Competition among Hospitals for HMO Business: Effect of Price and Nonprice Attributes

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Objective. To investigate patterns of competition among hospitals for the business of health maintenance organizations (HMOs). The study focused on the relative importance of hospital price and nonprice attributes in the competition for HMO business.

Data Sources/Study Setting. The study capitalized on hospital cost reports from Florida that are unique in their inclusion of financial data regarding HMO business activity. The time frame was 1992 to 1997.

Study Design. The study was designed as an observational investigation of acute care hospitals.

Principal Findings. Results indicated that a hospital's share of HMO business was related to both its price and nonprice attributes. However, the importance of both price and nonprice attributes diminished as the number of HMOs in a market increased. Hospitals that were market share leaders in terms of HMO business (i.e., 30 percent or more market share) were superior, on average, to their competitors on both price and nonprice attributes.

Conclusions. Study results indicate that competition among hospitals for HMO business involves a complex set of price and nonprice attributes. The HMOs do not appear to focus on price alone. Hospitals likely to be the most attractive to HMOs are those that can differentiate themselves on the basis of nonprice attributes while being competitive on price as well.

Key Words. Hospitals, HMOs, business strategy

Policymakers and health care analysts have been keenly interested in the role of health maintenance organizations (HMOs) in stimulating price competition among hospitals. The HMOs are thought to fulfill this role in large part by referring their business to those hospitals that offer their services at discounted prices. In support of this perspective, several empirical studies have reported that HMOs slowed the rate of growth in hospital costs and prices in many parts of the United States during the 1990s (Gaskin and Hadley 1997; Bamezai et al. 1999; Zwanziger and Melnick 1992; Robinson 1996).

Much less understood, however, is the general pattern of competition among hospitals for HMO business. Price is only one of several hospital attributes that may be of interest to HMOs. Health maintenance organizations are also likely to consider the reputation of a hospital for quality and its accessibility to both existing and potential enrollees. Yet, little research has investigated the pattern of competition among hospitals for HMO business. The most comprehensive study to date was carried out by researchers at the University of Minnesota (Feldman et al. 1990; Kralewski et al. 1983; Kralewski et al. 1992). Their results suggested that in the competition among hospitals for HMO business, price was perhaps less important than certain nonprice attributes such as services offered. However, the University of Minnesota study has two important limitations regarding its generalizability. First, the study sample consisted of a small number of hospitals that were drawn from several selected communities. Second, the study was based on data from the mid-1980s. Between the mid-1980s and the mid-1990s, HMOs more than doubled their market penetration nationally (i.e., from approximately 18 percent to more than 36 percent) (Kertesz 1996). Certainly, the growth and maturation of HMOs may have affected the pattern of competition among hospitals for HMO business.

This paper reports results from our study of competition among hospitals for HMO business. In contrast to the University of Minnesota study, our study was based on a substantially larger sample of hospitals and entailed a longitudinal analysis of data from the 1990s. In addition, our study was the first to investigate patterns of competition among hospitals for HMO business by relating statistically a hospital's share of HMO business in its market to several price and nonprice attributes that were measured relative to those of the hospital's competitors. We carried out our study to address the following two

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questions:

- In the competition among hospitals for HMO business, what is the relative importance of price versus nonprice attributes?
- Do patterns of competition among hospitals for HMO business appear to differ depending on market characteristics?

BACKGROUND

Many health care analysts have credited managed care organizations, which include preferred provider organizations (PPOs)¹ as well as HMOs, with changing the competitive paradigm in the hospital industry (e.g., Dranove, Shanley, and White 1993; Cutler, McClellan, and Newhouse 2000; Melnick et al. 1992). Until the early 1980s, before managed care organizations had gained much footing in the health care industry, hospitals appeared to compete largely on the basis of technological sophistication and amenities. Since most hospital patients were insured through indemnity plans, they lacked a strong financial incentive to shop for hospital care on the basis of price. Patients could pass all or most of the cost of a hospital service on to their insurers. In this environment of indemnity insurance, patients were more likely to be attracted to the convenience of a hospital's services and possibly its reputation for quality. In addition, individual physicians built up trust relationships with their patients that gave them considerable influence over the market share of hospitals (Phelps 1992).

At the same time, hospitals actively sought to build their market share by recruiting to their medical staff physicians with large practices who would be a source of hospital admissions. To attract physicians, hospitals invested in equipment and facilities that physicians could use to generate income for their own practices. The reimbursement policies that both the federal government (i.e., Medicare) and many private insurers used during this era essentially guaranteed hospitals that they would recover the costs of their capital expenditures. As a result, hospitals competed by offering the most advanced medical technology, a style of competition that came to be called the medical arms race (Dranove and White 1994). A number of empirical studies indicate that this style of competition resulted in higher rather than lower hospital prices in the most competitive hospital markets (e.g., Robinson and Luft 1985; Farley 1985).

