices of managed hospitals may be somewhat higher than internally managed hospitals. In all cases, the effect on prices and expenses of being independently managed is small. Since the data used in this study do not reflect the major expansion of the large chains and managed hospital systems, however, these results should be regarded as tentative.

Given the structure of the medical market in the late 1970s, it is not surprising that hospitals focused many of their competitive efforts on quality dimensions. It appears that the only major constraint on prices was that imposed by the necessity to raise private insurance premiums to cover cost increases.[101] Evidence suggests that consumers (enrollees) are responsive to differentials in premiums.[102] Substantial increases occurred during the 1970s as medical

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[101] Extensive copayments have been instituted only in the last few years. At the time, while deductibles existed, copayments were small and rare.

[102] Frank and Welch (1985) at 149.

care consumed an increasing portion of GNP.[103] Not only did consumers face increases in the price of their insurance coverage, but corporations also saw their labor costs rise due to their extensive subsidization of medical care benefits.

In recent years,[104] however, it appears that sensitivity to price is rising. In particular, corporations have become increasingly concerned about the proportion of their expenses attributable to subsidization of employee health benefits. Consequently, they have increased their search for alternative insurance arrangements and, in some cases, have established their own insurance plans.[105] In efforts to contain costs, many plans have raised their coinsurance rates,[106] and changed the relative reimbursement rates between in-patient and ambulatory surgery to create incentives for greater utilization of the latter, cheaper alternative.

Moreover, new types of arrangements have developed such as Preferred Provider Organizations (PPOs) where a

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[103] From 6% of GNP in 1965 when Medicare/Medicaid were enacted to 7.5 percent in 1970 to 10.5% in 1982.

[104] More recent than when the data for this study were collected.

[105] General Motors has announced that workers at its new Saturn plant will only be offered HMO and PPO insurance arrangements. Goodyear and Continental Illinois provide some in-house medical coverage, while Deere has established its own HMO. ("Industry Trends: 1985 Highlights," Hospitals 59, December 16, 1985, at 43.)

[106] Coinsurance is the amount of each bill the patient must pay out of pocket. According to various surveys, the percentage of companies offering full coverage of inpatient services has declined from about 90 to around 50 in the last five years. ("Companies Tackle Health Care Costs," New York Times, 3/3/85 at F11; "Increasing Number of Americans Lack Health Insurance," Hospitals 5/1/85 at 21; Corporate Initiative and Employee Attitudes on Cost Containment, Equitable Life Assurance Society survey, March 1985.)

limited group of physicians and hospitals are promised all of the insurance plan's subscribers and prompt reimbursement in return for discounted rates.[107] While the results of this study suggest that in 1977-1978, HMO membership share was, if in any way, positively correlated with hospital prices, demand for HMO arrangements may initially have been greatest in the costliest areas. HMOs are much more pervasive and well established now.[108] While no recent definitive study of their effect exists, the incentives they create should ultimately lead to greater price sensitivity, if not directly on the part of patients, then through their choice of insurance, or on the part of their physicians.[109] Hospitals, themselves, are forming HMOs and offering more ambulatory care through them.[110] Finally, alternative delivery forms have arisen to challenge the traditional practice settings of fee-for-service physicians and hospitals. For example, many types of surgery are now done in

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[107] Five major commercial insurance carriers sponsor either HMOs or PPOs. Moreover, 43 Blue Cross or Blue Shield plans in 38 states offer them as well. ("DRG/Alternative Delivery Scoreboard for Insurers," Hospitals, 1/16/86) Hospital chains are also beginning to sponsor their own PPOs. ("Hospital Chain Starts PPO," American Medical News, 4/27/84 at 3) 325 PPOs existed by November 1985, 71 of which were joint ventures between physicians and hospitals and 37 were solely sponsored by hospitals. ("Industry Trends: 1985 Highlights," Hospitals 59, December 16, 1985, at 51.)

[108] According to the National HMO Census 1984 (1985), as of December 1984, 337 plans contained 16.7 million members, and enrollment had increased 22.4% during 1984.

