PRICES AND CONCENTRATION IN HOSPITAL MARKETS

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TABLE OF CONTENTS

Chapter Page

LIST OF TABLES

Table | Page

Table		Page

LIST OF FIGURES

CHAPTER I

INTRODUCTION

A Brief History of Health Expenditures in the U.S.

Americans are spending an increasing proportion of their incomes on health expenditures. As shown in Figure 1 in Appendix B, health expenditures were only 5.2 percent of gross domestic product (GDP) in 1960. By 1987, health expenditures had increased to 11 percent of GDP. During the same twenty seven year period, healthcare costs in the U.S. have continually increased, as shown in Figure 2. The lowest rate of growth in medical costs for any year in that period was the 1 percent increase in 1963. The highest rate of growth in medical costs for any year in that period was approximately 11.3 percent in 1981. More importantly, for every year for the past fifteen years, medical costs have risen at a rate greater than the general inflation rate. In 1987, medical costs rose at a rate that was nearly twice that of the inflation rate. The continually rising cost of medical care in the United States has made it increasingly difficult for individuals to afford medical care. Approximately 36 million Americans, 15 percent of the population, had no health insurance in 1991 (Thompson (1992) p.18). Policymakers must make new policies or modify old policies to assure that healthcare is affordable to the average American.

The Role of Competition in Determining Hospital Charges

Policymakers need to understand how hospital markets operate in order to reduce the rate of growth of hospital costs. In particular, it's important for them to know how hospitals react to competition. On one hand, competition could reduce hospital charges to marginal cost making consumers better off. In this case, vigorous enforcement of antitrust in hospital markets by the Federal Trade Commission and the Justice Department would be likely to promote social welfare. On the other hand, hospitals may react to competition in a way that does not enhance consumer welfare. For example, insurance companies pay a large portion of patients' bills. Therefore, patients have a tendency to be sensitive to the quality element of a particular service and insensitive to the price element of a particular service. The end result is that competition among hospitals would actually increase quality and increase prices. If this is the case, the antitrust authorities may want to develop new policies for dealing with hospital markets.

This paper explores the relationship between market structure and performance in hospital markets to determine which of the above descriptions best characterizes the way these markets work. The goal of this study is to provide valuable information to policymakers, judges, and others who deal with antitrust and regulatory matters involving hospitals.

Overview

This overview outlines the plan of attack for providing evidence on the relationship between competition and hospital charges. The dissertation begins with the theoretical foundations of the relationship between market structure and performance. In this chapter, arguments are made for using hospital prices rather than other variables as measures of performance. Probably the strongest argument for using prices rather than some measure of profitability is that there is strong evidence that costs do not remain constant over different levels of market concentration. Thus, a firm in a highly concentrated market may be charging high prices and imposing a cost on society, but may actually have low profits if costs are positively related to concentration, e.g. if strong X-inefficiency exists. Chapter II also outlines the different views on the relationship between hospital prices and concentration. Unlike most industries, many economists believe that there is a negative relationship between hospital market concentration and prices.

Chapter III presents the model in Noether (1987) that examines the relationship between hospital prices and concentration. The analysis presented here makes several changes to this model. First, this dissertation focuses on California rather than the whole U.S. In the 80's, the Reagan administration delegated many regulatory responsibilities to the states that was previously held by the Federal government. As a result, states have adopted a variety of policies to deal with the rising cost of medical care. Some states (Massachusetts for example), have taken considerable authority over hospitals' pricing. California, on the other hand, has embraced a market mechanism for reducing hospital costs, making it a suitable subject for this study. Second, this dissertation uses a geographic market definition as opposed to the S.M.S.A. market definition used by Noether. This definition depends upon the flow of hospital patients from various zip codes. Therefore, the hospital markets can be quite small, as they tend to be for vaginal deliveries, or quite large, as they tend to be for kidney transplants. Third, this study uses data that are superior to those used by Noether. Noether used the MEDPAR data file, a 20 percent sample of all Medicare reimbursements. The prices that Medicare pays are no longer market determined since the Health Care Financing Administration's adoption of the prospective payment system. Thus the MEDPAR data are no longer appropriate for a price concentration study. However, the California Office of Statewide Health Planning and Development (OSHPD) records a large amount of detailed patient data that can be acquired by researchers. Unlike the MEDPAR data set which is derived from a 20 percent sample of Medicare payments, the California data set includes details from virtually all of the approximately 3 million discharges from California hospitals (Patient (1986) p.14). The OSHPD data set is also superior to the MEDPAR data set since there may be discrepancies between the prices hospitals charge to Medicare and those charged to the general public.

Chapter IV reports the regression results, which tend to support the Maw Lin Lee Hypothesis (1971) that non-profit hospital managers seek higher status through improving quality of their hospitals. The higher level of quality, however, increases costs which drives up hospital prices. The end result is that higher competition results in increased hospital prices as hospital managers attempt to improve the status of their hospitals. The negative relationship between prices and concentration only holds true for some of the non-profit hospitals' markets.

On the other hand, a positive relationship between prices and concentration exists for many of the for-profit hospitals' markets and some of the non-profit hospitals' markets. In addition, there is a tendency for for-profit hospitals to charge higher prices than non-profit hospitals and for government hospitals to charge lower prices than non-profit hospitals. It is also found that hospitals that are members of a system are inclined to charge higher prices than non-system members, either signifying that system membership aids collusive activities, or that system members have a higher level of quality which stimulates demand.

These results concerning market concentration certainly differ from the norm in most industries. However, as the upcoming pages demonstrate, the hospital industry is not a normal industry. Therefore, a careful study is necessary to determine the relationship between market structure and performance in the hospital industry.

CHAPTER II

LITERATURE REVIEW

Theoretical Background

Economists have studied the relationship between market structure and performance for many years. In 1838 Augustin Cournot developed his famous model of oligopoly behavior. He assumed that each firm believed that its competitors' output decision would not change in response to its own output decision. The end result was that the prices and the profits of firms in a market were inversely related to the number of competitors. Over one hundred years later, George Stigler (1964) hypothesized that as the number of firms in an industry increased, it became more difficult for the conspiring firms to detect cheating. Therefore, as the number of firms in an oligopoly increased, the ability of firms to raise price above the competitive level diminished. Thus the theories developed in the past have provided an empirical question to be answered: Does market structure affect performance?

Measures of Structure and Performance

Researchers have used a number of measures of structure and performance. Market structure deals with the competitiveness of a market and is typically represented in empirical studies by factors that facilitate collusion. Such factors include: the concentration of the market, barriers to entry, and buyer concentration (Carlton (1989) pp.368-370). One of the most common measures of market structure is the four-firm concentration ratio which sums the market shares of the four largest firms in an industry. Another commonly used measure of concentration is the Herfindahl-Hirschman index (HHI) which is the sum of the squared market shares of all firms in the market. The HHI is the foundation of current Justice Department and Federal Trade Commission rules for the evaluation of mergers. Market performance, on the other hand, refers to the outcome of the competitive process. Measures of profitability (e.g. rates of return and price-cost margins) or the separate components of profits such as prices and expenditures are common measures of performance.

While the theories of Cournot and Stigler predict a positive relationship between profits and concentration, there may be other market factors that tend to weaken this relationship and make other measures of market performance superior to profitability (Weiss(1989)). In some cases, firms may be restricting output and imposing a cost on society, yet at the same time show no extraordinary profits. Richard Posner pointed out that, at the margin, a firm would be willing to pay the amount equal to the expected monopoly profits to receive the monopoly rents. He assumed that "competition to obtain a monopoly results in the transformation of expected monopoly profits into social costs." (Posner,1975,p.807) Thus economic profits could be dissipated in an attempt to gain monopoly profits.

X-inefficiency is another way that the positive relationship between profits and concentration can be weakened. Market power may lead to inefficiency, an increase in costs and a reduction in profits (Comanor(1968)). In addition, Karier proposed that firms that have market power may share the profits with unions (1985). Thus price may be a better measure of performance than profitability due to the real possibility that firms' costs may rise with concentration. Werden came to a similar conclusion:

> It is important to appreciate that the studies in this category [price concentration] are quite different from, and far more reliable than, the traditional profits or price-cost margins studies. One important distinction is that price generally is the better performance measure. The critical policy question is whether higher concentration leads to lower welfare. Price is a reasonable measure of welfare in many cases. Profits or price-cost margins could be used in lieu of prices if concentration were unrelated to cost, but there are many strains of literature suggesting that such is not be [sic] the case (Werden (1991) p.6)

The vague relationship between cost and concentration makes price a superior measure of performance relative to profitability. Most of the published price-concentration studies have found a positive relationship between concentration and price. For a thorough review of many price-concentration studies in a number of industries, see Concentration and Price (1989) by Leonard Weiss.

Price and Concentration in the Hospital Market

Arguments for a Negative Relationship Between Price and Concentration

The hospital industry, however, may well be an exception to the price concentration relationship that is observed in other industries. Many economists believe that competition in the hospital industry can be characterized by quality competition rather than price competition due to the peculiar nature of hospital markets. In the hospital industry, the primary payer is not the consumer, but third parties such as insurance companies and Medicare. Approximately 90 percent of the hospital bills in the U.S. are paid by third parties (Noether (1987) p.7). Therefore the consumers of hospital care may be relatively insensitive to the charges of the hospital but sensitive to the quality of care. Salkever concurs with this conclusion:

> ...competition among hospitals is based primarily upon the availability and sophistication of services and facilities rather than price. This lack of price competition is most frequently explained by the current structure of insurance arrangements (Salkever (1979) p.201).

Since insurance pays a portion of the hospital bill, the price elasticity of hospital services may be low. Another factor which may weaken consumers' sensitivity to hospital prices is the fact that physicians, instead of the consumers, generally choose the hospital. Thus, consumers of hospital services may not be directly sensitive to the prices that hospitals charge.

In addition, hospital markets are peculiar because they are dominated by non-profit firms. Lee (1971) assumed that hospital administrators maximize their own utility by increasing the status of their hospital relative to other hospitals. The status of a hospital depends on the breadth of services offered and the level of specialized equipment and staff available to doctors. (Lee assumed that the research-teaching hospitals occupy the highest status level since they tend to adopt new medical technology the quickest.) Thus, competition among hospitals for higher status drives up hospital costs and prices. If quality competition is the dominant type of competition, then an increase in competition may actually increase prices and costs. Hospitals would compete by providing more attractive surroundings and modern, up to date equipment. Therefore a negative relationship between price and concentration may exist in the hospital market.

Arguments for a Positive Relationship Between Prices and Concentration.

On the other hand, competition in hospital markets may reduce hospital charges. For-profit hospitals are becoming a major provider of health care services. In 1986 approximately 30 percent of the hospitals in California were for-profit hospitals. If these hospitals are price competitors, then competition should improve the welfare of the community.

In addition competition among non-profit hospitals may enhance the welfare of the community. Non-profit hospitals have been thought of as physicians' "clubs". Pauly and Redisch (1973) hypothesized that hospitals attempt to maximize the incomes of the physicians since physicians are the ones who control the hospital. The price of hospital services would be set so that the hospital breaks even and any residual would be gained by the physicians. Competition among hospitals in this instance leads to competition among groups of doctors and reduces the total hospital bill (which includes both physicians' fees and hospital charges), while the costs of hospital charges are unaffected by competition.

Recent changes in the environment of hospitals may make them more sensitive to costs and also more prone to compete with each other on the basis of price. Some states have adopted legislation that would promote price competition. California, for instance, passed legislation in 1981 that attempted to accomplish this goal. The legislation required the State to negotiate prepaid contracts with hospitals for Medi-Cal patients. In addition, private insurance companies were allowed to negotiate with hospitals to provide health care on a preferred provider basis.(Melia (1983) p.789) Thus a positive relationship among concentration and prices may exist.

The Empirical Evidence

There are a number of empirical studies that may help answer the question as to the relationship between concentration and prices in hospital markets. Wilson and Jadlow (1982) found evidence to support a positive relationship between price and concentration. Their study shows that higher levels of competition tends to reduce efficiency. They hypothesiz that competition results in the excessive purchasing of equipment and services which reduces the efficiency of hospitals. Robinson and Luft (1987), using 1972 data, find that hospitals in more competitive markets have higher average cost per admission and per patient day than hospitals in less competitive markets. They did a similar study using 1982 data and find similar results. In addition to these studies a number of price studies have also been done. Kopit and McCann (1988) mention two such unpublished studies by Eisenstadt and Klass. In the first study, they show that there is no difference in the rate of hospital price increases between markets that have experienced mergers and similar markets that have not experienced mergers (Eisenstadt (1988a)). In another study, Eisenstadt and Klass find that concentration does not affect hospital price or quality (Eisenstadt (1988b)). Noether (1987) studied not only the effects of concentration on price, but also on costs. She finds that higher levels of market concentration reduce a hospital's level of costs (a proxy for quality) and have no effect upon a hospital's prices. She concludes that:

> 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.(Noether 81)

Since her study shows that price is unaffected by a decrease in competition, and the level of quality is reduced by a decrease in competition, she concludes that price competition exists in the hospital industry.

Thus the empirical evidence for the effect of concentration on the hospital industry is at an unresolved phase. On the one hand if Noether and the Federal

Trade Commission are correct, hospitals are primarily price competitors. Therefore hospital mergers should come under tight scrutiny. If, on the other hand, Eisenstadt and Klass are correct, market concentration does not play much of a role in determining the prices that hospitals charge. It is even possible that competition may reduce society's welfare by increasing hospital costs as shown by Robinson and Luft. It is this lack of consitency in empirical evidence which caused Judge Richard Posner to express his concern about the uncertainty pertaining to the relationship between hospital competition and society's welfare:

> We would like to see more effort put into studying the actual effect of concentration on price in the hospital industry as in other industries...unfortunately this literature is at an early and inconclusive stage, and the government is not required to await the maturation of the relevant scholarship in order to establish a prima facia case (United States v. Rockford Memorial).

Hopefully the study presented here will shed some new light on this very important issue.

CHAPTER III

AN EXTENSION OF NOETHER'S MODEL

Noether's Model

Noether assumes there are three categories of variables that affect the quantity demanded (X^d) of hospital services. They are: price (P), quality (q), and a vector of exogenous demand properties (M) such as income (Noether 15).

(1) $X^d = f(P,q,M)$

where $X^d_P < 0$

$X^d_q > 0$

$X^d_M > 0.$

The quantity supplied (X^s) is affected by price and costs. Costs are a function (h) of output (x), quality (q), and exogenous factor costs (N). Quantity supplied and quality are determined by concentration (C) (Noether (1987) 16).

(2) $X^s = g(P,h(q(C),N),C)$

Where:

$X^s_P = \partial g/\partial P > 0$

$X^s_q = \partial g/\partial h \cdot \partial h/\partial q < 0$

$X^s_N = \partial g/\partial h \cdot \partial h/\partial N < 0$

$X^s_C = \partial g/\partial C + \partial g/\partial h \cdot \partial h/\partial q \cdot \partial q/\partial C$? 0

Since:

$\partial g/\partial h < 0$

$\partial h/\partial q > 0$

$\partial q/\partial C < 0$

$\partial g/\partial C < 0$

$\partial h/\partial N > 0$

Note that an increase in quality tends to reduce supply. An increase in quality also increases costs, which reduces the supply of hospital services, ceteris paribus. The sign of the partial derivative of the quantity supplied with respect to structure is uncertain because it is not known which effect is larger--an increase in concentration tends to reduce output due to the exercise of market power, while an increase in concentration tends to reduce quality which reduces costs and increases supply. A reduced form equation for price can be obtained by equating the supply and demand equations (Noether (1987) p.17). Therefore hospital prices are a function, j, of quality, demand factors, exogenous costs, and concentration.

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

Where $P_q > 0$

$P_M > 0$

$P_N > 0$

P_C ? 0

The derivative of price with respect to concentration is uncertain, since the effects of concentration on price and quality competition work against one another.

In this study, regressions were run on Noether's price equation at the hospital level. If both quality and price competition exist, then the effect of concentration on price is a vague one. Thus the coefficient of concentration in the price regression could be positive, negative, or not significant. It should be positive if price competition is the dominant effect or negative if quality competition is the dominant effect. In the case of insignificance either the price competition and quality competition cancel each other out, or concentration actually plays no role in determining price, i.e. if the wrong **product** market definition is used.