In theory, managed care organizations alter the competitive paradigm for hospitals through selective contracting arrangements whereby they channel enrollees to hospitals within their own provider networks. As managed care organizations have increased their market penetration, they have been able to demand price discounts from hospitals in exchange for their business. Several years ago, Dranove, Shanley, and White (1993) observed that managed care organizations such as HMOs have shifted the hospital industry from a patient-driven style of competition to a price-driven style of competition.

CONCEPTUAL FOUNDATION

As noted, price appears to be growing in importance as a competitive attribute in the hospital industry. However, the degree to which the hospital industry is now price-driven is not clear. The emergence of price competition does not necessarily exclude other forms of competition in this setting. The business strategy literature indicates that firms in an industry often can achieve competitive advantage through any one of several strategies that differ in terms of their relative emphasis on price and nonprice attributes.² Porter's (1980) framework of competitive strategy has been a particularly important source of guidance for researchers investigating patterns of competition in an industry. This framework generally recognizes two primary ways for firms to gain competitive advantage in a market: cost leadership and differentiation. Firms following a cost leadership strategy seek to reduce costs through such means as economies of scale, product standardization, and tight inventory controls. Firms that implement this strategy successfully are able to offer services or products at lower prices than their competitors. By contrast, firms following a differentiation strategy seek competitive advantage through the technical quality of their services, product innovations, or other nonprice attributes. They typically charge a premium price for the superior quality or innovative features of the products or services they offer.

Whether firms can achieve competitive advantage by focusing on both price and nonprice attributes simultaneously has been a controversial issue among scholars of business strategy. Porter has taken the position that firms seldom are able to achieve competitive advantage through both cost leadership and differentiation.³ From this perspective, while firms pursuing differentiation can operate efficiently in terms of production, the costs they incur in implementing the strategy (i.e., developing innovative products, marketing expenses, etc.) ultimately impedes their ability to achieve a cost

leadership position. However, some scholars have challenged Porter on this point. Hill (1988) has argued that firms may pursue differentiation to build market share under circumstances where the cost savings realized from the economies of scale outweigh the initial investment cost of pursuing a differentiation strategy. Such firms can then translate these cost savings into a strategy of cost leadership. Moreover, several empirical studies across a variety of industries have reported the presence of firms that successfully combined cost leadership and differentiation strategies (e.g., Hall 1983; White 1986). Still, a debate over this issue continues since other empirical studies have reported results supporting Porter's position about the inherent difficulty of combining cost leadership and differentiation strategies (e.g., Hambrick 1984). This debate provides a conceptual foundation for investigating the extent to which hospitals compete for HMO business on the basis of price versus nonprice attributes.

To conduct the investigation, we began with a conceptual model of hospital competition for HMO business that we developed based on the previously discussed literature. This model posits that a hospital's share of HMO business in its market is a function of several price and nonprice competitive attributes. With respect to price, hospitals that can offer lower prices to HMOs may have a source of competitive advantage. Since an HMO receives for each enrollee (who are largely grouped by employers) a fixed price or premium to cover all services during an enrollment period, the difference between premiums and provider expenses (i.e., the prices the HMOs pay to providers for providing services to enrollees) represents its profit. Thus HMOs are likely to be attracted to hospitals with relatively low prices.

Hospitals also may be able to secure HMO business by differentiating their services through nonprice attributes. A primary way for hospitals to pursue this strategy is through investment in medical technology, which can create a perception among patients and physicians that the hospital offers services that are at the cutting edge of medicine (Chirikos 1992). If patients and physicians do have this perception, HMOs may be attracted to hospitals that make such investments since the inclusion of these hospitals in their networks will likely enhance their own enrollment. Similarly, the presence of teaching programs for graduate medical education may also help a hospital differentiate itself among hospitals competing for HMO business. Hospitals that engage in graduate medical education have affiliations with medical schools that typically provide them with access to clinical specialists. Since teaching hospitals are likely to be regarded by patients and physicians as

innovators in clinical medicine, HMOs may be attracted to these hospitals for purposes of building their enrollment base.