[109] A recent survey of consumer sensitivity to hospital prices found consumers in the West, where HMOs are still most pervasive, to be the most sensitive. ("Are Consumers Sensitive to Hospital Costs?" Hospitals, 2/1/85 at 68)

[110] 26 Chicago hospitals have formed an HMO with 800 participating physicians and contracts with at least 5 employers, including the Cook County government. ("Hospitals: Building Bigger Mousetraps to Snare Your Patients," Medical Economics, 11/12/84 at 15)

ambulatory surgery centers or even in physicians' offices.[111]

There are various indications that hospitals now compete more on price than they did in the past. Several urban hospitals have reduced their room and board rates in the last couple of years.[112] Business and consumer coalitions in several cities have collected and published information on prices charged by the major hospitals in their areas.[113]

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[111] 2300 freestanding primary care centers existed at the beginning of 1985, compared with only 150 in 1980. Such centers did not exist during the time period of this study.

[112] A few examples are listed here. Hospitals in some areas have begun to waive the Medicare deductible for eligible patients. ("Hospital Industry Price Wars Heat Up," Hospitals, 10/1/85 at 69) Hospital prices fell from 1983 to 1984 for about one half of 24 DRG categories surveyed in Columbus Ohio. ("10 Hospitals in Columbus, Ohio Cutting Prices on Some Services," Hospitals, 5/16/85 at 31) A Chicago hospital responded to competition by reducing room rates by 20% while Indiana hospitals have cut emergency department fees. ("Trends and Topics," Hospitals, 11/1/84 at 32) One hospital has advertised in the Wall Street Journal that its maternity services cost $300 less per patient day than those of its competitors. ("Maternity Services touted in Wall Street Journal Ads, Modern Healthcare, 9/28/85 at 14)

[113] For example, Washington, D.C.'s National Capital Area Health Care Coalition composed of 200 corporations, insurance companies, unions, trade associations and health care providers is currently conducting a survey. ("Shopping for Hospital Care," Washington Post, 11/14/84, at D7) Also, Chicago published one last year ("Putting a Clamp on Your Medical Costs," Chicago, 6/84 at 166) as did Boston and Minneapolis-St. Paul. The Blue Cross Association of Columbus, Ohio produced similar comparisons. ("Ohio Blues Plan Prints Booklet Listing Treatment Costs of 40 Local Hospitals," Modern Health Care, 9/13/85 at 56) Several states and private corporations have also published surveys. One such company, Quaker Oats reported that average medical costs per salaried employee fell nearly 7 percent between 1982 and 1984 as a result of a general cost control program. ("Posting Prices of Hospitals," New York Times, 4/2/85 at D2) 83 health care coalitions currently collect data on health care costs, and 20 produce price

Several states have authorized the negotiation of fixed fee contracts between insurance companies and doctors and hospitals.[114] In an attempt to control hospital expenditures, Medicare, which accounts for over half of all hospital payments, introduced its Diagnosis Related Group (DRG) system of reimbursement in October 1983.[115] This program appears to have diminished hospital utilization. The American Hospital Association reports that average hospital occupancy rates have fallen significantly since 1983.[116] Moreover, the hospital workforce decreased by 3 percent. Utilization diminished for the entire population rather than only for patients over age 65 (those covered by Medicare), suggesting that private insurance companies are also price conscious.[117] Indeed, in several states, Blue Cross-Blue Shield has negotiated with hospitals for DRG-type reimbursement mechanisms.[118] In California, hospitals bid for contracts to treat

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comparison guides. ("Hospital Industry Price Wars Heat Up," Hospitals, 10/1/85 at 69)

[114] "Health Insurance on the Statehouse Floor: 1985 Projections," Hospitals, 2/1/85 at 52.

[115] Under this program, hospitals are reimbursed a fixed amount per patient admission, determined by a classification system of 460 disease categories, regardless of the patient's length of stay or treatment complexity.