The Data

While Noether's study used data from a nationwide sample of medicare bills in 1977-78 (the MEDPAR file), this study uses California data for all hospital discharges. MEDPAR is a data set that is maintained by the Health Care Financing Administration. It is a 20 percent sample of all Medicare reimbursements (Wennberg (1980) p.48). The prices that Medicare is willing to pay are no longer determined by a market mechanism due to the Health Care Financing Administration's adoption of the prospective payment system. Thus the MEDPAR data are no longer appropriate for a price concentration study. However, the California Office of Statewide Health Planning and Development (OSHPD) records a large amount of detailed patient data that can be acquired by researchers. Unlike the MEDPAR data set which is derived from a 20 percent sample, the California data set includes details from virtually all of the approximately 3 million discharges from California hospitals (Patient (1986) p.14). The data set contains information that is very helpful in this study: the hospital facility where the discharge took place, the zip code of the patient's residence, the average length of stay, the diagnosis related group, the expected principal source of payment, and the total market determined charges for all services rendered during the patient's hospital stay. Thus the California data set from OSHPD, which includes information from almost all discharges from California hospitals, allows a more detailed analysis than Noether's price and concentration study that used only a 20 percent sample of Medicare reimbursements. In addition, it is worth noting that the California data set includes market determined charges, rather than Medicare charges. In this way, this study avoids any problem that may arise from any discrepancy that may occur between Medicare charges and total hospital charges. This aspect of the proposed study certainly is an improvement over Noether's study.

The Dependent Variables

Hospitals offer a number of services, thus it may be impossible to determine "the" price that hospitals charge. While some studies have found the price charged by a hospital by dividing inpatient revenues by number of admissions (e.g. D. Dranove), such a method could suffer from severe case mix problems if applied to a price concentration study. For instance, if hospitals located in cities do more complicated types of surgery than rural hospitals and urban hospitals tend to be in less concentrated markets, then the effect of concentration on price may have been reduced because the case mix problem has been ignored. Noether addresses the case mix problem on the left hand side of the equation by studying the prices of a number of "disease categories" such as diabetes mellitus, cataract surgery, and prostate surgery (Noether (1987) p.2). She then makes adjustments on the right hand side of the equation to take into account the degree of complexity within a disease category. This study makes similar adjustments for variations in case mix. Disease categories in this study are defined by diagnosis related group (DRG). DRGs were initially used by Medicare for reimbursement purposes, but have now become common place in other organizations, such as private insurance companies and health maintenance organizations. "The DRGs were developed as a patient classification scheme consisting of classes of patients who were similar clinically and in terms of their consumption of hospital resources" (Diagnosis (1990) p.3). After the product aspect of the market is defined, it is necessary to define the area of the market.

The Independent Variables

Market Structure

As in Noether's study, concentration is measured by the HHI. However, unlike Noether's study, the market areas are defined by a patient flow approach, rather than standard metropolitan statistical area (SMSA). While the SMSA is a convenient measure for a market definition, it has several drawbacks. First, there is no reason to suppose that a hospital's market coincides with the boundaries of an SMSA. Second, not all community hospitals are located in SMSAs. Only about 50 percent of all community hospitals are located in SMSAs (Noether (1987) p.268). Thus if the SMSA definition is used, valuable information would not be used. Third, the SMSA market definition ignores patient travel.

The patient flow approach does not depend strictly upon boundaries, but upon the location of the patients' homes for the determination of the geographic market. The patient flow market definition therefore takes into account the patients' travel, e.g. if a large regional hospital attracts patients from many counties around its SMSA, then the patient flow definition will place the hospitals in the neighboring counties as competitors. Morrisey et al. (1988) show that traveling distances can be quite large. They apply the Elzinga and Hogarty (1973) approach, a method that is very similar to the one that is applied in this study, and find that Nebraska hospital markets on average "encompassed six counties...and contained sixteen hospitals" (Morrisey (1988) 190). The patient origin approach has been used in a number of antitrust cases: U.S. vs. Rockford Memorial Corporation, American Medical International and Hospital Corporation of America (Baker (1988) 146-147).

Garnick, Luft, Robinson and Tetreault (1987) propose a patient flow method for defining hospital geographic markets based upon two indices that are used in the hospital planning literature. The "relevance index" is the percent of all patients from an area which go to the "study" hospital. The "commitment index" is the percent of the "study" hospital's patients which come from a particular area (Griffith 76). Both the relevance and the commitment indices are reported by OSHPD. The Garnick et al. approach is executed in the following steps:

> 1.Each hospital's initial market is defined by choosing the zip codes "in turn until 60 percent of the hospital's total admissions are included." For instance, if 40 percent of a hospital's patients come from one zip code, "15 percent from another, 10 percent from another, and 5 percent from seven more", the first three zip codes are included in the initial market.
>
> 2."....other hospitals are counted as competitors if they admit at least 5 percent of all the patients in any of the" zip codes included in the initial market.
> (Garnick (1987) p.76)

Thus, step 1 ranks the commitment indices from largest to smallest. Those zip codes with the largest commitment indices which sum to .6 are included in the hospital's initial market. Step 2 applies the relevance index to determine the competitors in the initial market. If a hospital has at least 5 percent of the patients from any of the zip codes included in the list of zip codes in the initial market, it is included as a competitor.

A brief example would be helpful to demonstrate the Garnick approach. The following example defines the market for the California Medical Center (CMC), and uses actual data for DRG 373, vaginal delivery without complications. Table I in Appendix A reports the commitment indices for CMC. This table describes where CMC gets most of its patients. CMC gets the the largest proportion (9.62 percent) of its patients from zip code 90011, which is contiguous to the southern boundary of its own zip code, 90015. These zip codes, as well as the location of CMC, are shown in Figure 1, a map of Los Angeles zip codes. Zip code 90006 is the second largest source of vaginal delivery patients for CMC, supplying 6.4 percent of its patients. This zip code is contiguous to the western boundary of CMC's own zip code, 90015. The initial market is defined as those zip codes with the largest commitment indices which sum to 60 percent. In this example the initial market is composed of those zip codes listed in Table I. In addition, those zip codes (with the exception of zip code 90020, which is outside the city of Los Angeles) are shown as the shaded area in Figure 3.

The next step in the Garnick approach was to compute the relevance index. Those hospitals who have at least 5 percent of the patients from any of the zip codes in CMC's initial market (i.e. those hospitals that have a relevance index greater than .05) are included as competitors of CMC. These competitors are listed in Table II and are shown in Figure 3. The largest relevance index of any competitor belongs to Los Angeles County Martin Luther King Drew Medical Center (MLK). MLK has 41 percent of the vaginal delivery patients that come from zip code 90003. Zip code 90003 touches the north west corner of MLK's own zip code, 90059. Since MLK has 41 percent of the patients who live in a zip code which is a member of CMC's initial market, MLK is considered a competitor of CMC.

It is interesting to note that the Garnick approach reveals a market that is considerably different from the SMSA, which defines the market in Noether's study. The <u>Count and City Data Book</u> reports that the Los Angeles SMSA has a total of 45 hospitals with 11,075 beds. CMC's market for vaginal deliveries consists of only 12 hospitals and a total of 5,574 beds. Thus it appears that, in most cases, women are not willing to travel great distances to have their babies delivered. The average initial market for vaginal deliveries is composed of only

7.16 zip codes. In fact, 51 percent of the vaginal delivery markets are composed of one to five zip codes, as shown in Figure 4.

To place these figures in perspective, it would be interesting to compare the vaginal delivery markets to more complicated treatment markets. For example, the average size of the coronary bypass initial market is 9 zip codes and 35 percent of the markets are composed of six to ten zip codes, as shown in Figure 5. Only 21.9 percent of the vaginal delivery markets are composed of six to ten zip codes. Over 10 percent of the coronary bypass markets are composed of twenty one or more zip codes, while less than 5 percent of the vaginal delivery markets are composed of more than twenty one zip codes. The largest computed initial market consists of 70 zip codes for DRG 209, joint and limb reattachment. The largest initial vaginal delivery market consists of only 43 zip codes. Thus it appears that individuals are willing to travel much further for more complicated treatments, like coronary bypasses and joint and limb reattachments. The advantage of the Garnick approach, as well as any geographic market definition, is that it will adjust the market size according to individuals' willingness to travel.

After the markets are determined, each hospital's share of its market is calculated. The American Hospital Association's (AHA) Guide to the Health Care Field provides data on the number of hospital beds per hospital. Beds, rather than actual patient visits, are used to determine market share to take into account a hospital's capacity and also to avoid simultaneity. The market share of each competitor in the geographic market is squared and summed to compute the HHI. A dummy variable is included for those hospitals that have a high level of concentration in case there is some threshold level of concentration that is significant (Noether (1987) p.23).

<u>Ownership Variables</u>

Other variables besides the HHI play a role in the model. A variable for-profit and non-profit hospitals is included (Noether (1987) p.24). The AHA classifies hospitals under several categories of control: government (nonfederal), nongovernment not-for-profit, investor owned (for-profit), government (federal), and osteopathic (some of which were also categorized as for-profit hospitals). Investor owned and the for-profit osteopathic hospitals are given a dummy variable of 1. The other government and nongovernment, non-profit hospitals are given a dummy variable of 0. The coefficient for hospital control can take on a number of signs. For-profit hospitals can reduce physician control of prices. If a hospital is controlled by physicians, the hospital would charge a price equal to marginal cost, so that monopoly rents would accrue to the physicians. Outside investors in a for profit hospital, however, would not allow this pricing to occur. Thus prices at investor owned hospitals may be higher than non-profit hospitals, even though the total bill (including both hospital and physicians' fees) to patients may be the same. If, however, for-profit hospitals are more efficient than non-profit hospitals then the coefficient should be negative (Noether (1987) pp. 24-31). Public hospitals may also play a role in determining hospitals' prices. Government hospitals provide health care mainly for indigent and non-insured patients. Thus the share of beds controlled by government hospitals should reduce the amount of cross subsidization that other hospitals in the area do. In other words, hospitals in markets with a large presence of government hospitals may not have to subsidize non-paying patients by raising insured patients' bills (Noether (1987) pp.33).

Whether or not a hospital is a member of a system may also play a role in the determination of hospital prices. Hospital systems may provide the hospital with cheaper capital or may be more efficient. A dummy variable for the membership in a system is included. These data are from the AHA Guide to the Health Care Field. In such a case the coefficient in the price regression should be negative. On the other hand, being a part of a system may aid collusive activity. In such a case, the coefficient for membership should be positive in the price regression. (Noether (1987) p.32).

Demand Variables

The level of per capita income should play a role in determining demand, therefore it should play a significant role in determining price (Noether (1987) p.89). Areas with higher levels of income should have higher levels of demand for hospital services, and therefore higher prices, ceteris paribus. Alternatively, higher incomes may imply better health, a lower demand for hospital care, and lower hospital prices. Data on per capita income at the county level from 1984 are from the most recent County and City Data Book from 1988. Thus, the hospital market is assigned the level of per capita income that exists in the hospital's county.

Population density should have two roles in the model that have an opposite effect on hospital demand (Noether (1987) p.90). First, higher population density should lead to a reduction in travel time, an increase in outpatient care, and a reduction in hospitalization. Second, urban area hospitals tend to attract more complicated cases than rural hospitals. Although the rate of hospitalization may be lower for urban hospitals due to the first effect, the length of stay may be longer due to the second. Therefore, the effect of population density on price depends on which effect is stronger. Population density data at the city and county level from 1986 are available from the 1988 County and City Data Book.

The health of the population also determines the demand for hospital services (Noether (1987) 92). Noether uses the percent of the population that is Caucasian as a measure of the health of the general population. In addition, the current study includes the percent of the population that is elderly. The data are at the city and county level from the 1988 County and City Data Book.

Cost Variables

The hospital industry is fairly labor intensive, thus labor costs should be a large part of total costs (Noether (1987) p.92). The present study uses an estimate of the average service salary to take into account regional differences in salary. The data are are from the 1988 County and City Data Book.

If any economies of scale or differences in the complexity of case mix exists, then the size (i.e. the number of beds) of the hospital would be an important variable in the model (Noether (1987) p.93). If economies of scale exist, then the coefficient of size would have a negative effect on prices. If the case mix problem has not been entirely eliminated, then the coefficient for size may have a positive value. The positive sign would thus be a result of larger hospitals treating more complicated cases and incurring higher costs. Hospital bed size data are from the AHA Guide to the Health Care Field.

Teaching hospitals may also tend to have higher costs than other hospitals (Noether (1987) 94). Teaching hospitals may subsidize the training of doctors and nurses. Hospitals are given a dummy variable indicating affiliation with Council of Teaching Hospitals. The data are from the AHA Guide to the Health Care Field.

In addition, a dummy variable is added for those cities that have populations greater than 300,000. (Noether's nationwide study used a dummy variable for those cities with populations greater than one million.) This variable is used to adjust for any case mix problem that might occur. Hospitals in larger cities may treat more complicated cases (Noether (1987) p.95). Also, the average length of stay (ALS), calculated by disease category, is included to adjust for any case mix problems (Noether (1987) p.95). Length of stay by disease category is included in the California data set. Individuals with more complicated cases may need more time in the hospital and may therefore incur higher costs and prices.

A variable is also included which measures the diversification of the hospital (DIV). DIV is defined as the percent of all of the hospital's patients which are treated for a particular DRG. Thus, if we are studying DRG 373, vaginal delivery without complications, then DIV would be the number of vaginal deliveries divided by the number of all cases treated at that particular hospital. If there are economies of scale from treating many patients for a particular DRG, the sign of this coefficient should be negative. If, on the other hand, consumers perceive higher quality at hospitals which specialize in a particular treatment, the demand for services at these hospitals which have a high DIV would also be higher, and the prices they charge would be higher than hospitals with a lower DIV. Therefore there could be a positive relationship between DIV and hospital charges.

Summary

The above discussion is summarized by Table III and the following equation:

$$(4) \qquad P = \alpha_1 + \alpha_2(HHI) + \alpha_3(OLD) + \alpha_4(FP) + \alpha_5(GOV) + \alpha_6(SGOV) + \alpha_7(MHS) + \alpha_8(PCY) + \alpha_9(WHITE) + \alpha_{10}(DENS) + \alpha_{11}(WAGES) + \alpha_{12}(COTH) + \alpha_{13}(SIZE) + \alpha_{14}(POPDUM) + \alpha_{15}(ALS) + \alpha_{16}(DIV)$$

The regression results of equation (4) are reported in Chapter 4.

Improvements to Noether's Study

While the study presented here is by no means flawless, it does offer some improvements over Noether's 1987 price-concentration study. First, her study uses data from 1977. The hospitals' environment has changed much in the past fifteen years. Legislation has been passed in some states, like California, to increase the level of price competition. For instance, "the [California] legislature [has] voted to authorize both the government and private insurance companies to negotiate prepaid contracts with hospitals and providers..." (Melia (1983) p.788) Therefore, the current study uses data from 1986, five years after the pro-competitive legislation was passed. Second, the present study uses data that are superior to the MEDPAR file used by Noether. While MEDPAR is a 20 percent sample of Medicare bills, the California data set is composed of all California hospital discharges. Thus this new study avoids any problems that may occur due to discrepancies between Medicare charges and charges in general (e.g. hospitals may try to receive higher payments by imposing higher Medicare charges, or hospitals may price discriminate between Medicare patients and other patients). Third, in antitrust litigation, market definition is one of the most important elements of a case. Yet, Noether's study does not properly define markets. While the SMSA is a convenient definition, it is more than likely an incorrect definition. Therefore, this new study uses a patient flow approach to define the markets. This approach has been applied in a number of antitrust cases involving hospitals. Hopefully the current study will help judges decide the future course of antitrust in the hospital industry. In addition, this study sheds some light on the success of the pro-competitive legislation passed in California.

CHAPTER IV

ECONOMETRIC RESULTS

Overview

Equation (4) is estimated using the ordinary least squares regression technique for 14 diagnosis related groups. These DRGs are listed in Table IV. They represent a variety of hospital treatments, from non complicated vaginal deliveries to cardiac bypass operations. An attempt is made to choose DRGs that vary greatly in complexity and expense so as to explore any differences that may exist between those complicated procedures where markets are inherently large (since there are few hospitals which do such procedures) and simple procedures where markets are local in nature. In addition, separate regressions are estimated for non-profit and for-profit hospitals in order to explore differences in each type's behavior concerning market concentration. Since market concentration is one of the variables that we are most interested in, care is taken to guarantee market determined prices. Therefore, medicare patients, whose charges are determined by Medicare, and health maintenance organization patients, who pay only a fixed amount for a period of time regardless of use, are eliminated from the data. Also, those patients who died in the hospital during the procedure are removed from the data to make the observations more homogeneous. The care taken to guarantee market determined charges, as well as to estimate markets determined by patient flows, have yielded econometric results which differ significantly from Noether's study.