A hospital's type of ownership may be relevant to its overall ability to differentiate its services as high quality. Some scholars argue that nonprofit ownership exists in health care largely because patients believe that nonprofits are less likely than for-profits to place financial considerations above clinical patient care (e.g., Hirth 1997; Hansmann 1980). From this perspective, most patients are not well prepared to judge the quality of care they receive and thus may be more comfortable receiving care from hospitals where profits, at least explicitly, are not central to their mission. If HMOs recognize this preference on the part of patients, they may try to maintain a strong network of nonprofit hospitals as a way to market their plan to potential enrollees. Although public hospitals also do not have profitability as an explicit goal, as government entities they may be perceived by patients to offer lower quality services relative to nongovernment hospitals. Thus, public hospitals may be at a competitive disadvantage in securing HMO business.

A hospital's physical location within a market may be a source of competitive advantage in securing HMO business. Existing research indicates that HMOs are attracted to hospitals with locations that are close to where enrollees reside (Feldman et al. 1990; Kralewski et al. 1992). A hospital's share of the available business of HMOs may also be affected by several structural characteristics of its local market such as the number of competing hospitals. Most hospitals compete for HMO business within local markets since patients typically obtain hospital services close to where they live (Garnick et al. 1987).⁴

METHODS

We conducted an observational study of the relationship between a hospital's share of HMO business in its market and its competitive position as indicated by the attributes included in our conceptual model. The setting for the study was Florida. We chose Florida for several reasons. First, Florida makes available several sources of hospital data that can be used to construct hospital-specific measures of market share for HMO business and prices. In particular, Florida offers a publicly available dataset that provides the amounts of gross and net revenues that hospitals earned from HMOs in a given year. Second, while Florida has a developing HMO market with penetration levels that were about the national average during the 1990s, there has also been considerable

variation across the state in HMO penetration rates (Miller et al. 1996). We were able to capitalize on this variation to assess whether patterns of competition among hospitals for HMO business differ relative to the stage of HMO market development as indicated by penetration rate and number of HMO plans. Third, Florida is a large and highly populous state with a number of hospital markets that have a mix of hospital ownership types. This enabled us to have a sufficient sample size within a single state for carrying out the study. Also, by focusing on hospital competition within a single state, we eliminated biases resulting from interstate differences in regulatory conditions that can affect patterns of competition in an industry. The timeframe for the study was 1992 to 1997. The study sample consisted of nonfederal, acute care hospitals.

To conduct the study, we used several datasets. The primary datasets were hospital cost reports and patient discharge files. We obtained both of these datasets from the Florida Agency for Health Care Administration. The reporting period for the cost reports is fiscal year whereas the reporting period for patient discharge files is calendar year. Accordingly, for purposes of the analyses presented in this paper, we reconstructed each study hospital's discharge files so they matched its fiscal year. We also obtained data on HMO activity in hospital markets from Douglas Wholey at the University of Minnesota. These data provide information on HMO penetration rates and number of HMOs by geographic area (e.g., metropolitan statistical area). The HMO penetration rates were also broken out by type of HMO (i.e., group/staff, independent practice association [IPA]). The construction of this dataset has been described elsewhere (Wholey, Feldman, and Christianson 1995).

Key Variables and Measures

Market Share. The dependent variable was a hospital's share of HMO business in its market. The construction of this variable entailed several steps. A first step was to define the market for hospitals competing for the business of HMOs. Researchers have defined hospital markets in several ways based on either geopolitical boundaries, travel distances to the hospital, or geographic patterns among patients admitted to the hospital (Garnick et al. 1987). Following several previous studies, we defined market as a metropolitan statistical area (MSA) (e.g., Chernew 1995; Burns et al. 2000). There is typically a negligible presence of HMOs outside MSAs (Burns et al. 2000).

A second step was measuring each hospital's share of the HMO business in its market. We used and compared two different measurement units for

computing market share. One unit was HMO revenue; the other was HMO admissions. Many studies of hospital competition use inpatient admissions for assessing a hospital's overall market share (e.g., Dranove, Shanley, and White 1993; Chirikos 1992). However, the use of admissions has important limitations since hospitals are increasingly shifting care to outpatient settings. Indeed, because the revenues of HMOs are capped during their enrollment periods, they have an incentive to control inpatient utilization and may actually prefer to do business with hospitals that are willing to help them in this endeavor (Melnick et al. 1992). Thus, market share based on admissions may be an inadequate measure of a hospital's success in competing for HMO business. The computation of market share based on HMO revenue avoids these problems. To strengthen the reliability of study results, we computed market share based on revenues and on admissions so that the results could be compared.

To compute market share based on HMO revenues, we summed for each market the total net HMO revenue (net of discounts) that all hospitals earned in a given year. We then computed each hospital's market share based on the proportion of the HMO revenue that it earned within that market. Data on hospital revenues from HMOs were obtained from hospital cost reports. We computed market share based on admissions following essentially the same procedures we used for computing market share based on HMO revenues. Data on HMO admissions were obtained from patient discharge abstracts. These abstracts indicate whether a patient's source of payment was an HMO.