[116] Occupancy rates fell to 64 percent of staffed hospital beds during the third quarter of 1984 from 71 percent a year previously and 77.4 during the first quarter of 1983, despite the shutting down of some beds. This decline resulted from decreases in both admissions rates and lengths of stay.

[117] "Business Declines for Nation's Hospitals," American Medical News, 7/20/84 at 7 & "Hospitals Losing Rapidly, AHA Study Finds," American Medical News, 1/25/85 at 28.

[118] Blue Cross of Northern Ohio requires hospitals to bid for its contracts and reimburses any losers only 70% of their bills. (Business Week, 12/24/84, at 20.)

the state's Medicaid enrollees. $500 million in savings since 1983 is attributed to this program.[119]

The evidence cited in the last few pages suggests that insensitivity to price, due to extensive third party coverage and lack of information, may be diminishing. If this trend continues, it would not be surprising if the form of competition among hospitals focuses more on price dimensions and, if consumers prefer, becomes less concerned with quality. This study of hospital competition in 1977-1978 should provide a useful benchmark by which to measure industry changes.

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[119] "The Corporate Rx for Medical Costs," Business Week, 10/15/84, at 141.

APPENDIX

Demand Variables

Income is often thought to have a positive effect on the demand for most forms of health care.[120] Evidence on the effect of income on total costs is mixed however. Per capita income (PCY) is measured at the SMSA level. The results show an almost universally positive, but only sometimes significant at the SMSA level, effect of income on prices. Its effect on expenses is insignificant.

More extensive insurance coverage is thought to increase demand (or at least reduce elasticity) for hospital services, if it reduces price sensitivity, as commonly believed. As Hersch (1983) notes, an empirical problem exists if hospital insurance coverage is used as the measure of insurance protection, since insurance coverage and hospital care may in fact be jointly determined. Various researchers have used the share of the population covered by Blue Cross instead, but this measure has problems as well. Blue Cross' market share is affected by competitors such as HMOs that may also have direct effects on hospital demand.[121] Another problem in ascertaining the effect of insurance is the difficulty of measuring depth of coverage rather than mere existence. Depth of coverage takes account of which services are covered, limitations on benefits covered, and required copayments. Finally, differences may exist between the influence of private and public insurance plans; in particular, public programs may function more as subsidies

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[120] Feldstein (1971) found an income elasticity of .47 for mean length of stay, but only a small effect (elasticity of .08) on admissions. Newhouse and Phelps (1976) find a small (.02-.04) and insignificant elasticity for admissions.

[121] Inclusion of a Blue Cross coverage variable in addition to the variable measuring total private insurance coverage produced an insignificant coefficient and did not alter any other results. Hence, these results are not reported. It was expected that if large Blue Shield plans negotiated discounts from providers, the effect of this variable might be negative.

than as pure insurance mechanisms and therefore also have an income effect.

Two variables are used to measure the separate effects of private and public insurance coverage. NETINS measures the net (of duplicate coverage) percentage of the population covered by a private insurance program.[122] Data are only available at the state level. ENROLLA measures the percentage of the population enrolled in Medicare's Part A (hospital insurance) program. It is measured at the SMSA level.

The private insurance variable, NETINS, has the expected positive effect on both prices and expenses but is only significant at the individual hospital level. The Medicare variable, ENROLLA, has a generally insignificant effect on prices. Interestingly, its effect on expenses is significantly positive. The differential effect can perhaps be explained by the difference between the units of observation in the data sets. If the elderly hospitalized population is on average sicker and costlier, this would be reflected in aggregated hospital expenses. Since the price data are solely for Medicare cases, it is not surprising that no effect is seen.