Regression Results

Concentration

Tables V through XVIII in Appendix A contain a summary of the descriptive statistics for the variables in the non-profit hospital regressions. In the non-profit regressions, all of the study DRGs have at least one monopolist, with an HHI equal to one. The lowest reported HHI is .044 for DRG 268, breast implants. The lowest mean of the HHI in the non-profit regressions is .13 for DRG 106, cardiac bypass and the highest mean of the HHI in the non-profit regressions is .54 for DRG 262, breast biopsy.

Tables XIX through XXXII in Appendix A contain a summary of the descriptive statistics for the variables in the for-profit hospital regressions. In the for-profit regressions, there are several DRGs which did not have a monopolist. DRG 36, optical procedures, highest HHI was only .31; while DRG 106, cardiac bypass highest HHI was .58; DRG 116, pacemaker implants highest HHI was .89; and DRG 209, joint and limb reattachment, highest HHI was .70. The lowest HHI computed in the for-profit regression is .050 for DRG 36, optical procedures; DRG 209 joint and limb reattachment;DRG 355, hysterectomy; and DRG 371, cesarean section. The lowest mean of the HHI in the for-profit regressions is .15 for DRG 36, optical procedures and the highest mean of the HHI in the for-profit hospital regressions is .49 for DRG 232, arthroscopy.

Tables XXXIII through XXXV in Appendix A contain the regression results for all of the chosen DRGs for the non-profit hospitals, the for-profit hospitals, and all hospitals (except Kaiser Medical Centers whose charges are omitted by O.S.H.P.D.). In addition, Tables XXXVI and XXXVII contain the results of a Wald test on the previous non-profit and for-profit regressions. The Wald test is a joint hypothesis test which has a null hypothesis that certain coefficients in the model are jointly equal to zero. The coefficients which are equal to zero are represented by a dash. The purpose of the Wald test in this study is to simplify the somewhat cumbersome tables that resulted from twenty-eight regressions. The sign and significance of the variables are similar to the regular regressions.

Table XXXVIII summarizes the signs of the significant coefficients of the HHI. It is interesting to note that all of the significant coefficients for the HHI and most of the non-significant coefficients in the for-profit hospital regressions are positive. This implies that for-profit hospitals in the cesarean section, the hysterectomy and the appendectomy markets will increase their prices of these procedures in the more highly concentrated markets. In other words, competition reduces the ability of these hospitals to raise their prices above marginal cost. This is also true for some of the non-profit hospitals. The coefficient for the HHI is positive and significant for three of the markets, pacemaker implants, arthroscopy, and cesarean section. Thus, non-profit hospitals can and do raise prices in some of the more highly concentrated markets.

However, unlike the for-profit hospital markets, some non-profit hospital markets have a significant negative coefficient for the HHI, in particular major joint and limb reattachment, total mastectomy, and prostatectomy. This implies that in some markets, non-profit hospitals may tend to charge lower prices in more concentrated markets. Remember that this outcome is actually hypothesized by Lee. That is to say, that non-profit hospital managers attempt to increase the status of their hospitals by increasing the quality of their hospitals relative to others in the market. Managers increase the quality of their hospitals by investing in modern facilities. The end result is that more competitive markets have higher costs, and therefore have to charge higher prices than those in less competitive markets. These results are therefore consistent with the Lee's hypothesis on non-profit hospitals.

The changing sign of the coefficient for the HHI in the non-profit regressions is an interesting phenomenon. Possibly, insurance could play an important role in determining the sign of the coefficient. Most insurance policies have two components that the individual pays, the co-payment which is a percentage of the total charge, and a fixed portion called the deductible. The co-payment usually has a cap, i.e. the point that the co-payment does not increase with the cost of a procedure. Thus, patients may be more price sensitive to lower cost procedures because the co-payment increases with hospital charges. On the other hand, with higher cost procedures where costs exceed the cap, the co-payment is fixed. Therefore, the coefficient of the HHI should be positive for the less expensive procedures and negative for the more expensive procedures.

Ranking the non-profit regression coefficients according to average adjusted charges yields Table XXXIX. This table shows that DRG 371, cesarean section and DRG 268 breast implants do have positive HHI coefficients and the lower average adjusted charges. DRG 306, prostatectomy and DRG 209, major joint and limb reattachment have negative HHI coefficients and higher average adjusted charges. However, DRG 116, pacemaker implants has both a positive HHI coefficient and the highest average adjusted charge of any significant HHI coefficient, which goes against the above hypothesis.

Another factor which could determine the sign of the HHI coefficient is the ability of the patient to shop around for a hospital. If the patient has the ability and time to determine the prices for a certain procedure at various hospitals, he or she would be able to choose the hospital with the price and the level of quality that he or she desires. The capability of an individual to search for the proper hospital would certainly depend on the type of procedure performed. If the procedure is elective, such as cosmetic surgery, then the individual should have the time to determine the hospital which best meets his needs. In this case each hospital's demand curve should be relatively elastic, given that the patients have a number of substitute hospitals from which to choose. If, on the other hand, the surgery is required in a short amount of time, such as joint and limb reattachment, then it would be impossible for the individual to ascertain information about the providers of medical care. He or she, in essence, would be unable to determine the subset of hospitals which provide the level of quality and price he or she desires. It is in this situation that the demand for health services would be relatively inelastic, given that there are relatively few substitutes for the patient to choose. Therefore, each hospital would have more leeway in choosing the level of quality and price that it deemed necessary, even if it was a level of quality that the patient did not want.

The econometric results tend to support this hypothesis. DRG 268, breast implant, is many times elective surgery, therefore it is expected that patients would have time to choose a hospital based upon price. The sign of the coefficient of the HHI is positive as expected in the non-profit hospital regression. On the other hand DRG 209, major joint and limb reattachment, is many times a procedure that must be done quickly with little time for the patient to compare hospitals' prices. The coefficient is negative as expected in the non-profit regressions.

It should also be noted that non-profit and for-profit regressions which included four firm concentration ratios for several DRGs: DRG 116, DRG 209 and DRG 232, were executed. These regression results are shown in tables XXXX and XXXXI. For the most part, these regressions yield the same results as the HHI regressions.

In addition, a number of regressions for several DRGs using dummy variables with a variety of threshold values for the HHI were also performed. According to the Merger Guidelines of the Justice Department, mergers will not be challenged if the postmerger HHI is less than .10. If the postmerger HHI is between .10 and .18, the Justice Department (J.D.) will challenge the merger if the HHI has increased by at least .01. If the postmerger HHI exceeds .18, the

J.D. will challenge the merger if the HHI has increased by at least .005. Therefore, a variety of threshold values were used to create the dummy variables for the HHI. If the HHI is greater than the threshold value, the HHI dummy is set equal to one. If the HHI is less than the threshold value, the HHI dummy is set equal to zero.

Tables XXXXII and XXXXIII show the HHI dummy coefficients for both non-profit and for-profit regressions. The smallest threshold value used to form the HHI dummy variable is .10, coinciding with the J.D.'s view that market's with an HHI less than .10 are not concentrated. For the most part, these HHI dummy coefficients with a threshold value of .10 are not statistically significant. Of the fourteen regressions, only one regression, for-profit DRG 36, is significant with a threshold of .10.

In addition, a threshold value of .20 (which corresponds to the J.D.'s .18 boundary in the Guidelines) is used to compute the HHI dummy variables. The HHI dummy coefficient with a threshold value of .20 is positive and significant in three out of fourteen regressions. The coefficients in the non-profit DRG 116 and the for-profit DRG 371 regressions have a positive sign and significance as in the previous regressions which used the HHI instead of the HHI dummy. On the other hand, the HHI dummy coefficient in the non-profit DRG 36 regression is positive and significant. Interestingly, the HHI coefficient computed in the previous regressions which uses the HHI instead of the HHI dummy is not significant at the 10 percent level.

While the .30, .50, and .70 thresholds do not correlate to any of the J.D.'s boundaries for the HHI, it is interesting to note that many of the HHI dummy coefficients are significant. The .30 threshold HHI dummy coefficient is significant in three out of fourteen regressions. The signs of these coefficients are the same as the regular HHI coefficients, positive for non-profit DRG 116 and negative for non-profit DRGs 258 and 306. The .50 threshold HHI dummy coefficient is also significant for three out of fourteen regressions and has the same signs as the standard HHI coefficients reported in tables XXXIII and XXXIV. The .70 threshold HHI dummy coefficient is significant for three out of fourteen regressions. While two of the coefficients of the HHI dummy have the same sign and significance as the HHI coefficient in the standard HHI regressions, one does not. The HHI dummy coefficient in the non-profit DRG 373 regression is positive and significant, while the HHI coefficient in the standard regression is insignificant.

Ownership

Noether hypothesized that hospitals that are members of a system may be able to collude easier than non-system members. If this is the case, the coefficient for the system dummy should be positive, and of course significant. This is indeed the case for many of the DRGs: non-profit DRG 116, pacemaker implants; non-profit and for-profit DRG 232, arthroscopy; non-profit DRG 355, hysterectomy; non-profit DRG 371, cesarean section; and for-profit 373, vaginal delivery. Another element that is consistent with this hypothesis is that in most cases the sign of the HHI coefficient is the same as the sign of the system dummy. This indicates that when price competition dominates quality competition, collusion tends to increase hospital prices. However, when quality competition dominates price competition, collusion actually lowers prices through a reduction in quality and costs. That is to say, if the HHI coefficient is positive, then hospitals in that particular market are primarily price competitors. In this case the effect of price competition would exceed quality competition and there would be a positive relationship between price and concentration. Then, it would make sense that the system dummy coefficient, a measure of collusive ability, should be positive, since hospitals in less competitive markets would charge higher prices. However, if the HHI coefficient is negative, then hospitals in that particular market are primarily quality competitors. The system dummy coefficient should be negative, since hospitals in less competitive markets would have a lower level of quality and therefore lower prices and costs.

In addition, it is interesting to note that in almost all of the regressions, the for-profit dummy variable is positive and significant, which indicates that for-profit hospitals tend to charge higher prices than non-profit hospitals. Therefore, it seems that for-profit hospitals can reduce physician control of prices, and raise hospital prices above marginal cost. The descriptive statistics also tend to support this hypothesis. In every case but one, the average adjusted charge was higher for for-profit hospitals than for non-profit hospitals. On the other hand, the government dummy variable is almost always negative, which indicates that government hospitals tend to charge lower prices than non-profit hospitals. The coefficient for the share of government beds is insignificant in most of the regressions.

Demand Variables

The coefficient of per capita income is significant in many of the regressions. Every time the coefficient is significant, the sign is positive, as expected for a normal good. Higher income should imply higher demand and therefore higher prices.

The coefficient of the percent of the population greater than 70 years of age was insignificant in most of the regressions. However, it is interesting to note that it is positive and significant in the for-profit pacemaker implant market but negative and significant in the vaginal delivery market. Obviously, the higher the percentage of elderly people in the market, the higher should be the demand for pacemakers and the lower should be the demand for vaginal deliveries.

The coefficient of the percent of the white population is insignificant in most of the regressions. In the few cases that it is significant, the sign is negative, as expected, implying that predominately White communities tend to have better health and lower demand for hospital services.

The coefficient for population density is significant for only two out of 14 non-profit regressions and two out of twelve for-profit regressions. However, in three of the four instances when the coefficient is significant, it is positive, indicating that the hospitals in more densely populated areas do more complicated procedures than those in less densely populated, rural areas. This conclusion is also demonstrated by the fact that DRG 106, cardiac bypass, one of the most complicated procedures, had the highest average population density, equal to 2,380 people per square mile, as reported in Tables V through XXXII. In addition, these tables show that the lowest reported average population density for non-profit hospitals is 1,547 people per square mile for DRG 373, vaginal deliveries without complications, a relatively simple procedure. Moreover, the DRGs with the smallest reported population density, 3 people per square mile, were DRG 167, appendectomies; DRG 232, arthroscopy; and DRG 373, vaginal deliveries, all of which are relatively simple procedures. DRG 116, pacemaker implants, was the only coefficient for population density that was negative and significant, indicating that travel time is reduced for most patients who live in relatively densely populated counties and increasing the amount of outpatient care. The fact that the coefficient for population density is mainly insignificant and that the more complicated procedures tend to be performed in more densely populated areas imply that the case mix problem was corrected by studying separate DRGs.

Costs

As expected, the average length of stay coefficient is positive and strongly significant in almost all of the regressions, indicating that a longer stay at the hospital increased the total charge. In many cases the coefficient is strongly significant, with t-statistics as high as 37.219 for DRG 232, arthroscopy. The longest average length of stay is 13.6 days for cardiac valve procedures as reported in Table VI. The shortest average length of stay is 1.67 days for vaginal deliveries as reported in Table XXXII.

In addition, the number of beds is expected to measure economies of scale or differences in case mix. The coefficient for this variable is significant in many of the regressions. In the non-profit regressions, the four significant coefficients are all negative, which is evidence of economies of scale. In the for-profit regression, two coefficients are positive and significant and two of the coefficients are negative and significant, indicating that larger hospitals tend to do more complicated procedures. The descriptive statistics tables tend to support this hypothesis. Table VII shows that DRG 106, cardiac bypass, a complicated procedure, has the highest reported average number of beds, equal to 328.28 beds. The smallest hospital that performs cardiac bypass operations has 103 beds. On the other hand, Table XXX shows that DRG 355, hysterectomy, has the smallest average number of beds, equal to only 114 beds, only 11 more beds than the smallest hospital that performed bypass operations. The smallest hospital to do hysterectomies has only 9 beds.

The coefficient of the diversification variable is negative and significant in two of the twelve for-profit regressions, for DRG 371, cesarean section and DRG 373, vaginal delivery. In addition DIV is negative and significant in one of the non-profit regressions, DRG 355, hysterectomy. This is an indication that hospitals which specialize in particular treatments tend to have lower costs. The largest reported diversification variable is for non-profit DRG 373, vaginal deliveries. Table XVIII shows that approximately 9.1 percent of all of the treatments of the non-profit hospitals are vaginal deliveries. In fact, 24 percent of one hospital's patients were admitted for vaginal deliveries.

The coefficient of the population dummy variable is significant in ten of the fourteen non-profit regressions and four out of twelve for-profit regressions. As expected, the significant population dummy variables are positive, indicating that those hospitals located in urban areas do more complicated procedures.

The average service sector wage of the county where the hospital is located is placed in the model to measure the labor component of costs. Higher wages should mean higher costs and therefore higher charges. However, the regression results do not show this. The coefficient for this variable is negative and significant for five of the chosen DRGs for the non-profit and for-profit regressions. None of them are positive and significant as hypothesized. Therefore, the average service sector wage must be measuring something else besides cost. The service sector wage could be measuring the health of the community in a way that is similar to the percentage of the population that is White, since communities with higher service sector wages would be associated with communities with a higher percentage of White population. It is interesting to note that two (almost three) of the five significant wage coefficients are also accompanied by negative and significant race coefficients.

It is widely believed that teaching hospitals have higher costs than other hospitals. In addition, teaching hospitals may have a high level of quality which would stimulate demand. The regression results tend to support either hypothesis. The coefficient for the teaching hospital dummy is positive and significant in five of the fourteen chosen DRGs.

Summary

The regression results are very much similar to those anticipated by economic theory. In addition, the model has high explanatory power. However, the changing sign of the coefficient of the HHI is very perplexing. It is possible that those hospitals who are monopolists in treating certain DRGs may be able to reduce there costs through scale economies in a particular treatment. Thus a high HHI may imply low costs, and a negative coefficient for the HHI. However, the diversification variable, DIV, should have picked up such a relationship. In every case that the HHI coefficient is negative, the DIV coefficient is not significant at the 10 percent level. Therefore, this is not a very likely explanation for the changing sign of the coefficient of the HHI.

CHAPTER V

CONCLUSION

The study presented here should be helpful to the anti-trust authorities, policymakers, and others who deal in regulatory matters dealing with hospitals. It was shown that for-profit hospitals do compete on a price basis. Therefore, an active policy to enforce current F.T.C. and Justice Department rules should enhance consumer welfare, especially in the case of for-profit hospitals.