Price. Our measure of price focused on inpatient services. Although it would be valuable to have a measure of price that covered both inpatient and outpatient services, there is no well-defined unit for measuring hospital price for outpatient services. Instead, we used inpatient price as a proxy for the hospital's competitive position on price for HMO business in general. Since hospital care is primarily a local market, in terms of competitive strategy it is not a hospital's absolute price that is important but its price relative to competitors in the local market area. Therefore, we created an index of relative hospital prices for HMO business in each market. To create this index for each hospital-observation that had at least five hundred HMO admissions in a given year, we first computed the average net revenue for each of ten common HMO medical-surgical admissions (based on diagnosis related groups [DRGs]).⁵ This entailed summing the hospital's gross charges (i.e., from the discharge files) for each type of admission or DRG and adjusting the gross charges by the hospital's overall discount rate to HMOs (i.e., the

difference between the hospital's gross HMO revenues and net HMO revenues, which was obtained from the hospital cost reports).⁶ We then computed the average of the net revenue earned per admission across all ten types of admissions, which was the hospital-specific price. In previous studies researchers have used a similar procedure to compute a hospital's mean price for all its private payers (e.g., Lynk 1995; Keeler, Melnick, and Zwanziger 1999).

If a hospital did not have at least five hundred HMO admissions, we imputed an HMO price based on the hospital's average net price for all medical–surgical admissions. We did this because an HMO price calculated on a small number of HMO admissions according to the procedures outlined above may not be reliable. Less than 8 percent of the observations in the study sample had fewer than five hundred HMO admissions in a given year. The correlation between a hospital's price for HMO medical–surgical admissions (for those observations with more than five hundred admissions) and its price for all medical–surgical admissions was .71.

To obtain hospital relative prices for all hospitals in the sample, we divided the focal hospital's HMO price by the mean HMO price for all competitor hospitals in its market. An index value above one indicated that the focal hospital's price was above the average price of its competitors; an index value below one indicated the focal hospital's price was below the average price of its competitors.

Our study raises an important methodological issue as to whether the price index is endogenous with the estimation of hospital market share. To examine this issue empirically, we performed a Hausman test (Staiger and Stock 1997)⁷ This entailed two primary steps. First, we selected a set of instruments for the hospital price index as part of an instrumental variable (IV) analysis. Since a hospital's price can be expected to be related to market-level conditions affecting the demand for hospital services, we included as instruments several variables pertaining to the socioeconomic conditions of a hospital's market. These included at the MSA level the proportion of individuals older than age 65, per capita income, and employment rate. Second, we performed the Hausman test for endogeneity using the OLS (ordinary least squares) and IV estimators. Based on the results of this test, we could not reject the null hypothesis that the price index was exogenous in the analysis. Accordingly, for purposes of all subsequent analyses for the study we used the hospital price index as an independent variable.⁸

High-Tech Capability. We created a composite measure of a hospital's high-technology capability. Following previous research (Dranove, Shanley,

and White 1993), we selected for the measure four high-technology services: neonatal intensive care, burn care, cardiac bypass, and transplant. For each hospital-observation we computed the composite score as the sum of the four high-technology services that it had available. Data on hospital high-tech services were obtained from the hospital cost reports. To create an index that would account for a hospital's competitive position in its market for high-tech capability, we subtracted from the hospital's technology composite score the mean composite score for all competitor hospitals in the market.⁹ An index value above zero indicated that the hospital offered more high-tech services than other hospitals in the market on average; an index value below zero indicated the hospital offered fewer high-tech services than other hospitals in the market on average.

Teaching Status. Teaching status was a dichotomous variable. We classified hospitals as teaching institutions if they had at least one active residency program. The cost reports provided information on hospital residency programs.

Ownership Type. All hospitals were assigned to one of three types of ownership categories: nonprofit, for-profit, and public. This information was obtained from the hospital cost reports.

Location. We accounted for hospital location by focusing on a hospital's relative distance from the centroid of the MSA where it is located. The MSA centroid is the geographic location where the population within the MSA is balanced geographically. Thus the closer a hospital is to the MSA centroid, the more centrally located it is from the standpoint of the population distribution within its market as defined by MSA. Health maintenance organizations may be attracted to hospitals that are more centrally located in terms of population distribution because these hospitals are likely to be accessible geographically to many of the HMOs actual and potential enrollees.¹⁰ For each hospital-observation, we divided the hospital's distance in miles from the centroid of the MSA in which it was located by the average distance of all other hospitals to the MSA centroid. An index value below one indicated that the hospital was located more closely to the MSA centroid than other hospitals in the same market area on average; an index value above one indicated that the hospital was located farther from the MSA centroid than other hospitals in the same market, on average. Data for computing this measure were obtained from the *County and City Data Book*. Our approach to measuring location is somewhat similar to that used by the University of Minnesota team in its study of hospital competition for HMO business (Feldman et al. 1990). Specifically, they used a dichotomous variable to indicate whether a hospital was centrally located

within a specific HMO's enrollment area. However, we did not have information on HMO-specific enrollment areas. Moreover, study hospitals typically had contracts with multiple HMOs so that there was no single enrollment area to focus on.