Population density (DENS) is expected to have two opposing effects on hospital care demand. Its influence is negative if decreases in travel time lead to substitution of outpatient services for hospitalization. Alternatively, since hospitals in urban areas are generally more sophisticated than rural hospitals, they may attract all of the complicated cases. In this case, while population density might reduce admissions, it would increase average length of stay and have an

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[122] An alternative specification of private insurance as the proportion of total dollars spend on hospital care that were covered by private insurance was also used to reflect depth of coverage. This variable generally had insignificant coefficients. The results are not reported.

indeterminate effect on bed demand. DENS is measured at the SMSA level as the population per square mile. In practice, density appears to have a generally positive, albeit frequently insignificant, effect on hospital prices and expenses. Whether this is due to the offsetting impacts of the two anticipated effects or to multicollinearity is not clear. An alternative measure which may more directly measure more complicated case mix is a dummy variable indicating large urban locations. This is discussed below in the section on cost variables.

Population growth (INCPOP), measured as the percentage growth between 1970 and 1977, generally has a positive and significant effect on prices, particularly at the individual hospital level. This suggests that there is some lag in supply responses to increases in demand. Individual hospital level expenses rise as well, suggesting the substitution of more costly inputs as demand rises.

Two other variables are used to measure the general economic status of the population. These are WELFARE, measured at the SMSA level as total welfare expenditures per capita, and UNEMPLOY, the percentage of population that is unemployed (also measured at the SMSA level.) While these variables are designed to measure poverty and thus were initially expected to influence prices negatively, both usually have positive coefficients, and at least those for UNEMPLOY are highly significant. The positive effects of these variables may indicate a high degree of cross-subsidization of uninsured patients by those who are covered by insurance. The poor population is likely to be sicker when they enter a hospital, since they generally have less access to medical care and therefore may be more costly to treat. If this effect were important, however, significantly positive coefficients would obtain in the expense regressions as well. This is not the case.

A less healthy population demands more hospital care, all else constant. Various proxies have been used in other studies to measure health status, such as percentage of the

population above a certain age, percentage female, and environmental factors. This study uses the percentage of the population that is caucasian (WHITE) which has the expected negative effect on price (significant only at the SMSA level, however), and the death rate (DEATHS) which is generally insignificant (but also strangely negative.)

Cost Variables

Since the hospital industry is heavily labor intensive, hospital wages are clearly an important cost. Two alternative specifications of a wage variable were tried in the regressions. First, results are reported that use a variable measuring the average wage paid by the hospital (or in the SMSA.)[123] Since the hospital labor market is probably national, local wage rates should be exogenous. As expected the effect on both prices and expenses of this measure is positive and highly significant. Alternatively, since an average wage measure is affected by the mix of employees at a hospital or SMSA, the measured average wage may be endogenous since it may reflect quality competition. Therefore a measure of service industry wages in the SMSA was substituted. The results using this variable are very similar, albeit less significant for the wage variable itself, so only the results using the hospital wage are reported.

Numerous studies have produced conflicting results regarding the minimum efficient scale and the existence of economies of scale in hospitals. Average hospital size has grown over time, suggesting that changes in technology have increased the MES. Recent studies suggest about 150-200 beds to be the minimum.[124] The existence of economies of

[123] Since physicians are not on hospital salary generally, this variable does not reflect physician costs.

[124] Salkever (1978) at 194 and P. Feldstein (1979) at 185.

scale has never been well documented; most work suggests that some diseconomies set in after about 300 beds, but the cost curve is in general fairly flat.[125] The problem with many of the cost studies is the difficulty in controlling for case mix. Since larger hospitals attract more complex cases, their costs are likely to be higher. This does not imply that they are less efficient, however.

A variable measuring the number of beds in the hospital (SIZE) is used to measure either the effects of any economies of scale or of more complex case mix. It has a negative, albeit mostly insignificant, effect in the price regressions suggesting that some slight economies of scale may exist. In the expense regressions, the coefficients are positive, significantly so in the SMSA level expense regression. While SIZE itself is insignificant in the hospital level expense regressions, RSIZE is significantly positive. These coefficients suggest that case mix is not completely held constant in the aggregate expense data, and that relatively larger hospitals treat a more complex and costly case mix, the effect of which more than offsets any economies of scale. RSIZE also has a positive effect in the price regressions, again suggesting that relatively larger hospitals may offer a higher quality service and/or have some local market power due to their favorable reputation.[126]

Several studies have shown that hospitals affiliated with medical and/or nursing schools have higher costs. This occurs, it is alleged, because of the necessary subsidization of training costs by the hospital. However, as Hadley (1983) notes, according to Gary Becker's model of generalized on-the-job training, the student should bear the cost. A

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[125] For example, Barocci, at 108.