On the other hand, non-profit hospitals tend to compete primarily via quality or price in different types of markets. If the patient has the ability to determine the subset of hospitals which provide the level of quality at the price he desires, then the demand curve for the hospital would be expected to be relatively elastic, given that the patients have a number of substitute hospitals from which to choose. The statistical results in this dissertation show that in this type of market, price competition tends to dominate quality competition. If, on the other hand, the treatment is required in a short amount of time, such as joint and limb reattachment, then it would be impossible for the individual to ascertain information about the providers of medical care. He or she, in essence, would be unable to determine the subset of hospitals which provide the level of quality and price he or she desires. It is in this situation that the demand for health services would be relatively inelastic, given that there are relatively few substitutes for the patient to choose. Therefore, each hospital would be able to choose the level of quality and price that it deemed necessary, even if it was a level of quality that the patient did not want. Under the Lee hypothesis, this would imply that hospital managers would be free to raise quality, prices and status to a level that they desired, with little concern for losing patients, since the patients have few substitutes to turn to. Consequently, quality competition tends to dominate price competition in those markets where patients do not have the ability to shop for hospital services. In this case, more competitive markets actually have higher prices and an anti-trust policy that would enforce competitive markets would actually result in higher prices.

In addition, a number of other interesting facts were learned about the determination of hospital prices. It was learned in the DRGs studied here that for-profit hospitals tend to charge higher prices than non-profit hospitals. Government hospitals, on the other hand, tend to be subsidized by the government and charge lower prices than non-profit hospitals. Also, hospitals that are members of a system are inclined to charge higher prices than non-system hospitals, indicating that system membership either improved the level of perceived quality of the institution, or the ability of hospitals to collude. It should also be noted that teaching hospitals tend to charge higher prices than non-teaching hospitals, reflecting the fact that teaching hospitals either have higher demand due to a perceived higher level of quality than non-teaching hospitals or that teaching hospitals have higher costs than non-teaching hospitals.

Hopefully the results from this study will help policymakers and others interested in regulatory matters covering hospitals. For it is only through understanding how health care markets work that they can make a logical choices about modifying our current market system or adopting another method of providing health care.

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APPENDIXES

APPENDIX A

TABLES

TABLE I

DEFINING THE INITIAL MARKET FOR VAGINAL DELIVERIES: CALIFORNIA MEDICAL CENTER

Zip Codes	Commitment Index
90011	.0962
90006	.0641
90037	.0636
90018	.0456
90019	.0382
90003	.0332
90004	.0332
90044	.0320
90007	.0315
90026	.0270
90020	.0274
90047	.0242
90062	.0242
90005	.0230
90057	.0202
90043	.0197
90016	.0191

TABLE II

DEFINING THE COMPETITORS IN THE INITIAL MARKET FOR VAGINAL DELIVERIES: CALIFORNIA MEDICAL CENTER

Initial Market Zip Code	Relevance Index	Hospital	Hospital's Zip Code
90003	.05769	Saint Francis Medical Center	90262
90003	.40673	Los Angeles County Martin Luther King Drew Medical Center	90059
90004	.12148	Hollywood Presbyterian	90027
90006	.09494	UCLA Medical Center	90024
90007	.21542	White Memorial Medical Center	90033
90019	.14073	Cedars Sinai Medical Center - Beverly Blvd.	90048
90020	.14150	Kaiser Foundation Hospital - Los Angeles	90027
90026	.21838	Queen of Angels Medical Center	90026
90043	.08403	Centinela Hospital	90307
90044	.13640	Los Angeles County Harbor/ UCLA Medical Center	90502
90047	.15763	Kaiser Foundation Hospital - West Los Angeles	90034
90057	.35632	Los Angeles County USC Medical Center	90033

TABLE III

THE VARIABLES IN THE MODEL

Name	Description
	<u>Dependent Variable</u>
P	Average DRG charge at the hospital
	<u>Structure</u>
HHI	Herfindahl-Hirschman Index
CDUM	Dummy variable for HHI >.30
	<u>Ownership Variables</u>
FP	For profit dummy variable
SGOV	Share of beds in the market that are operated by the government
GOV	Dummy variable for government operated hospital
MHS	Dummy variable for a hospital that is a member of a hospital system
	<u>Demand Variables</u>
PCY	Per capita income of the county where the hospital is located
WHITE	Percent of the population who are Caucasian
OLD	Percent of the population who are elderly
DENS	Population density of the county where the hospital is located
	<u>Cost Variables</u>
WAGES	The average wages of service workers in the county of the hospital's location
COTH	Dummy variable for hospitals that are members of the Council of Teaching Hospitals
SIZE	The number of hospital beds in a hospital
DIV	Diversification
POPDUM	Dummy variable for hospitals located in cities with populations > 300,000
ALOS	The average length of stay

TABLE IV

CHOSEN DIAGNOSES RELATED GROUPS

DRG	Explanation
36	Retinal Procedures
105	Cardiac Valve Procedures
106	Cardiac Bypass
116	Pacemaker Implant
167	Appendectomy
209	Major Joint and Limb Reattachment
232	Arthroscopy
258	Total Mastectomy
262	Breast Biopsy
268	Breast Implant
306	Prostatectomy
355	Hysterectomy
371	Cesarean Section
373	Vaginal Delivery

TABLE VII

DESCRIPTIVE STATISTICS: DRG 106, CARDIAC BYPASS NON - PROFIT HOSPITALS

Variables	Mean	Minimum	Maximum	Variance
Number of Beds	328.28	103	977	20837.56
Per Capita Income	14947.06	10346	20157	4373977.06
Population Density	2298.13	56.80	16282	12972157.43
Percent of Population >70	10.24	7.5	15.5	3.95
Service Sector Wages	23276.62	18207	26756	6026693.03
Percent of White Population	75.70	59.2	93.10	76.55
Share of Government Beds	.09	0	.274	.007
HHI	.13	.04	1	.015
Average Length of Stay	13.19	8.35	31.5	10.17
Average Adjusted Charge	33939.96	19079.56	82027.75	91917341.51
Diversification	.009	.00006	.034	.000056

TABLE VIII

DESCRIPTIVE STATISTICS: DRG 116, PACEMAKER IMPLANT NON - PROFIT HOSPITALS

Variables	Mean	Minimum	Maximum	Variance
Number of Beds	222.78	43.00	977	19796.37
Per Capita Income	14342.11	9270	22650	6549128.93
Population Density	2130.91	18.90	16282	15496405.47
Percent of Population >70	10.58	7.5	15.5	4.58
Service Sector Wages	22587.64	15040	27822.00	7924360.55
Percent of White Population	77.16	59.20	97.20	88.31
Share of Government Beds	.093	0	.93	.017
HHI	.24	.041	1.00	.043
Average Length of Stay	5.28	1.00	18.00	7.73
Average Adjusted Charge	14362.34	4663.00	34249	22591996.86
Diversification	.0030	.00016	.017	4.5E-6

TABLE V

DESCRIPTIVE STATISTICS: DRG 36, OPTICAL PROCEDURES NON - PROFIT HOSPITALS

Variables	Mean	Minimum	Maximum	Variance
Number of Beds	271.95	35	977	23288.64
Per Capita Income	15001.74	9917	22650	5360585.82
Population Density	2380.02	35.20	16282	15959937.09
Percent of Population >70	10.47	7.5	15.4	4.16
Service Sector Wages	22997.42	17693	27822	7418416.27
Percent of White Population	75.81	59.2	95.6	85.31
Share of Government Beds	.0912	0	.376	.0096
HHI	.149	.032	1.00	.016
Average Length of Stay	2.68	.50	10.00	2.056
Average Adjusted Charge	4226.03	1183.50	18852.00	5115305.01
Diversification	.0068	.000057	.274	.00079

TABLE VI

DESCRIPTIVE STATISTICS: DRG 105, CARDIAC VALVE NON - PROFIT HOSPITALS

Variables	Mean	Minimum	Maximum	Variance
Number of Beds	320.92	103	977	22696.76
Per Capita Income	14875.81	10346	20157	4566581.86
Population Density	2276.47	56.80	1682.00	13258727
Percent of Population >70	10.24	7.5	15.5	4.05
Service Sector Wages	23044.47	18207	26756	6246381
Percent of White Population	76.17	59.20	93.1	77.14
Share of Government Beds	.095	0	.478	.014
HHI	.188	.039	1	.0159
Average Length of Stay	13.60	8.00	55.00	57.19
Average Adjusted Charge	33343.25	9249	75800.5	111649834
Diversification	.002	.000078	.02	7.13E-6

TABLE IX

DESCRIPTIVE STATISTICS: DRG 167, APPENDECTOMY
NON - PROFIT HOSPITALS

Variables	Mean	Minimum	Maximum	Variance
Number of Beds	193.57	15.00	977	19458.76
Per Capita Income	13999.31	9270	22650.00	6454946.54
Population Density	1809.73	3.00	16282.00	1237980.38
Percent of Population >70	10.57	4.30	21.90	5.07
Service Sector Wages	22194.25	13928.00	27822.00	8659954.38
Percent of White Population	77.90	59.20	97.20	91.56
Share of Government Beds	.176	0	.954	.033
HHI	.252	.067	1	.034
Average Length of Stay	3.19	1.91	4.5	.279
Average Adjusted Charge	3400.92	1636.52	6143.31	68981.44
Diversification	.0064	.00052	.038	.000018

TABLE X

DESCRIPTIVE STATISTICS: DRG 209, LIMB REATTACHMENT
NON - PROFIT HOSPITALS

Variables	Mean	Minimum	Maximum	Variance
Number of Beds	203.08	30.00	977	19355.60
Per Capita Income	14187.11	9270	22650.00	6343719.15
Population Density	1920.06	6.80	16282.00	13417814.89
Percent of Population >70	10.59	7.5	21.9	4.95
Service Sector Wages	22420.56	15040.00	27822.00	8409139.60
Percent of White Population	77.43	59.20	97.20	90.46
Share of Government Beds	.094	0	.67	.011
HHI	.203	.027	1.00	.025
Average Length of Stay	10.51	4.2	30.33	11.29
Average Adjusted Charge	14141.90	4484.00	30039.83	1695858.37
Diversification	.010	.00020	.072	.00007

TABLE XI

DESCRIPTIVE STATISTICS: DRG 232, ARTHROSCOPY
NON - PROFIT HOSPITALS

Variables	Mean	Minimum	Maximum	Variance
Number of Beds	226.24	15.00	977.00	20861.04
Per Capita Income	14245.07	9270.00	22650.00	6512508.97
Population Density	1956.36	3.00	16282.00	13848527.27
Percent of Population >70	10.30	4.30	15.50	4.08
Service Sector Wages	22426.67	13928.00	27822.00	8904993.61
Percent of White Population	77.35	59.20	95.80	84.79
Share of Government Beds	.06	0	.75	.02
HHI	.57	.07	1.00	.10
Average Length of Stay	2.80	.25	36.00	20.78
Average Adjusted Charge	3490.10	1078.00	25329.00	10480358.59
Diversification	.0011	.000060	.034	.000017

TABLE XII
DESCRIPTIVE STATISTICS: DRG 258, TOTAL MASTECTOMY
NON - PROFIT HOSPITALS

Variables	Mean	Minimum	Maximum	Variance
Number of Beds	199.86	13.00	977.00	19799.51
Per Capita Income	14091.25	9270.00	22650.00	6658360.72
Population Density	1880.32	5.50	16282.00	13393510.35
Percent of Population >70	10.66	7.50	21.90	5.08
Service Sector Wages	22321.41	15040.00	27822.00	8679477.33
Percent of White Population	77.48	59.20	97.20	89.64
Share of Government Beds	.093	0	.87	.018
HHI	.27	.052	1.00	.055
Average Length of Stay	3.85	1.00	35.82	6.87
Average Adjusted Charge	4275.67	1853.00	14222.27	2766402.41
Diversification	.0016	.00023	.0055	9.45

TABLE XIII

DESCRIPTIVE STATISTICS: DRG 262, BREAST BIOPSY NON - PROFIT HOSPITALS

Variables	Mean	Minimum	Maximum	Variance
Number of Beds	240.87	33.00	977.00	23671.10
Per Capita Income	14415.79	9270.00	22650.00	5256183.68
Population Density	2187.76	35.20	16282.00	14828951.19
Percent of Population >70	10.45	7.50	15.50	3.90
Service Sector Wages	23013.42	16616.00	27822.00	7327305.47
Percent of White Population	75.46	59.20	95.80	88.02
Share of Government Beds	.05	0	.81	.02
HHI	.54	.09	1.0	.09
Average Length of Stay	2.06	.14	13.00	4.34
Average Adjusted Charge	2674.12	431.00	15756.00	4377316.24
Diversification	.00053	.000059	.0081	7.93

TABLE XIV

DESCRIPTIVE STATISTICS: DRG 268, BREAST IMPLANTS NON - PROFIT HOSPITALS

Variables	Mean	Minimum	Maximum	Variance
Number of Beds	228.20	28.00	977.00	21788.36
Per Capita Income	14298.99	9270.00	22650.00	6109874.18
Population Density	2158.24	6.80	16282.00	15696195.33
Percent of Population >70	10.62	7.50	21.90	5.16
Service Sector Wages	22527.94	16548.00	27822.00	8183158.18
Percent of White Population	76.66	59.20	95.80	88.72
Share of Government Beds	.13	0	.86	.04
HHI	.41	.044	1.00	.084
Average Length of Stay	2.95	.50	28.00	12.44
Average Adjusted Charge	3925.17	924.00	25426.00	8308490.80
Diversification	.0009	.00004	.021	4.37

TABLE XV

DESCRIPTIVE STATISTICS: DRG 306, PROSTATECTOMY
NON - PROFIT HOSPITALS

Variables	Mean	Minimum	Maximum	Variance
Number of Beds	249.36	59.00	977.00	26474.23
Per Capita Income	14530.95	9270.00	20157.00	5669522.93
Population Density	2301.13	18.90	16282.00	18280623.88
Percent of Population >70	10.46	7.50	15.40	4.69
Service Sector Wages	22585.91	18207.00	26756.00	8378401.98
Percent of White Population	76.54	59.20	94.70	79.25
Share of Government Beds	.062	0	.61	.02
HHI	.041	.081	1.00	.074
Average Length of Stay	6.14	1.00	19.00	12.24
Average Adjusted Charge	6242.06	624.00	19283.00	14253687.12
Diversification	.0013	.00010	.0081	1.96

TABLE XVI

DESCRIPTIVE STATISTICS: DRG 355, HYSTERECTOMY
NON - PROFIT HOSPITALS

Variables	Mean	Minimum	Maximum	Variance
Number of Beds	195.36	13.00	977.00	19623.02
Per Capita Income	14077.92	9270.00	22650.00	6581869.78
Population Density	1847.43	5.50	16282.00	12935758.87
Percent of Population >70	10.57	7.50	15.50	4.34
Service Sector Wages	22290.46	15040.00	27822.00	8403588.65
Percent of White Population	77.67	59.20	97.20	89.54
Share of Government Beds	.14	0	.81	.02
HHI	.22	.05	1.00	.03
Average Length of Stay	4.61	3.04	9.00	.57
Average Adjusted Charge	4676.99	2563.35	11600.00	1695562.06
Diversification	.013	.00012	.037	.000049

TABLE XVII

DESCRIPTIVE STATISTICS: DRG 371,CESAREAN SECTION NON - PROFIT HOSPITALS

Variables	Mean	Minimum	Maximum	Variance
Number of Beds	211.30	28.00	977.00	21574.51
Per Capita Income	14049.29	9359.00	22650.00	6787599.45
Population Density	1583.12	5.50	16282.00	9458602.65
Percent of Population >70	10.51	7.50	15.50	4.40
Service Sector Wages	22208.24	15040.00	27822.00	8855158.62
Percent of White Population	78.09	59.20	97.20	86.66
Share of Government Beds	.18	0	.83	.032
HHI	.26	.076	1.00	.041
Average Length of Stay	3.97	2.00	5.03	.20
Average Adjusted Charge	3564.29	2011.79	6340.40	616622.91
Diversification	.030	.00091	.068	.00016