Analysis

To analyze the data, we pooled observations for the study period.¹¹ We excluded all hospitals that operated in markets with fewer than three hospitals. We made this exclusion because we needed a sufficient number of hospitals in a market to assess patterns of competition for HMO business. After these exclusions, 934 observations were available for analysis. These observations were distributed among up to 18 MSAs during the study period.

We used regression analysis to examine the relationship between a hospital's market share and the previously discussed measures of hospital price and nonprice attributes. In addition, our model included several variables that relate to the structure of the local hospital market: number of hospitals in the market, number of HMOs in the market, and the HMO penetration rate (i.e., the proportion of the population in the market area enrolled in HMOs). The model also included dummy variables to account for which year during the study period the observation occurred.

We estimated the regression model using the generalized estimating equation (GEE) approach derived by Liang and Zeger (1986) and Zeger, Liang, and Albert (1988) for estimating general linear models with longitudinal or panel data. The GEE takes into account autocorrelated errors, which is a common problem for pooled, cross-sectional data structures such as the one used for our study. We also used White's general approach to correct for heteroskedasticity (White 1980), which in the GEE case produces "semi-robust" standard errors for the estimates (in the sense that it assumes the model correctly specifies the mean parameter estimate).

RESULTS

Table 1 presents descriptive statistics for study variables before any of them were converted to indexed values. The mean price is computed based on all observations during the study period and is not expressed in constant dollars. Nonprofit and public hospitals combined constituted a little more than half of the observations. Although not presented in the table, we did examine the zero-order correlations among the independent variables. None of the

Table 1: Descriptive Statistics (Pooled Data for Study Period)

<i>Variable</i>	<i>Mean</i>	<i>Standard Deviation</i>
Hospital market share (based on HMO revenue)	.105	.185
Hospital market share (based on HMO admissions)	.111	.170
Price (\$)	4,336	2,342
High tech	.654	.917
Teaching status	.173	—
Nonprofit	.432	—
Public	.109	—
For-Profit	.459	—
Location	12.27	8.53
Number of hospitals	9.5	8.1
HMO penetration rate	.179	.176
Number of HMOs	11.79	4.93

variables were correlated above .30 and thus multicollinearity in the regression analyses was not a concern.

Table 2 presents the results of the regression analyses that related market share to hospital price and nonprice attributes. The results are presented for both market share based on HMO revenue and market share based on HMO admissions. We report the results from the regression analyses in the form of standardized betas for two reasons. First, the standardized betas indicate the relative importance of the competitive attributes so they can be compared directly. Such a comparison of the competitive attributes was a key objective for the study. Second, since several of the independent variables, like price, are indexed or expressed in market-relative terms, the unstandardized results are not easily interpreted (the unstandardized regression results are available from the authors).

The results of the two models were nearly identical in terms of the direction and statistical significance of the independent variables. The results indicated a price effect on market share. Hospitals with lower relative prices had a larger share of the HMO business in their respective markets. The regression results also indicated a nonprice effect on the share of HMO business for hospitals. A relatively greater number of high-tech services were significantly and positively associated with more market share based on HMO revenue and based on HMO admissions. Teaching hospitals also had more market share than their nonteaching counterparts. With respect to ownership type, the results were somewhat surprising: Nonprofit hospitals on average had less market share than did their for-profit counterparts, though the

Table 2: Results from Regression Analyses

<i>Variables</i>	<i>Market Share Based on HMO Revenues Standardized Coefficient</i>	<i>Market Share Based on HMO Admissions Standardized Coefficient</i>
Price	-.144***	-.212***
High tech	.303***	.305***
Teaching status	.077*	.066**
Nonprofit	-.050**	-.047*
Public	-.046*	-.030*
Location	-.122***	-.137***
Number of hospitals	-.156***	-.144***
HMO penetration rate	.059*	.057**
Number of HMOs	-.322***	-.332
Pseudo R-square	.321	.374
Observations	934	934

* = $p < .10$

** = $p < .05$

*** = $p < .01$

difference was only marginally significant. There was also a marginally significant effect for public hospitals. Like their nonprofit counterparts, public hospitals had less market share than did the for-profit hospitals. As expected, location was related to a hospital's share of HMO business; hospitals located relatively farther from the market (as defined by MSA) centroid had less market share.