[126] Initially a size-squared term was also included to measure the effects of a non-linear cost function. It was either insignificant or negative (suggesting an upside-down U shaped cost function), and its omission changed none of the results.

recent study by Sloan, Feldman, and Steinwald (1983) showed that after accounting for case mix differences and incorporating payments to physicians, the cost difference between teaching and non-teaching hospitals is slight.[127] Another reason that measured costs in teaching hospitals may exceed those in non-teaching institutions is the different ways physician inputs are measured in the two set-ups. In non-teaching hospitals, physicians bill separately (from the general hospital bill) for their services. In teaching hospitals, residents are salaried and appear as a hospital expense. Thus, while the physician costs to patients may be lower in teaching hospitals, the hospital bill may appear higher.

In the SMSA level regressions, COTH measures the proportion of all hospital beds in the SMSA in hospitals that belong to the Council of Teaching Hospitals, a group of most hospitals with substantial teaching responsibilities.[128] At the individual hospital level COTH is measured as a simple dummy variable indicating membership in COTH for a particular hospital. It has a strong positive effect on prices and expenses at both levels, suggesting that the latter hypothesis is valid.

The occupancy rate of a hospital should negatively influence costs since at least some hospital costs are fixed. AOCC is measured as the SMSA-average occupancy rate in the SMSA level regressions and as the individual hospital's occupancy rate in the individual hospital regressions. Both expense per admission and price show the expected negative coefficients. In all cases, the coefficients are negative, significantly so, particularly at the individual hospital level. The SMSA level regressions cannot control for a particular

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[127] Using a dummy variable to indicate school-affiliated hospitals may be one way to account for otherwise unmeasured case mix differences.

[128] This group does not include all hospitals that are affiliated with medical schools.

ospital's occupancy relative to the average which may eflect local market power. Therefore, it is not surprising hat the estimated results at the SMSA level are weaker, ince they incorporate the offsetting effect. If price ompetition were strong, occupancy rates might be expected o affect prices positively since they are negatively related to excess capacity. These results, however, confirm those of Joskow (1980) who posited that excess capacity was one quality dimension on which hospitals compete.[129]

A dummy variable for hospitals located in SMSAs with population of greater than one million (**POPDUM**) is used to measure the effects of the more complicated case mix generally found in large urban hospitals. Such a control is particularly important in the expense regressions where the data are aggregated across disease categories. As expected, this variable has a uniformly positive and generally significant coefficient.

Also included in the expense regressions is a variable measuring the ratio of births to admissions (**BIRTHR**). This variable controls for case-mix. Since the average cost of a delivery stay is low relative to average hospital visits, its expected (and actual) effect is negative. It is not included in the price regressions since they concern individual disease categories.

Finally, we include one variable which is probably not entirely endogenous, but which is too important to exclude. Average length of stay (**ALS**), calculated for each particular disease category within each SMSA, shows a strongly significant and positive effect on price. Each additional day of stay adds from $130 to $230 to the price in the individual

[129] Joskow (1981) suggests that one important quality dimension on which hospitals engage in costly competition is on excess capacity which reduces the probability of bed shortage. He finds that in less concentrated hospital markets, occupancy rates are lower. This could also imply simple excess capacity due to a greater supply relative to prevailing demand, however.

hospital regressions. While length of stay can partially be controlled by the physician, it presumably also measures important case mix differences that we have been unable to account for in other ways. Therefore it seems necessary to include it.[130] As expected, ALS also has a positive effect on expense per admission since longer stays add to the total cost of an admission.

[130] Its omission from the regressions did not change the results significantly although the total explanatory power was reduced.

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