TABLE XVIII

DESCRIPTIVE STATISTICS: DRG 373, VAGINAL DELIVERY NON - PROFIT HOSPITALS

Variables	Mean	Minimum	Maximum	Variance
Number of Beds	206.80	8.00	977.00	21755.04
Per Capita Income	13977.73	3959.00	22650.00	6800908.89
Population Density	1547.67	3.00	16282.00	9224537.30
Percent of Population >70	10.54	4.30	21.90	5.32
Service Sector Wages	22125.64	13928.00	28722.00	9250790.43
Percent of White Population	79.31	59.20	97.20	88.86
Share of Government Beds	.19	0	.91	.033
HHI	.28	.087	1.00	.044
Average Length of Stay	1.79	.500	2.72	.14
Average Adjusted Charge	1457.31	702.53	3060.71	193441.67
Diversification	.091	.00021	.24	.0013

TABLE XIX

DESCRIPTIVE STATISTICS: DRG 36, OPTICAL PROCEDURES
FOR - PROFIT HOSPITALS

Variables	Mean	Minimum	Maximum	Variance
Number of Beds	167.26	48.00	364.00	5559.46
Per Capita Income	14303.00	10346.00	17577.00	2631050.40
Population Density	1323.21	31.90	2715.00	907159.25
Percent of Population >70	10.61	7.500	15.500	3.57
Service Sector Wages	22596.84	16831.00	26528.00	6701516.01
Percent of White Population	78.50	67.80	93.10	95.24
Share of Government Beds	.054	0	.24	.0057
HHI	.15	.050	.31	.0062
Average Length of Stay	2.45	1.00	4.50	.84
Average Adjusted Charge	4305.35	2186.00	7278.25	1995621.21
Diversification	.0049	.000091	.032	.000046

TABLE XX

DESCRIPTIVE STATISTICS: DRG 105, CARDIAC VALVE
FOR - PROFIT HOSPITALS

Variables	Mean	Minimum	Maximum	Variance
Number of Beds	244.667	132	364	6951.75
Per Capita Income	14079.44	11294	16877	2364492.28
Population Density	1331.93	59.5	2715	1055883.50
Percent of Population >70	10.10	8.3	13.4	2.975
Service Sector Wages	22199.89	16831.00	24993.00	8798498.11
Percent of White Population	78.29	68.60	90.50	91.27
Share of Government Beds	.084	0	.36	.0154
HHI	.31	.10	1.00	.092
Average Length of Stay	13.26	9.33	27	30.24
Average Adjusted Charge	39798.45	26609.25	62155	100224313
Diversification	.002	.00014	.005	2.86

TABLE XXI

DESCRIPTIVE STATISTICS: DRG 106, CARDIAC BYPASS FOR - PROFIT HOSPITALS

Variables	Mean	Minimum	Maximum	Variance
Number of Beds	238.30	132	364	6584.68
Per Capita Income	14124.10	11294	16877	2121712.10
Population Density	1402.54	59.50	2715	988416.13
Percent of Population >70	10.08	8.30	13.40	2.05
Service Sector Wages	22479.20	16831	24993	8601034
Percent of White Population	77.32	68.6	90.5	90.51
Share of Government Beds	.069	0	.25	.009
HHI	.17	.055	.58	.023
Average Length of Stay	12.31	8.71	15.31	3.82
Average Adjusted Charge	37304.16	23136	46889.17	49668795.10
Diversification	.016	.0044	.037	.00013

TABLE XXII

DESCRIPTIVE STATISTICS: DRG 116, PACEMAKER IMPLANT FOR - PROFIT HOSPITALS

Variables	Mean	Minimum	Maximum	Variance
Number of Beds	131.06	26.00	364.00	4728.34
Per Capita Income	14411.35	9917.00	22650.00	4021033.19
Population Density	1456.50	21.30	2715.00	983369.77
Percent of Population >70	10.28	7.50	15.50	2.92
Service Sector Wages	22622.05	16831.00	27822.00	7828271.01
Percent of White Population	77.97	97.80	95.50	92.50
Share of Government Beds	.067	0	.45	.013
HHI	.21	.067	.89	.023
Average Length of Stay	6.17	1.00	32.00	21.61
Average Adjusted Charge	15683.49	3078.00	47786.00	40723303.90
Diversification	.0030	.00051	.0090	3.15

TABLE XXIII

DESCRIPTIVE STATISTICS: DRG 167, APPENDECTOMY
FOR - PROFIT HOSPITALS

Variables	Mean	Minimum	Maximum	Variance
Number of Beds	115.99	9.00	364.00	4358.43
Per Capita Income	14323.06	9356.00	22650.00	3809741.94
Population Density	1477.85	4.20	2715.00	950858.58
Percent of Population >70	10.02	7.50	15.50	2.45
Service Sector Wages	22692.98	16548.00	27822.00	7157942.27
Percent of White Population	77.30	67.80	95.60	84.80
Share of Government Beds	.20	0	.89	.03
HHI	023	.07	1.00	.030
Average Length of Stay	3031	1.97	5.00	.28
Average Adjusted Charge	4075.34	2280.93	8032.88	968206.48
Diversification	.0070	.0011	.042	.000023

TABLE XXIV

DESCRIPTIVE STATISTICS: DRG 209, LIMB REATTACHMENT
FOR - PROFIT HOSPITALS

Variables	Mean	Minimum	Maximum	Variance
Number of Beds	129.49	28.00	364.00	4432.31
Per Capita Income	14501.73	9917.00	22650.00	3860947.56
Population Density	1559.64	21.30	2715.00	924812.76
Percent of Population >70	9.97	7.50	15.50	2.30
Service Sector Wages	22800.70	16831.00	27822.00	6716652.50
Percent of White Population	77.57	67.80	95.60	85.62
Share of Government Beds	.080	0	.82	.013
HHI	.16	.050	.70	.012
Average Length of Stay	10.11	3.00	21.33	9.70
Average Adjusted Charge	14821.65	2782.00	30217.67	18094650.15
Diversification	.0080	.00090	.034	.000040

TABLE XXV

DESCRIPTIVE STATISTICS: DRG 232, ARTHROSCOPY FOR - PROFIT HOSPITALS

Variables	Mean	Minimum	Maximum	Variance
Number of Beds	134.17	18.00	364.00	5355.72
Per Capita Income	14706.47	10772.00	22650.00	3399453.66
Population Density	1609.20	21.30	2715.00	840101.92
Percent of Population >70	9.93	7.50	14.90	2.05
Service Sector Wages	23035.21	16831.00	27822.00	6470326.28
Percent of White Population	76.98	97.80	95.60	90.30
Share of Government Beds	.037	0	.42	.011
HHI	.49	.091	1.00	.073
Average Length of Stay	2.47	.500	14.00	5.99
Average Adjusted Charge	4193.65	1327.00	17533.50	7505697.15
Diversification	.0010	.00071	.0080	1.77

TABLE XXVI

DESCRIPTIVE STATISTICS: DRG 258, TOTAL MASTECTOMY FOR - PROFIT HOSPITALS

Variables	Mean	Minimum	Maximum	Variance
Number of Beds	125.62	17.00	364.00	4117.68
Per Capita Income	14533.55	9888.00	22650.00	3691061.73
Population Density	1527.15	21.30	2715.00	946396.30
Percent of Population >70	10.07	7.50	15.50	2.60
Service Sector Wages	22720.34	16831.00	27822.00	6807008.94
Percent of White Population	77.63	67.80	95.60	85.19
Share of Government Beds	.099	0	.50	.018
HHI	.25	.073	1.00	.030
Average Length of Stay	3.98	1.500	15.50	2.92
Average Adjusted Charge	5348.59	2245.00	29847.00	8180680.94
Diversification	.0016	.00018	.0078	1.46

TABLE XXVII

DESCRIPTIVE STATISTICS: DRG 262, BREAST BIOPSY FOR - PROFIT HOSPITALS

Variables	Mean	Minimum	Maximum	Variance
Number of Beds	128.22	15.00	364.00	2548.54
Per Capita Income	14567.69	9873.00	16877.00	2588488.83
Population Density	1755.76	56.80	2715.00	794820.71
Percent of Population >70	9.96	8.30	15.50	2.35
Service Sector Wages	23178.68	16831.00	24993.00	5704666.28
Percent of White Population	78.86	68.60	93.10	81.61
Share of Government Beds	.050	0	.70	.020
HHI	.41	.12	1.00	.084
Average Length of Stay	1.69	.33	6.50	1.40
Average Adjusted Charge	2640.69	302.00	8623.00	2020585.08
Diversification	.0012	.00013	.011	3.06

TABLE XXVIII

DESCRIPTIVE STATISTICS: DRG 268, BREAST IMPLANT FOR - PROFIT HOSPITALS

Variables	Mean	Minimum	Maximum	Variance
Number of Beds	138.35	36.00	364.00	4726.26
Per Capita Income	14629.79	9917.00	22650.00	4310564.76
Population Density	1545.21	21.30	2715.00	960155.47
Percent of Population >70	10.15	7.50	15.50	2.99
Service Sector Wages	22734.36	16831.00	27822.00	749662.83
Percent of White Population	78.21	67.80	95.60	87.36
Share of Government Beds	.099	0	.86	.030
HHI	.42	.11	1.00	.078
Average Length of Stay	2.75	.50	27.00	11.87
Average Adjusted Charge	4108.89	722.00	29120.00	12464821.79
Diversification	.0012	.00013	.017	5.25

TABLE XXIX

DESCRIPTIVE STATISTICS: DRG 306, PROSTATECTOMY FOR - PROFIT HOSPITALS

Variables	Mean	Minimum	Maximum	Variance
Number of Beds	143.06	52.00	346.00	5976.85
Per Capita Income	14655.89	9917.00	17577.00	2850584.04
Population Density	1665.56	56.80	2715.00	846711.08
Percent of Population >70	9.78	7.50	14.90	1.85
Service Sector Wages	22906.75	17693.00	26528.00	6295150.65
Percent of White Population	75.86	67.80	93.10	71.33
Share of Government Beds	.097	0	.82	.054
HHI	.39	.086	1.00	.053
Average Length of Stay	6.32	2.00	21.00	11.14
Average Adjusted Charge	7624.62	2761.00	28671.00	19352965.26
Diversification	.0014	.00013	.0051	1.23

TABLE XXX

DESCRIPTIVE STATISTICS: DRG 355, HYSTERECTOMY FOR - PROFIT HOSPITALS

Variables	Mean	Minimum	Maximum	Variance
Number of Beds	114.20	9.00	364.00	4432.43
Per Capita Income	14373.58	9356.00	22650.00	3760181.65
Population Density	1495.99	4.20	2715.00	925139.71
Percent of Population >70	10.11	7.500	15.50	2.41
Service Sector Wages	22782.43	16548.00	27822.00	7103725.21
Percent of White Population	77.16	67.80	95.60	84.70
Share of Government Beds	.14	0	.86	.020
HHI	.18	.050	1.00	.015
Average Length of Stay	4.78	3.00	8.33	.69
Average Adjusted Charge	5606.57	2481.00	9793.00	1677093.47
Diversification	.014	.0013	.11	.00014

TABLE XXXI

DESCRIPTIVE STATISTICS: DRG 371, CESAREAN SECTION
FOR - PROFIT HOSPITALS

Variables	Mean	Minimum	Maximum	Variance
Number of Beds	159.27	16.00	364.00	2685.52
Per Capita Income	14102.56	9356.00	17577.00	4184680.41
Population Density	1435.27	4.20	2715.00	1094805.49
Percent of Population >70	10.02	7.50	14.90	2.16
Service Sector Wages	22445.23	16831.00	26528.00	6752081.61
Percent of White Population	77.85	67.80	93.90	81.29
Share of Government Beds	.19	0	.86	.031
HHI	.22	.050	1.00	.024
Average Length of Stay	3.84	2.86	4.50	.13
Average Adjusted Charge	4205.76	2767.60	5919.00	569185.59
Diversification	.064	.00056	.071	.00030

TABLE XXXII

DESCRIPTIVE STATISTICS: DRG 373, VAGINAL DELIVERY
FOR - PROFIT HOSPITALS

Variables	Mean	Minimum	Maximum	Variance
Number of Beds	126.66	15.00	364.00	5491.26
Per Capita Income	14065.79	9356.00	17577.00	4315809.79
Population Density	1432.21	4.20	2715.00	1102594.61
Percent of Population >70	9.98	7.50	14.90	2.09
Service Sector Wages	22401.58	16831.00	26528.00	6894636.68
Percent of White Population	77.80	67.80	93.90	79.73
Share of Government Beds	.23	0	.86	.04
HHI	.24	.058	1.00	.023
Average Length of Stay	1.67	.92	2.26	.12
Average Adjusted Charge	1531.10	927.06	2974.00	138831.03
Diversification	.097	.00030	.23	.0022

TABLE XXXIII

REGRESSION RESULTS: DEPENDENT VARIABLE = PRICE OF DRG NON-PROFIT HOSPITALS

Dependent Variables	DRG 36 Retinal Procedures	DRG 105 Cardiac Valve	DRG 106 Cardiac Bypass	DRG 116 Pacemaker Implant	DRG 167 Appendectomy
Intercept	5791.68 (1.34)	411174 (1.119)	-2215.41 (-.070)	6493.28 (.979)	1607.74 (1.568)
Teaching Hospital Dummy	308.50 (.605)	-583.78 (-.160)	-1377.76 (-.455)	1062.41 (.885)	536.95 (2.629**)
Number of Beds	-.169 (-.131)	9.07 (.893)	-.523 (-.068)	3.74 (1.346)	-.788 (-1.764**)
Population Dummy	1180.44 (3.49**)	1351.62 (.54)	3176.41 (1.584)	492.61 (.649)	469.95 (3.933**)
Share of Gov Beds	-787.91 (-.539)	4622.48 (.44)	834.31 (.076)	2852.86 (1.324)	-288.76 (-1.141)
Per Capita Income	.235 (1.974**)	.180 (.205)	.645 (.968)	.232 (1.305)	.081 (2.921**)
Population Density	-.051 (-.761)	.582 (.960)	-.207 (-.442)	-.233 (-1.670**)	.285 (1.367)
Percent of Population >70	-39.84 (-.422)	-435.49 (-.590)	-193.77 (-.338)	33.98 (.199)	-10.68 (-.453)
Percent of White Population	-42.82 (-1.416)	-9.64 (-.039)	-33.82 (-.180)	-83.27 (-1.642**)	-4.32 (-.567)
System Dummy	1698.27 (.842)	-3384.01 (-.187)	1376.16 (.087)	3436.48 (2.109**)	198.84 (.908)
HHI	1653.45 (.983)	-11467 (-.623)	-5500.87 (-.323)	5589.86 (2.718**)	98.96 (.311)
Average Length of Stay	1241.67 (13.169**)	917.49 (6.64**)	2349.29 (8.47**)	1131.14 (10.618**)	763.51 (8.564**)
Diversification	7865.24 (1.516)	-218660 (-.491)	11032 (.080)	12020.00 (.091)	-10838 (-.878)
Wages	-.303 (-2.579**)	-.733 (-.841)	-.039 (-.055)	-.037 (-.201)	-.066 (-2.489**)
R^2	.67	.39	.57	.49	.48
n	97	68	69	162	207

** Denotes a coefficient that is significant at the 10% level.
() Denotes t-statistics
– Denotes a variable that was omitted from the regression.