In addition to the competitive attributes, all three market structural characteristics were also statistically significant. The number of hospitals in the market was associated with lower hospital-level market share. The number of HMO plans was associated with lower hospital-level market share whereas the HMO penetration rate was associated with higher hospital-level market share. None of the time dummies were statistically significant and to conserve space are not presented with the other results. In both regression models, the standardized coefficients indicate that among the competitive attributes high-tech capability had the largest effect on market share followed by price and location.

We also investigated whether patterns of competition among hospitals for HMO business vary in relation to market characteristics. First, we conducted stratified analyses for each of the three structural characteristics: number of hospitals, number of HMOs, and HMO market penetration. We conducted the stratified analyses for both regression models (i.e., market share

based on HMO revenue and market share based on inpatient admissions). For each analysis hospitals were divided into one of two groups based on whether they were located in markets that had relatively high or relatively low values for the relevant structural characteristic (based on frequency distributions). Based on Chow tests for examining whether significant differences existed between regression models (i.e., the high versus low values of a market characteristic), we did not find that the results differed materially from what was presented in Table 2. We conducted two other market-level stratified analyses, one for proportion of HMO enrollees in independent practice associations (versus enrollees in group/staff HMOs) and another for the market penetration of preferred provider organizations (data obtained from the hospital cost reports), but this also did not affect materially the results presented in Table 2.

Second, we conducted additional regression analyses that included interaction terms consisting of the product of one of the structural characteristic and one of the competitive attributes. Specifically, we conducted six additional regression analyses, two analyses for each of the three structural characteristics (i.e., number of hospitals, number of HMOs and HMO market penetration). For one of the two analyses the dependent variable was market share based on revenue and for the other analysis the dependent variable was market share based on admissions. Each analysis included six interaction terms; that is one interaction term for each of the six competitive attributes (i.e., price, high-tech capacity, teaching status, nonprofit hospital, public hospital, and convenience). These analyses revealed statistically significant results for one market characteristic: A greater number of HMO plans was associated with a diminishing effect of the competitive attributes on the share of HMO business for hospitals, whether market share was based on revenue or admissions (see Table 3).

We also performed a fixed-effects model to assess whether study results might be affected by unobserved characteristics of hospital markets. We performed the analysis by estimating the regression models with dummy variables for hospital market (i.e., MSA). The results were robust to the fixed-effects analysis.

Finally, to further investigate the effect of the price and nonprice attributes on hospital competition for HMO business, we identified hospitals with a substantial share of the HMO business in their respective markets. After reviewing frequency distributions of the numbers of hospitals with various levels of market share, we selected for closer analysis hospitals with 30 percent or more market share (based on revenues), which we labeled as market share

Table 3: Results from Regression Analyses with Interaction for Number of HMOs

<i>Variables</i>	<i>Market Share Based on HMO Revenues</i>	<i>Market Share Based on HMO Admissions</i>
	Standardized Coefficient	Standardized Coefficient
Price	-.484***	-.679**
High tech	.856***	.811***
Teaching status	.176**	.191**
Nonprofit	-.150**	-.151**
Public	-.226**	-.179
Location	-.231***	-.256***
Number of hospitals	-.151***	-.137***
HMO penetration rate	.037	.045
Number of HMOs	-.688***	-.761***
Number of HMOs $\times$ price	.562***	.662**
Number of HMOs $\times$ high tech	-.573***	-.530**
Number of HMOs $\times$ teaching status	-.136*	-.163**
Number of HMOs $\times$ nonprofit	.121*	.125*
Number of HMO $\times$ public	.258**	.194**
Number of HMOs $\times$ location	.162**	.173**
Pseudo R-square	.412	.456
Observations	934	934

* = $p < .10$

** = $p < .05$

*** = $p < .01$

leaders. We compared the market share leaders with all other hospitals that were located in markets with one or more market share leaders on the three attributes that were most important in relation to market share based on the regression analyses: high-tech services, price, and location. For each attribute, we compared the market share leaders to the other hospitals on both the indexed as well as nonindexed values.