TABLE XXXIII (CONTINTUED)

Independent Variables	DRG 209 Limb Reattachment	DRG 232 Arthroscopy	DRG 258 Total Mastectomy	DRG 262 Breast Biopsy	DRG 268 Breast Implant
Intercept	7052.55 (1.345)	-689.56 (-.346)	3232.47 (1.651)	-1220.56 (-.468)	1482.87 (.527)
Teaching Hospital Dummy	1293.30 (1.281)	-489.67 (-1.343)	1215.30 (2.857**)	459.63 (1.062)	612.53 (1.173)
Number of Beds	.375 (.176)	-.025 (-.029)	-2.97 (-3.297**)	-.536 (-.568)	1.06 (.869)
Population Dummy	1982.00 (3.379**)	755.79 (3.147**)	451.07 (1.886**)	437.11 (1.603**)	355.81 (1.081)
Share of Gov Beds	-1750.47 (-.796)	-553.04 (-.861)	104.89 (.157)	-522.43 (-.714)	119.63 (.198)
Per Capita Income	.231 (1.650**)	.076 (1.438)	.101 (1.809**)	.053 (.654)	.115 (1.387)
Population Density	-.069 (-.634)	.081 (1.876**)	.014 (.315)	-.005 (-.085)	.004 (.068)
Percent of Population >70	.021 (0.00)	39.78 (.730)	24.24 (.488)	39.98 (.513)	-23.46 (-.338)
Percent of White Population	-8.06 (-.204)	5.87 (.357)	-6.02 (-.381)	6.33 (.312)	-5.92 (-.270)
System Dummy	-1649.40 (-.988)	548.15 (2.438**)	-280.78 (-.608)	-48.39 (-.143)	209.68 (.508)
HHI	-4424.03 (-2.511**)	551.23 (1.495)	-1443.59 (-2.615**)	206.10 (.400)	940.97 (1.590**)
Average Length of Stay	665.02 (10.104)	684.84 (37.219**)	376.70 (11.242**)	857.68 (16.390**)	698.01 (19.856**)
Diversification	39869 (1.559)	26677 (1.172)	14928 (.161)	23327 (.188)	30659 (.468)
Wages	-.038 (-.271)	-.030 ()-.553	-.029 (-.510)	.015 (.184)	-.070 (-.859)
R^2	.49	.92	.50	.74	.75
n	192	118	193	107	145

** Denotes a coefficient that is significant at the 10% level.
() Denotes t-statistics
-- Denotes a variable that was omitted from the regression.

TABLE XXXIII (CONTINUED)

Independent Variables	DRG 306 Prostatectomy	DRG 355 Hysterectomy	DRG 371 Cesarean Section	DRG 373 Vaginal Delivery
Intercept	7275.56 (1.333)	1879.44 (1.352)	1806.14 (1.452)	656.25 (1.256)
Teaching Hospital Dummy	533.50 (.479)	662.72 (2.336**)	706.31 (2.782**)	348.24 (3.044**)
Number of Beds	-2.75 (-1.228)	-1.38 (-2.423**)	-.949 (-1.830**)	-.043 (-.186)
Population Dummy	1311.50 (2.189**)	761.92 (4.670**)	383.98 (2.683**)	164.42 (2.409**)
Share of Gov Beds	-1716.07 (-1.154)	681.97 (1.634**)	-212.30 (-.641)	-18.11 (-.131)
Per Capita Income	.065 (.409)	.118 (3.214**)	.115 (3.524**)	.040 (2.619**)
Population Density	-.059 (-.540)	.025 (.837)	-.001 (-.044)	.013 (1.019)
Percent of Population >70	38.34 (.279)	-44.29 (-1.226)	25.21 (.847)	-12.56 (-1.046)
Percent of White Population	-35.75 -.761()	-8.40 (-.783)	-18.16 (-1.876**)	-3.93 (-.911)
System Dummy	-953.90 (-1.344)	670.78 (1.677**)	606.26 (2.245**)	141.40 (1.372)
HHI	-2298.22 (-1.877**)	510.72 (1.086)	622.16 (1.570**)	82.18 (.492)
Average Length of Stay	914.14 (14.758**)	953.60 (11.212**)	623.68 (4.429**)	505.32 (5.817**)
Diversification	-162680 (-.921)	-41155 (-4.384**)	-5853.14 (-1.406)	-596.31 (-.902)
Wages	-.127 (-.805)	-.112 (-2.976**)	-.073 (-2.283**)	-.018 (-1.222)
R^2	.78	.63	.40	.58
n	74	201	157	162

** Denotes a coefficient that is significant at the 10% level.
() Denotes t-statistics
-- Denotes a variable that was omitted from the regression.

TABLE XXXIV

REGRESSION RESULTS: DEPENDENT VARIABLE = PRICE OF DRG FOR-PROFIT HOSPITALS

Independent Variables	DRG 36 Retinal Procedures	DRG 105 Cardiac Valve	DRG 106 Cardiac Bypass	DRG 116 Pacemaker Implant	DRG 167 Appendectomy
Intercept	8222.65 (.959)	—	—	-182.37 (-.012)	-1089.78 (-.496)
Number of Beds	3.24 (.786)	—	—	17.83 (2.372**)	-.104 (-.095)
Population Dummy	-779.89 (-1.003)	—	—	2092.47 (1.484)	250.96 (1.369)
Share of Gov Beds	5228.54 (1.166)	—	—	-815.15 (-.189)	-303.21 (-.650)
Per Capita Income	-.003 (-.015)	-	—	.284 (.700)	.055 (.863)
Population Density	.116 (.202)	—	—	.730 (.824)	.078 (.606)
Percent of Population >70	117.19 (.548)	—	—	821.74 (1.868**)	17.27 (.303)
Percent of White Population	-61.85 (-1.144)	—	—	-78.77 (-.790)	-1.55 (-.099)
System Dummy	--	—	—	-3645.99 (-.750)	1208.99 (2.453**)
HHI	3784.04 (.723)	—	—	406.72 (.096)	958.94 (1.647**)
Average Length of Stay	845.56 (2.750**)	—	—	967.16 (8.162**)	1124.25 (8.141**)
Diversification	27828 (.639)	—	—	75534 (.250)	-8675.40 (-.581)
Wages	-.172 (-.880)	—	—	.139 (.376)	-.036 (-.703)
R^2	.16			.57	.39
n	31			80	139

** Denotes a coefficient that is significant at the 10% level.

() Denotes t-statistics

-- Denotes a variable that was omitted from the regression.

TABLE XXXIV (CONTINUED)

Independent Variables	DRG 209 Limb Reattachment	DRG 232 Arthroscopy	DRG 258 Total Mastectomy	DRG 262	DRG 268
Intercept	4324.89 (.409)	-1621.42 -.227()	379.18 (.071)	733.63 (.165)	-1251.50 (-.185)
Number of Beds	8.65 (1.708**)	.993 (.358)	2.22 (.755)	-2.94 (-1.694**)	-1.06 (-363)
Population Dummy	-2042.67 (-2.126**)	67.86 (.123)	-292.36 (-.527)	278.06 (.765)	539.19 (.961)
Share of Gov Beds	105.13 (.034)	429.14 (.210)	-1584.69 (-1.053)	-201.32 (-.234)	2455.02 (1.714**)
Per Capita Income	.186 (.600)	-.009 (-.055)	.249 (1.493)	.259 (1.637**)	-.126 (-.773)
Population Density	.103 (.169)	.385 (1.094)	.146 (.466)	-.102 (-.311)	.560 (1.381)
Percent of Population >70	-26.97 (-.089)	171.50 (.913)	154.60 (1.035)	37.64 (.342)	-61.80 (-.312)
Percent of White Population	-3.56 (-.049)	9.56 (.198)	-39.55 (-.991)	-15.75 (-.509)	26.57 (.642)
System Dummy	--	1719.90 (1.815**)	374.78 (.312)	--	134.16 (.125)
HHI	2266.47 (.596)	-363.02 (-.420)	330.80 (.247)	-320.65 (-.669)	-356.32 (-.380)
Average Length of Stay	873.87 (7.870**)	949.92 (12.187**)	1327.97 (12.421**)	908.99 (9.124**)	892.13 (15.159**)
Diversification	-17427 (-.2852)	-67966 (-.416)	-30478 (-.197)	-41520 (-.526)	-86652 (-.856)
Wages	.-.074 (-.282)	-.044 (-.258)	-.137 (-.951)	-.080 (-.621)	.104 (.715)
R^2	.39	.69	.59	.56	.80
n	105	71	113	72	72

** Denotes a coefficient that is significant at the 10% level.
() Denotes t-statistics
-- Denotes a variable that was omitted from the regression.

TABLE XXXIV (CONTINUED)

Independent Variables	DRG 306 Prostatectomy	DRG 355 Hysterectomy	DRG 371 Cesarean Section	DRG 373 Vaginal Delivery
Intercept	-16165 (-1.018)	3789.97 (1.497)	2867.40 (1.039)	4444.21 (3.546**)
Number of Beds	-2.95 (.517)	1.33 (.963)	-2.09 (-1.655**)	.140 (.227)
Population Dummy	-934.57 (-.803)	543.09 (2.194**)	1128.12 (2.649**)	258.28 (1.575**)
Share of Gov Beds	1044.70 (.508)	-673.33 (-.965)	-255.78 (-.430)	-14.44 (-.053)
Per Capita Income	-.130 (-.203)	-.018 (-.242)	-.063 (-.739)	.021 (.511)
Population Density	.154 (.189)	.336 (1.863**)	.419 (2.021**)	-.004 (-.037)
Percent of Population >70	212.60 (.556)	55.51 (.709)	82.23 (1.081)	-78.63 (-2.230**)
Percent of White Population	54.66 (.396)	-17.20 (-.996)	-3.02 (-.194)	-18.91 (-2.364**)
System Dummy	1106.68 (.683)	--	260.59 (.460)	597.33 (2.141**)
HHI	1461.78 (.675)	1500.66 (1.626**)	1715.69 (2.323**)	379.49 (1.104)
Average Length of Stay	1166.26 (9.397**)	844.10 (6.905**)	233.68 (.898)	33.88 (.244)
Diversification	22731 (.053)	-7462.88 (-.972)	-11957 (-2.308**)	-2217.55 (-2.653**)
Wages	.467 (1.011)	-.089 (-1.471)	.012 (.220)	-.066 (-2.555**)
R^2	.75	.37	.15	.19
n	36	142	75	80

** Denotes a coefficient that is significant at the 10% level.
() Denotes t-statistics
-- Denotes a variable that was omitted from the regression.

TABLE XXXV

REGRESSION RESULTS: DEPENDENT VARIABLE = PRICE OF DRG ALL HOSPITALS

Independent Variables	DRG 36 Retinal Procedures	DRG 105 Cardiac Valve Procedures	DRG 106 Cardiac Bypass	DRG 116 Pacemaker Implant	DRG 167 Appendectomy
Intercept	7439.43 (2.242**)	34951 (1.15)	9212.77 (.32)	6315.68 (1.136)	1302.97 (1.533)
Teaching Hospital Dummy	38.08 (.088)	951.78 (.30)	295.65 (.11)	-279.39 (-.252)	371.15 (1.955**)
Number of Beds	-.208 (-.219)	-2.77 (-.371)	-11.81 (-1.81**)	2.07 (.891)	-1.01 (-2.720**)
Population Dummy	722.52 (2.481**)	858.35 (.374)	2758.72 (1.33)	852.78 (1.240)	463.52 (4.577**)
Share of Gov Beds	-519.20 (-.506)	10173 (1.18)	9946.00 (.97)	2010.52 (1.199)	-278.28 (-1.480)
Per Capita Income	.222 (2.363**)	.29 (.38)	.33 (.52)	.192 (1.189)	.065 (2.696**)
Population Density	-.056 (-.968)	.44 (.81)	.01 (.02)	-.232 (-1.819**)	.0278 (1.414)
Percent of Population >70	9.36 (.125)	-281.66 (-.42)	-437.23 (-.74)	983.75 (.627)	-7.63 (-.388)
Percent of White Population	-53.25 (-2.347**)	-3.79 (-.02)	-12.28 (-.07)	-55.90 (-1.361)	-5.67 (-.916)
System Dummy	782.14 (.459)	-2541.82 (-.22)	914.73 (.071)	1354.20 (.874)	260.58 (1.451)
HHI	777.53 (.686)	-8477.44 (-.95)	-2151.03 (-.174)	2988.21 (1.682**)	372.20 (1.440)
Average Length of Stay	1028.84 (12.604**)	951.17 (7.47**)	1852.67 (7.55**)	1012.31 (15.302**)	889.22 (12.762**)
Diversification	8584.82 (1.686**)	-40198 (-.10)	24538 (.208)	99300 (.788)	-17207 (-1.995**)
Wages	-.275 (-3.099**)	-.57 (-.75)	.08 (.11)	.028 (.179)	-.058 (-2.672**)
Government Dummy	-814.83 (-2.131**)	-4862.84 (-1.43)	-6805.02 (-2.44**)	-1651.59 (-2.158**)	18.38 (.176)
For Profit Dummy	552.80 (1.863**)	8342.48 (2.64**)	5076.86 (1.94**)	642.52 (1.108)	577.35 (7.070**)
R^2	.56	.40	.44	.49	.48
n	148	86	88	288	428

** Denotes a coefficient that is significant at the 10% level.
() Denotes t-statistics
-- Denotes a variable that was omitted from the regression.

TABLE XXXV (CONTINUED)

Independent Variables	DRG 209 Limb Reattachment	DRG 232 Arthroscopy	DRG 258 Total Mastectomy	DRG 262 Breast Biopsy	DRG 268 Breast Implant
Intercept	6570.50 (1.556)	-332.80 (-.172)	1070.94 (.558)	496.98 (.275)	4429.40 (1.797)
Teaching Hospital Dummy	-302.63 (-.342)	-247.98 (-.669)	734.21 (1.642**)	19.20 (.061)	867.38 (1.769**)
Number of Beds	3.26 (1.903**)	-.098 (-.129)	-1.41 (-1.585**)	-.787 (-1.250)	-.291 (-.288)
Population Dummy	737.34 (1.465)	315.78 (1.384)	296.74 (1.177)	494.50 (2.483**)	56.25 (.183)
Share of Gov Beds	174.80 (.116)	183.10 (.407)	449.22 (.868)	-294.77 (-.684)	-120.62 (-.245)
Per Capita Income	.263 (2.161**)	.055 (1.003)	.089 (1.533)	.116 (1.981**)	.080 (1.048)
Population Density	.024 (.252)	.093 (2.124**)	.043 (.919)	.002 (.046)	.024 (.411)
Percent of Population >70	97.62 (.959)	39.26 (.749)	26.53 (.549)	30.05 (.570)	-88.88 (-1.358)
Percent of White Population	-6.45 (-.207)	5.88 (.396)	-.558 (-.037)	-.572 (-.042)	-18.18 (-.952)
System Dummy	-1708.50 (-1.313)	601.01 (2.495**)	244.03 (.553)	-56.90 (-.230)	42.71 (.110)
HHI	-3176.09 (-2.137**)	340.54 (1.000)	-394.50 (-.722)	-173.75 (-.546)	-256.47 (-.513)
Average Length of Stay	618.28 (12.596**)	702.64 (33.336**)	563.96 (14.630**)	836.66 (20.053**)	668.43 (22.838**)
Diversification	29422 (1.246)	14339 (.521)	-124845 (-1.539)	-13038 (-.220)	-39358 (-.689)
Wages	-.092 (-.767)	-.030 (-.545)	-.015 (-.272)	-.056 (-1.041)	-.055 (-.760)
Government Dummy	-1500.83 (-2.834**)	-251.30 (-.715)	-274.89 (-1.026)	-4.11 (-.010)	-600.75 (-1.621**)
For Profit Dummy	1198.86 (2.862**)	868.85 (4.479**)	959.80 (4.821**)	268.01 (1.559**)	370.56 (1.388)
R^2	.41	.83	.45	.68	.68
n	357	229	370	206	261

** Denotes a coefficient that is significant at the 10% level.
() Denotes t-statistics
-- Denotes a variable that was omitted from the regression

TABLE XXXV (CONTINUED)

Independent Variables	DRG 306 Prostatectomy	DRG 355 Hysterectomy	DRG 371 Cesarean Section	DRG 373 Vaginal Delivery
Intercept	2723.38 (.595)	781.40 (.721)	767.72 (.790)	1050.71 (2.609**)
Teaching Hospital Dummy	94.66 (.123)	485.61 (1.924**)	327.30 (1.576**)	264.21 (2.794**)
Number of Beds	-1.64 (-1.118)	-1.04 (-2.259**)	-1.09 (-2.703**)	-.008 (-.046)
Population Dummy	480.27 (1.015)	762.64 (5.710**)	539.20 (3.917**)	216.81 (3.501**)
Share of Gov Beds	-662.64 (-.744)	63.22 (.207)	60.06 (.264)	36.66 (.384)
Per Capita Income	-.023 (-.167)	.084 (2.792**)	.070 (2.587**)	.041 (3.371**)
Population Density	-.016 (-.180)	.032 (1.210)	.048 (.986)	.013 (1.118)
Percent of Population >70	8.13 (.075)	-5.076 (-.185)	23.48 (1.013)	-13.92 (-1.495)
Percent of White Population	-26.90 (-.706)	-6.74 (-.881)	-6.51 (-.920)	-5.39 (-1.721**)
System Dummy	45.16 (.090)	712.47 (2.150**)	412.76 (2.195**)	145.97 (1.885**)
HHI	-827.32 (-.944)	584.70 (1.568**)	935.46 (3.147**)	177.62 (1.377)
Average Length of Stay	974.09 (19.753**)	973.86 (15.457**)	587.22 (5.990**)	352.72 (5.677**)
Diversification	-72525 (-.484)	-18246 (-3.520**)	-9505.43 (-3.197**)	-1407.75 (-3.205**)
Wages	.0265 (.204)	-.084 (-3.036**)	-.025 (-1.005)	-.017 (-1.574**)
Government Dummy	-975.62 (-1.549**)	-167.54 (-1.254)	103.40 (.904)	-43.01 (-.831)
For-Profit Dummy	1051.79 (2.592**)	797.02 (7.418**)	855.25 (8.345**)	172.06 (3.743**)
R^2	.78	.57	.35	.44
n	130	425	298	315

** Denotes a coefficient that is significant at the 10% level.

() Denotes t-statistics

-- Denotes a variable that was omitted from the regression.

TABLE XXXVI

FINAL REGRESSION RESULTS: DEPENDENT VARIABLE = PRICE OF DRG NON-PROFIT HOSPITALS

Independent Variables	DRG 36 Retinal Procedures	DRG 105 Cardiac Valve	DRG 106 Cardiac Bypass	DRG 116 Pacemaker Implant	DRG 167 Appendectomy
Intercept	3013.77 (2.52**)	18579 (5.294**)	-2982.30 (-.519)	5576.87 (1.352)	959.30 (1.676**)
Teaching Hospital Dummy	--	--	--	--	526.36 (2.599**)
Number of Beds	--	8.75 (1.350)	--	5.41 (2.484**)	-.755 (-1.703**)
Population Dummy	1311.73 (4.505**)	--	2436.62 (1.571)	--	479.43 (4.051**)
Share of Gov Beds	--	--	--	2918.33 1.375	-211.62 (-.909)
Per Capita Income	.104 (1.383)	--	.458 (1.335)	.182 (1.468)	.077 (3.165**)
Population Density	--	.326 (1.232)	--	-.162 (-1.662**)	.029 (1.798**)
Percent of Population >70	--	--	--	--	--
Percent of White Population	--	--	--	-72.48 (-1.911**)	--
System Dummy	--	--	--	3463.74 (2.158**)	216.86 (1.000)
HHI	742.45 (.700)	-6697.30 (-.857)	-5652.41 (-.936)	5506.71 (2.755**)	65.45 (.208)
Average Length of Stay	1233.63 (13.611**)	917.10 (7.302**)	2271.66 (9.813**)	1145.21 (11.155**)	763.85 (8.715**)
Diversification	7110.87 (1.508)	--	--	--	-10513 (-.858)
Wages	-.186 (-2.732**)	--	--	--	-.057 (-2.524)
R^2	.68	.45	.62	.50	.49
n	97	68	69	162	207

** Denotes a coefficient that is significant at the 10% level.
() Denotes t-statistics.
-- Denotes a coefficients that are jointly equal to zero.

TABLE XXXVI (CONTINUED)

Independent Variables	DRG 209 Limb Reattachment	DRG 232 Arthroscopy	DRG 258 Total Mastectomy	DRG 262 Breast Biopsy	DRG 268 Breast Implants
Intercept	4112.80 (2.644**)	-293.27 (-.473)	2217.30 (3.770**)	-252.75 (-.368)	414.30 (.505)
Teaching Hospital Dummy	1299.18 (1.628**)	-463.59 (-1.699**)	1324.47 (3.382**)	333.01 (1.058)	799.71 (1.980**)
Number of Beds	--	--	-3.11 (-3.693**)	--	--
Population Dummy	1761.47 (3.288**)	695.27 (2.984**)	518.83 (2.374**)	398.98 (1.606)	359.47 (1.214)
Share of Gov Beds	--	--	--	--	--
Per Capita Income	.193 (2.186**)	.050 (1.370)	.094 (2.651**)	.055 (1.206)	.070 (1.331)
Population Density	--	.084 (3.083**)	--	--	--
Percent of Population >70	--	--	--	--	--
Percent of White Population	--	--	--	--	--
System Dummy	--	566.00 (2.600**)	--	--	--
HHI	-3586.12 (-2.482**)	728.35 (2.269**)	-1251.40 (-2.860**)	366.26 (1.108)	606.38 (1.342)
Average Length of Stay	671.18 (10.584**)	685.30 (38.742**)	378.14 (11.720**)	848.78 (17.334**)	701.66 (20.888**)
Diversification	39156 (1.578)	28295 (1.423)	--	--	--
Wages	--	--	--	--	--
R^2	.50	.93	.51	.75	.76
n	192	118	193	107	145

** Denotes a coefficient that is significant at the 10% level.
() Denotes t-statistics.
-- Denotes coefficients that are jointly equal to zero.

TABLE XXXVI (CONTINUED)

Dependent Variables	DRG 306 Prostatectomy	DRG 355 Hysterectomy	DRG 371 Cesarean Section	DRG 373 Vaginal Delivery
Intercept	7124.41 (1.546)	1498.08 (1.135)	1748.74 (1.621)	-77.45 (-.337)
Teaching Hospital Dummy	--	695.85 (2.613**)	726.84 (3.139**)	350.79 (3.852**)
Number of Beds	-2.01 (-1.346)	-1.40 (-2.563**)	-1.03 (-2.153**)	--
Population Dummy	1357.34 (2.376**)	786.21 (4.978**)	399.30 (2.876**)	147.60 (2.293**)
Share of Gov Beds	-1800.81 (-1.244)	664.75 (1.630)	--	--
Per Capita Income	--	.132 (4.042**)	.111 (3.831**)	.031 (2.863**)
Population Density	-.013 (-.189)	--	--	.012 (1.329)
Percent of Population >70	--	--	--	--
Percent of White Population	-23.11 (-.631)	-12.66 (-1.376)	-15.27 (-2.060**)	--
System Dummy	-1013.82 (-1.499)	695.60 (1.745**)	561.54 (2.120**)	126.10 (1.252)
HHI	-2447.68 (-2.162**)	571.12 (1.223)	577.31 (1.473)	49.85 (.332)
Average Length of Stay	906.58 (15.281**)	950.09 (11.235**)	668.34 (5.020**)	495.53 (6.477**)
Diversification	-176296 (-1.031)	-38852 (-4.231**)	-6834.97 (-1.688**)	--
Wages	-.106 (-.994)	-.110 (-2.957**)	-.072 (-2.285**)	--
R^2	.79	.63	.41	.59
n	74	201	157	162

** Denotes a coefficient that is significant at the 10% level.

() Denotes t-statistics.

-- Denotes coefficients that are jointly equal to zero.

TABLE XXXVII

FINAL REGRESSION RESULTS: DEPENDENT VARIABLE = PRICE OF DRG FOR-PROFIT HOSPITALS

Independent Variables	DRG 36 Retinal Procedures	DRG 105 Cardiac Valve	DRG 106 Cardiac Bypass	DRG 116 Pacemaker Implant	DRG 167
Intercept	10124 (1.639)	--	--	4264.60 (.604)	-1779.42 (-2.006**)
Teaching Hospital Dummy	--	--	--	--	--
Number of Beds	--	--	--	18.21 (2.509**)	--
Population Dummy	--	--	--	2112.63 (1.562)	221.53 (1.264)
Share of Gov Beds	4066.22 (1.206)	--	--	--	--
Per Capita Income	--	--	--	.45 (1.635)	.046 (1.192)
Population Density	--	--	--	--	--
Percent of Population >70	--	--	--	587.33 (1.654)	--
Percent of White Population	-55.87 (-1.321)	--	--	-127.96 (-2.361**)	--
System Dummy	--	--	--	--	1266.46 (2.784**)
HHI	2537.54 (.584)	--	--	832.80 (.228)	802.80 (1.562)
Average Length of Stay	782.34 (3.182**)	--	--	973.55 (9.297**)	1130.80 (9.055**)
Diversification	--	--	--	--	--
Wages	-.175 (-1.187)	--	--	--	--
R^2	.27	--	--	.59	.41
n	31	--	--	80	139

** Denotes a coefficient that is significant at the 10% level.

() Denotes t-statistics.

-- Denotes coefficients that are jointly equal to zero or too few observations

TABLE XXXVII (CONTINUED)

Dependent Variables	DRG 209 Limb Reattachment	DRG 232 Arthroscopy	DRG 258 Total Mastectomy	DRG 262 Breast Biopsy	DRG 268 Breast Implants
Intercept	2159.47 (.685)	-1688.86 (-.855)	806.14 (.157)	-878.53 (-.745)	682.61 (1.034)
Teaching Hospital Dummy	--	--	--	--	--
Number of Beds	8.60 (1.765**)	--	2.37 (.852)	-2.82 (-1.886**)	--
Population Dummy	-2078.08 (-2.265**)	--	--	--	--
Share of Gov Beds	--	--	-1848.24 (-1.294)	--	1992.16 (1.665)
Per Capita Income	.179 (.984)	--	.285 (1.935**)	.167 (2.271**)	--
Population Density	--	.246 (1.026)	--	--	.572 (2.626**)
Percent of Population >70	--	155.39 (1.042)	136.14 (1.003)	--	--
Percent of White Population	--	--	-43.60 (-1.197)	--	--
System Dummy	--	1788.49 (2.021**)	--	--	--
HHI	2340.13 (.709)	-258.04 (-.384)	110.94 (.092)	-168.55 (-.409)	-297.90 (-.378)
Average Length of Stay	879.86 (8.537**)	955.39 (12.966**)	1344.78 (13.095**)	902.52 (9.931**)	898.26 (16.833**)
Diversification	--	--	--	--	--
Wages	--	--	-.135 (-.973)	--	--
R^2	.43	.72	.60	.59	.81
n	105	72	113	72	72

** Denotes a coefficient that is significant at the 10% level.
() Denotes t-statistics.
-- Denotes coefficients that are jointly equal to zero.

TABLE XXXVII (CONTINUED)

Independent Variables	DRG 306 Prostatectomy	DRG 355 Hysterectomy	DRG 371 Cesarean Section	DRG 373 Vaginal Delivery
Intercept	-5194.93 (-1.515)	2112.74 (2.137**)	3962.02 (3.181**)	4563.92 (4.564**)
Teaching Hospital Dummy	--	--	--	--
Number of Beds	--	--	-1.64 (-1.401)	--
Population Dummy	--	591.31 (2.458**)	1184.27 (2.920**)	247.82 (1.578)
Share of Gov Beds	--	--	--	--
Per Capita Income	--	--	-.077 (-1.051)	--
Population Density	--	.295 (2.183**)	.469 (2.766**)	--
Percent of Population >70	--	--	90.60 (1.301)	-85.99 (-2.930**)
Percent of White Population	--	--	--	-17.02 (-2.888**)
System Dummy	--	--	--	617.29 (2.528**)
HHI	1069.53 (.711)	1290.54 (1.488)	1524.36 (2.279**)	228.19 (.784)
Average Length of Stay	1147.69 (11.272**)	858.96 (7.451**)	--	--
Diversification	--	--	-11142 (-2.276**)	-2244.16 (-2.812**)
Wages	.225 (1.575)	-.061 (-1.424)	--	-.058 (-2.617**)
R^2	.80	.37	.19	.23
n	36	141	75	80

** Denotes a coefficient that is significant at the 10% level.

() Denotes t-statistics.

-- Denotes coefficients that are jointly equal to zero.

TABLE XXXVIII

SUMMARY OF SIGNIFICANT HHI COEFFICIENTS

DRG	Non - Profit Hospitals	For - Profit Hospitals	All Hospitals
36	0	0	0
105	0	0	0
106	0	0	0
116	+	0	+
167	0	+	0
209	-	0	-
232	0	0	0
258	-	0	0
262	0	0	0
268	+	0	0
306	-	0	0
355	0	+	+
371	+	+	+
373	0	0	0

0 Denotes an HHI coefficient that is not significant at the 10% confidence level.

TABLE XXXIX

SORT BY AVERAGE ADJUSTED CHARGE THE SIGN OF COEFFICIENT OF HHI: NON-PROFIT REGRESSIONS

DRG	Sign of the HHI Coefficient	Average Adjusted Charges
371	+	3564
268	+	3925
258	-	4275
306	-	6242
209	-	14141
116	+	14362

TABLE XXXX

REGRESSION RESULTS: MEASURE OF CONCENTRATION = CR4 DEPENDENT VARIABLE = PRICE OF DRG FOR-PROFIT HOSPITALS

Independent Variables	DRG 116 Pacemaker Implant	DRG 209 Limb Reattachment	DRG 232 Arthroscopy
Intercept	-5344.22 (-.372)	4074.87 (.385)	-463.46 (-.069)
Number of Beds	17.73 (2.363**)	8.60 (1.68**)	2.94 (1.13)
Population Dummy	1932.06 (1.366)	-2091.22 (-2.16**)	451.74 (.779)
Share of Gov Beds	-599.98 (-1.37)	475.24 (.154)	1483.09 (.717)
Per Capita Income	.178 (.463)	.171 (.553)	-.095 (-.557)
Population Density	.744 (.917)	.0897 (.143)	.395 (1.14)
Percent of Population >70	820.69 (1.88**)	-16.71 (-.055)	175.36 (.966)
Percent of White Population	-58.55 (-.605)	.393 (.005)	17.66 (.394)
System Dummy	687.44 (.695)	--	1147.37 (2.39**)
Four Firm Concentration	-263.59 (-.072)	683.98 (.298)	-1984.49 (-.997)
Average Length of Stay	958.73 (8.23**)	871.01 (7.78**)	942.09 (12.41**)
Diversification	73358 (.248)	-22273 (-.368)	-107310 (-.591)
Wages	.204 (.580)	-.0714 (-.271)	.026 (.155)
R^2	.57	.39	.65
n	80	105	71

** Denotes a coefficient that is significant at the 10% level.
() Denotes t-statistics.
-- Denotes a variable that was omitted from regression.

TABLE XXXXI

REGRESSION RESULTS: MEASURE OF CONCENTRATION = CR4 DEPENDENT VARIABLE = PRICE OF DRG NON-PROFIT HOSPITALS

Independent Variables	DRG 116 Pacemaker Implant	DRG 209 Limb Reattachment	DRG 232 Arthroscopy
Intercept	9443.80 (1.48)	8433.91 (1.73**)	-291.48 (-.14)
Teaching HospitalDummy	1254.03 (1.02)	1151.69 (1.17)	-521.91 (-1.40)
Number of Beds	3.42 (1.18)	-1.01 (-.47)	-.087 (-.10)
Population Dummy	615.79 (.80)	1800.29 (3.11**)	790.88 (3.28**)
Share of Gov Beds	1638.95 (.77)	-1845.05 (-.86)	-848.24 (-1.33)
Per Capita Income	.231 (1.30)	.237 (1.74**)	.064 (1.18)
Population Density	-.228 (-1.60**)	-1.09 (-.99)	.095 (2.14**)
Percent of Population >70	-21.81 (-.13)	35.24 (.28)	25.65 (.46)
Percent of White Population	-87.41 (-1.72**)	-9.07 (-.24)	10.85 (.66)
System Dummy	-438.79 (-.76)	87.34 (.20)	83.53 (.49)
Four Firm Concentration	3751.70 (2.36**)	-4532.33 (-3.81**)	64.12 (.09)
Average Length of Stay	1141.01 (10.61**)	650.49 (10.07**)	686.67 (36.34**)
Diversification	35839 (.266)	32165 (1.27)	22783 (.959)
Wages	-.035 (-.19)	-.062 (-.45)	-.023 (-.41)
R^2	.48	.51	.93
n	162	192	118

** Denotes a coefficient that is significant at the 10% level.

() Denotes t-statistics.

-- Denotes a variable that was omitted from regression.