Table 4 presents the results of the analyses. In relation to their competitors, the market share leaders had for both indexed and nonindexed values relatively lower prices, greater high-tech capability, and a closer geographic proximity to the market centroid. We also expanded the analysis to compare the market share leaders with all other hospitals in the study sample (i.e., including those that were not located in a market with a market share leader). The pattern of results for the three attributes was the same as those presented in Table 4. While these three attributes (i.e., relatively lower prices, greater high-tech capability, and closer geographic proximity to the market centroid) distinguished the market share leaders from the other hospitals in the sample, their zero-order correlations reveal that this pattern of

Table 4: Results of Market Share Leader Analysis

		<i>High Tech</i>	<i>\$Price</i>	<i>Location</i>
<i>Market Share Leader</i> ($\geq 30\%$ market share)	Nonindexed value	1.48***	3569***	5.94**
Observations = 99	Indexed value	.751***	.952***	.590**
<i>Others</i>	Nonindexed value	.481	4114	12.08
Observations = 366	Indexed value	-.217	1.02	1.11

** = $p < .05$ *** = $p < .01$

attributes was uncommon among study hospitals. Specifically, for the study overall, price and high-tech capability were significantly and positively correlated ($r=.21$) indicating that hospitals with relatively lower prices typically had relatively less rather than more high-tech capability, and price and location were also significantly and positively correlated ($r=.18$) indicating that hospitals with relatively lower prices typically had relatively farther rather than closer physical proximity to the market centroid. Thus, the market share leaders were able to win HMO market share by combining capabilities in a manner that was uncommon among their competitors.

DISCUSSION

Although policymakers and health care analysts have been keenly interested in the role of HMOs in stimulating price competition among hospitals, whether and to what degree hospitals compete for the business of HMOs on the basis of price versus nonprice attributes has not been carefully investigated. Our study is one of the first investigations of the pattern of competition among hospitals for the business of HMOs. The study produced several key findings. First, consistent with general business strategy theory, hospitals appear to compete for HMO business on the basis of both price and nonprice attributes. Our results suggest that certain nonprice attributes, namely technological capability and location, may be as or more important than price. Thus our results are consistent with those of the University of Minnesota study, even though we used a very different sample and time period.

Second, market share leaders appear on average to be superior to their competitors on both price and nonprice attributes. As noted, for most hospitals in the study lower prices were associated with less technology and possibly a less optimal location in terms of the population distribution within the market area. Market share leaders appeared to be able to combine lower prices with attractive nonprice attributes. This does not necessarily mean that market share leaders have the lowest prices or the most high-tech services in their respective markets but rather that they performed better than the market average on both these price and nonprice dimensions. This finding suggests that to be most attractive to HMOs hospitals need to be somewhat balanced in their emphasis on price and nonprice attributes; they cannot afford to put too much emphasis on low prices by sacrificing quality-related attributes and vice versa. This is consistent with the perspective that firms can combine cost leadership and differentiation strategies successfully.

Third, our results suggest that the pattern of competition among hospitals for HMO business may vary by market characteristics. We found that both price and nonprice attributes diminish in importance as the number of HMO plans in a market increases. When competition among HMOs increases as indicated by number of plans, HMOs appear to become less selective in recruiting hospitals for their networks. Indeed, this finding is consistent with a recent study by Burns et al. (2000), who reported a positive association between the number of HMO plans and the number of hospital-physician alliances such as physician-hospital organizations and hospital-sponsored independent practice associations. In discussing their results, Burns et al. suggested that as the number of HMO plans increase in a market, competition among the plans to recruit hospitals into their networks also increases. This competitive dynamic, they speculated, creates an incentive for hospitals to form alliances with physicians to capitalize on their favorable opportunities for obtaining managed care contracts. Thus while previous research suggests that competition among HMOs results in lower insurance premiums for consumers (Wholey, Feldman, and Christianson 1995), our results suggest it also limits the extent to which hospitals compete on the basis of price and nonprice attributes for HMO business. How this competitive dynamic affects price inflation for health care services in the long run is not clear but currently some speculation exists that it may be driving prices upward. In this vein, our findings should be considered in the context of the recent trend among HMOs toward consolidation. Although HMO consolidation has raised concerns among policymakers and consumer advocates concerning its impact on competition in insurance markets, this consolidation

trend may eventually prove to be a positive development from the standpoint of lowering hospital prices if it reduces the negotiating leverage of hospitals in relation to HMOs. Further, our findings are relevant to the current debate among federal policymakers over the future role of managed care organizations in the Medicare program since an important issue is the number of plans that should be permitted to participate in the program in a given market area.