TABLE XXXXII

HERFINDAHL DUMMY COEFFICIENTS: NON-PROFIT REGRESSIONS

Threshold Value	DRG 36	DRG 116	DRG 167	DRG 258	DRG 306	DRG 371	DRG 373
.10	0	0	0	0	0	0	0
.20	975.1 (2.13*)	1747.54 (2.52*)	0	0	0	0	0
.30	0	1228.05 (1.64**)	0	-591.78 (-2.33*)	-780.66 (-1.6**)	0	0
.50	0	0	0	-665.90 (-2.06*)	0	0	0
.70	0	4660.18 (2.20*)	0	0	0	0	207.76 (1.72**)

TABLE XXXXIII

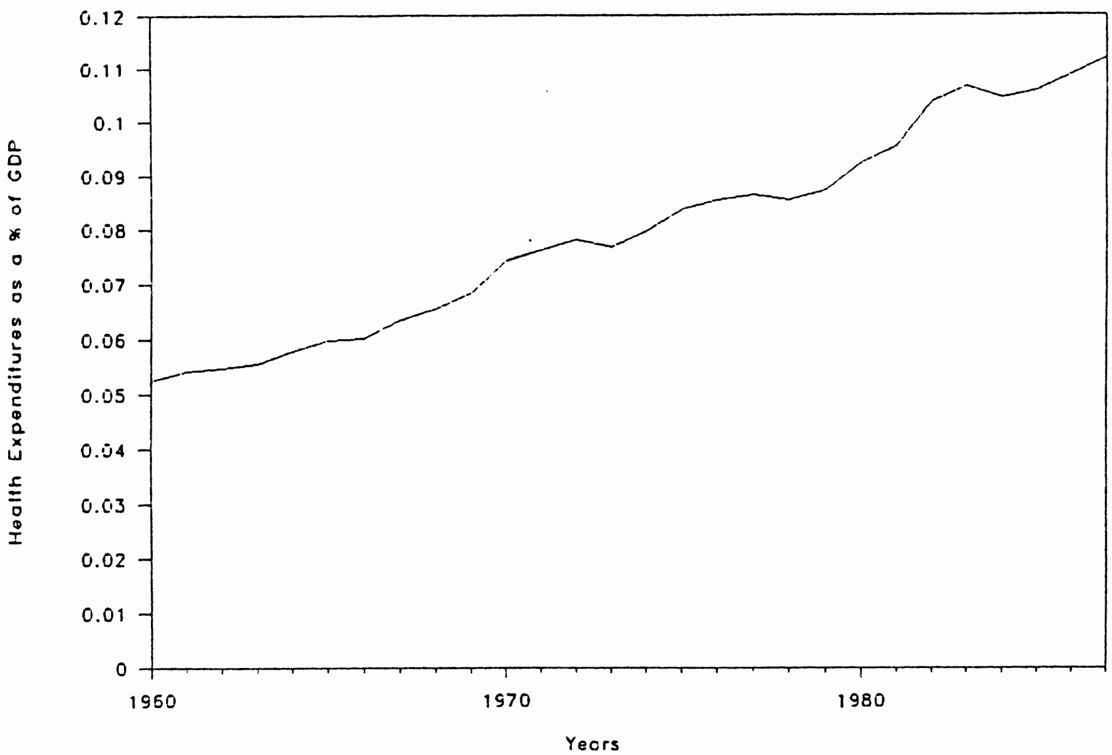
HERFINDAHL DUMMY COEFFICIENTS: FOR-PROFIT REGRESSIONS

Threshold Value	DRG 36	DRG 116	DRG 167	DRG 258	DRG 306	DRG 371	DRG 373
.10	1149.50 (1.63**)	0	0	0	0	0	0
.20	0	0	0	0	0	413.67 (1.70**)	0
.30	0	0	0	0	0	0	0
.50	0	0	681.29 (2.05*)	0	0	999.49 (2.17*)	0
.70	0	0	920.17 (1.96*)	0	0	0	0

* Denotes a coefficient that is significant at the 5 percent level.
** Denotes a coefficient that is significant at the 10 percent level.
() Denotes t-statistics.
0 Denotes a coefficient that is not signficant.

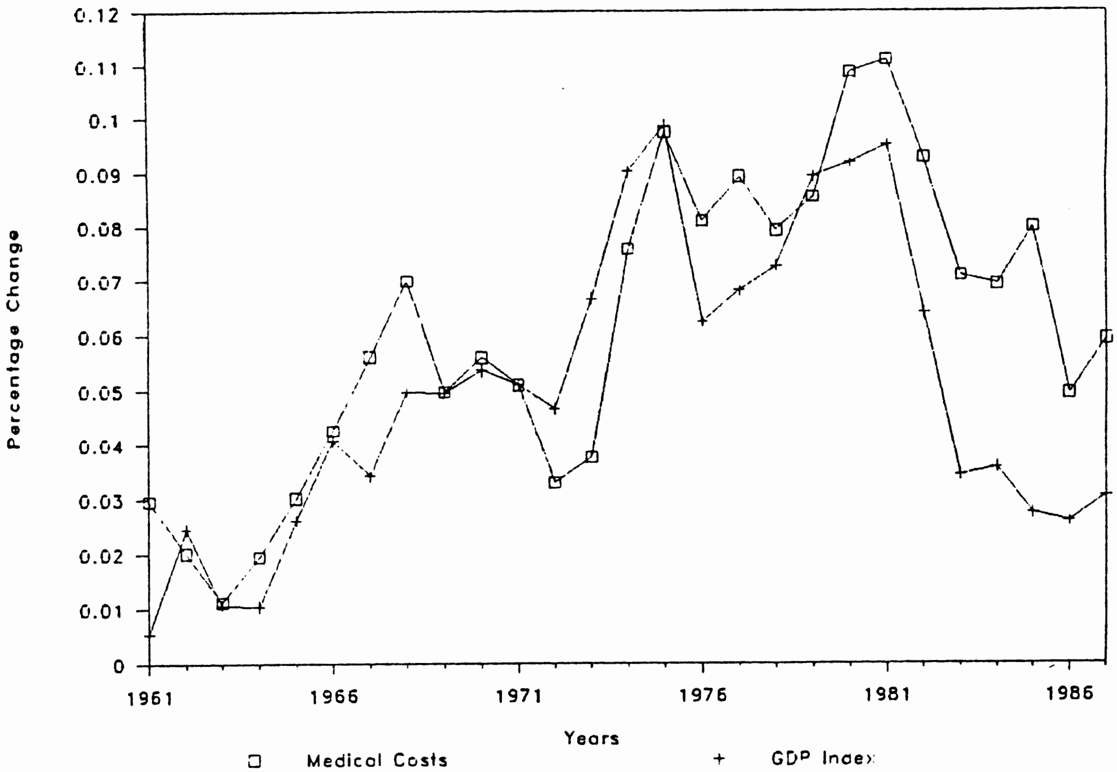
APPENDIX B

FIGURES



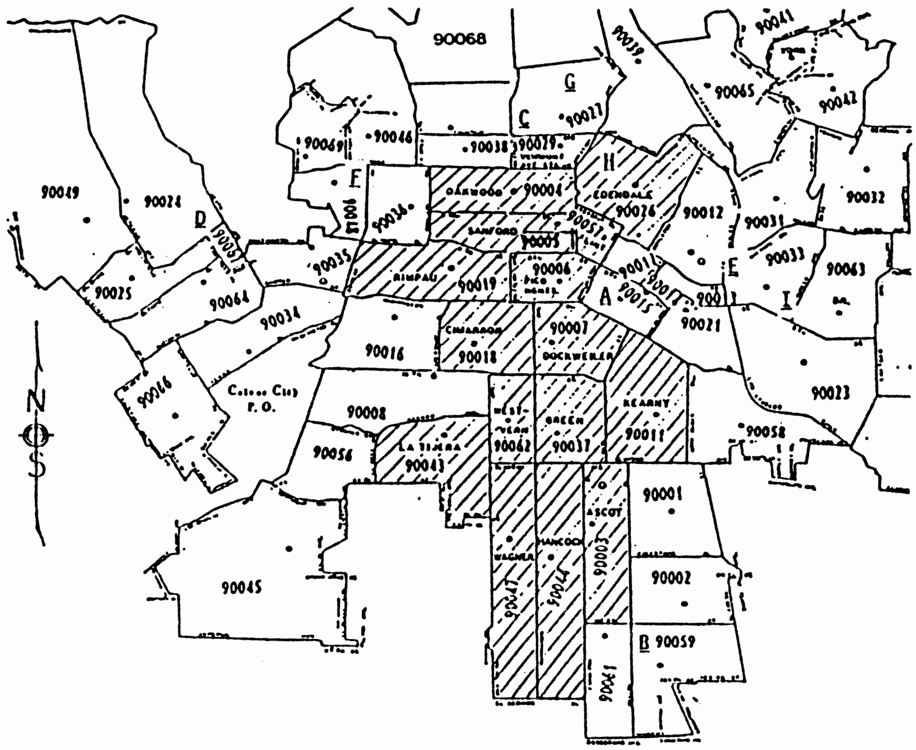
Source: <u>Health Care Financing Review</u>

Figure 1. Medical Expenditures



Source: Health Care Financing Review

Figure 2. Medical Costs



A California Medical Center
B Los Angeles County, Martin Luther King Drew Medical Center
C Hollywood Presbyterian
D UCLA Medical Center
E White Memorial Medical Center
F Cedars Sinai Medical Center - Beverly Blvd.
G Kaiser Foundation Hospital - West Los Angeles
H Queen of Angels Medical Center
I Los Angeles County USC Medical Center

Indicates a zip code that is a member of the initial market of the California Medical Center.

Map Source: Zip Code Directory

Figure 3. The Market for Vaginal Deliveries: California Medical Center

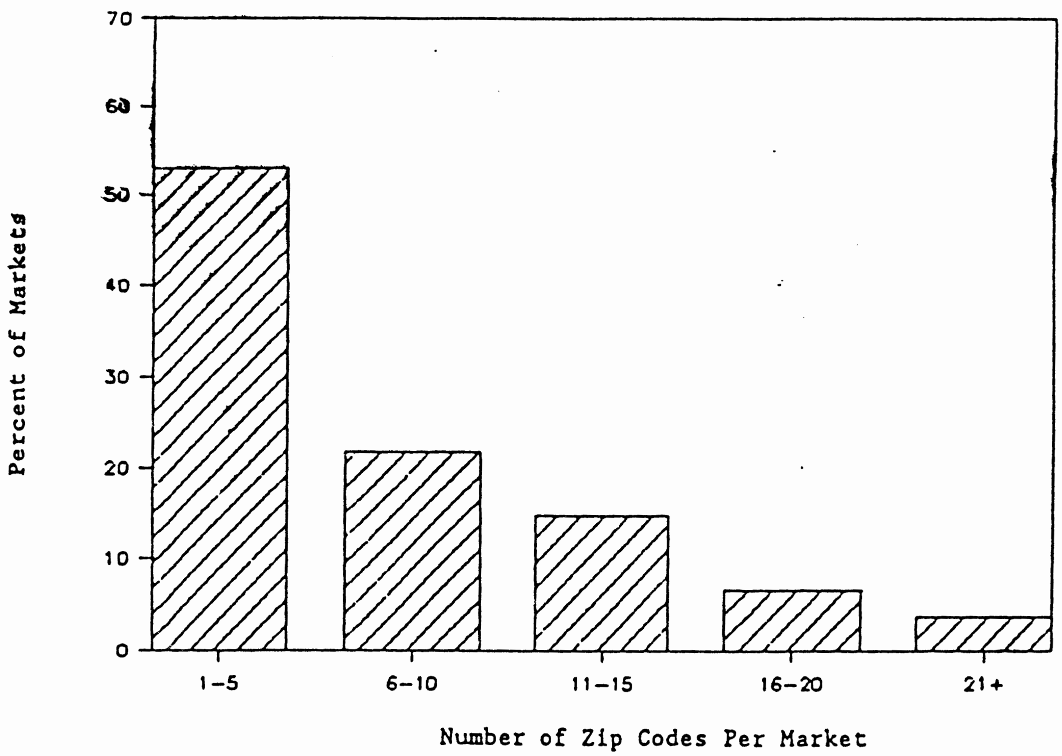


Figure 4. The Market Size of DRG 373, Vaginal Delivery

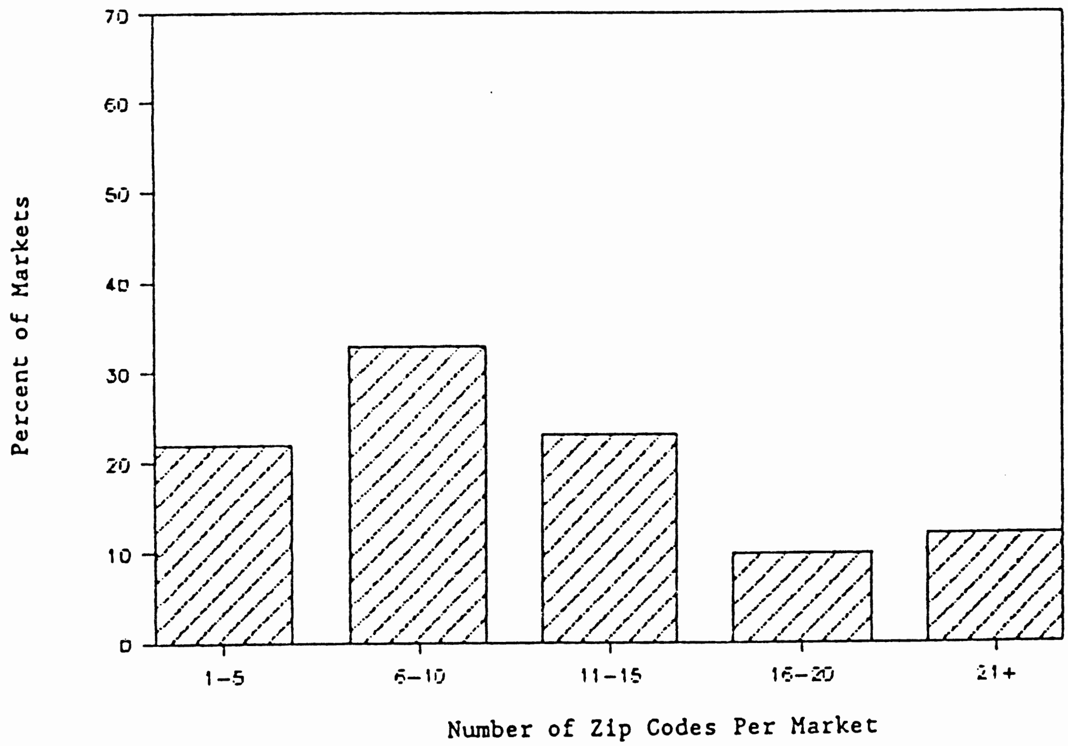


Figure 5. The Market Size of DRG 106, Coronary Bypass

VITA

John Anderson Wilson

Candidate for the Degree of

Doctor of Philosophy

Thesis: PRICES AND CONCENTRATION IN HOSPITAL MARKETS

Major Field: Economics

Biographical:

Personal Data: Born in Kansas City, Missouri, August 19, 1965, the son of William R. and Kay Wilson.

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Institution: Oklahoma State University

Location: Stillwater, Oklahoma

Title of Study: PRICES AND CONCENTRATION IN HOSPITAL MARKETS

Pages in Study: 94 Candidate for the Degree of Doctor of Philosophy

Major Field: Economics

Scope and Method of Study: The main purpose of this study was to determine how hospital markets react to competition. On the one hand, competition may tend to improve the welfare of society by reducing hospital charges to marginal cost. On the other hand, competition may drive up hospital charges due to several unusual characteristics about hospital markets. For instance, in most situations insurance pays a large portion of the patients' bill, making the consumer of healthcare insensitive to the level of price, but sensitive to the level of quality. Therefore hospitals in more competitive markets may drive up hospital costs and hospital charges by attempting to improve the level of quality. In addition, most hospitals are non-profit hospitals. Maw Lin Lee hypothesized that non-profit hospital managers attempt to maximize their utility functions by improving the status of their hospitals. To improve the status of their hospitals, the non-profit hospital managers increase the costs of the hospital by purchasing expensive equipment or improving the surroundings of the hospital. The end result is that competition among non-profit hospitals increases costs and charges. A price-concentration study was performed to determine whether competition tends to increase or reduce hospital charges.

Findings and Conclusions: This study showed that for-profit hospitals in more competitive markets charged lower prices than for-profit hospitals in less competitive markets. In addition, it was found that non-profit hospitals react to competition in two different ways. When patients have the ability to determine the level of price and quality that they desire, there was a tendency for there to be a positive relationship between hospital charges and market concentration. However, when the patients do not have time to determine information about hospitals, there was a tendency for non-profit hospitals to charge higher prices in more competitive markets. The fact that this negative relationship between price and concentration was only observed with non-profit hospitals tends to support Maw Lin Lee's hypothesis.

ADVISER'S APPROVAL: Joseph M. Jadlow