Fourth, nonprofit hospitals may be less effective in competing for HMO business than are for-profit hospitals. Study results pointed to the possibility that nonprofit hospitals had relatively less of the HMO business in their markets. Although this finding may be viewed as surprising given the perspective of many health care scholars that patients prefer to obtain hospital services from nonprofit organizations, there is in fact little empirical support for this perspective. One explanation for our finding is simply that patients may be less concerned about ownership type than what some scholars currently believe or that perhaps over time patients have become more accepting of for-profit ownership of hospitals. Alternatively, HMOs may be able to steer patients to the hospitals they prefer. Many HMOs are organized as for-profit institutions and they may prefer to deal with hospitals that are also for-profit. Unfortunately, we could not test this hypothesis more directly in our own study because we lacked data by market area on the proportion of HMO enrollees who were members of for-profit versus non-profit plans. Such an investigation presents an exciting opportunity for future research, however. Moreover, an important issue for future research is to understand the roles of the various players—hospitals, HMOs, physicians, and patients—regarding the hospitals from which patients obtain care.

The study has several limitations that should be noted. One limitation is that our study did not account for a number of attributes that may attract HMOs to certain hospitals. For example, HMOs may be attracted to hospitals with a large medical staff since this may help them recruit physicians into their provider networks. The HMOs also may be interested in the technical quality hospitals offer enrollees and so a model that included risk-adjusted clinical outcomes might be valuable for delving more deeply into the pattern of competition among hospitals for HMO business. Some earlier research suggests that a patient's choice of a hospital for certain types of care is influenced directly or indirectly (through their physicians) by the hospital's technical quality as measured by risk-adjusted outcomes (e.g., Luft et al. 1990). Also, a recently published study suggests that HMOs tend to channel enrollees in need of cardiac bypass surgery to the hospitals with better risk-adjusted mortality rates for this procedure (Escarce et al. 1999). There are also many

possible intangible factors such as the rapport that might exist between the hospital's managers and HMO executives that may come into play in hospital-HMO negotiations. Indeed, most of the nonprice attributes that we examined in this study are not readily within the control of managers. While attributes such as ownership status and location are relevant to a hospital's ability to differentiate itself in a market, health care managers need more information about the types of attributes that they can directly influence and that are effective for implementing a differentiation strategy.

Another limitation is that we used market share exclusively as a measure of hospital success in competing for HMO business. Some hospitals may be willing to sacrifice some market share for higher profit margins from HMO contracts, a position that can be consistent with a strategy of differentiation (Porter 1980). Also, while this study focused on patterns of competition among hospitals for HMO business, as previously noted hospitals also pursue the business of PPOs, which have made significant gains in market penetration in recent years. However, as noted we tested the sensitivity of our results to differences in PPO market penetration among the study's hospital markets and found the results to be robust to such differences, which supports the generalizability of the study's results. Quite possibly, the pattern of competition among hospitals for HMO business that we observed in this study is consistent with the pattern that exists among hospitals for PPO business. Nevertheless, more research is needed to understand how PPOs affect patterns of competition in the hospital industry. Along similar lines, the bargaining position of managed care organizations in relation to purchasers of health insurance, treated in our study as exogenous, is a relevant factor influencing the way managed care organizations select hospitals for their networks and this presents another research opportunity.

Overall, study results indicate that competition among hospitals for HMO business involves a complex set of price and nonprice attributes. Health maintenance organizations do not appear to focus on price alone. Whether this changes over time and what the underlying forces might be behind the change is an important topic for future research.

NOTES

1. Preferred provider organizations (PPOs) are financing arrangements in which networks or panels of providers agree to furnish services and receive reimbursement on a negotiated fee schedule. In contrast to HMOs, PPOs typically place fewer controls on enrollee service utilization such as gatekeeper arrangements. In

addition, enrollees are permitted to seek services from providers who are outside the network though they typically face reduced financial coverage. However, the distinction between HMOs and PPOs is beginning to blur as some HMOs now allow their enrollees to go to providers outside the network at reduced coverage levels (Wagner 2001).

2. As noted by Hill (1988), the viability of the business strategy of differentiation varies across industries. Some services or products are inherently more capable of being differentiated on the basis of nonprice attributes.
3. Porter (1980) argues that such firms risk being “stuck in the middle,” a situation where they fail to implement either strategy successfully.
4. Previous research suggests that in metropolitan areas patients typically do not travel more than approximately 15 miles to obtain most routine hospital services (Garnick et al. 1987). However, researchers are beginning to study whether the selective contracting arrangements that managed care companies develop are leading patients to travel farther distances to obtain hospital care (e.g., Mobley and Frech 2000).
5. The ten diagnosis related groups (DRGs) were: 14, 89, 96, 127, 174, 182, 183, 243, 296, and 320. These are the same DRGs used in previous comparative studies of hospital pricing patterns (e.g., Lynk 1995).
6. A hospital's net revenue is the difference between its listed charges for services and the discounts it extends to payers such as HMOs. Thus a hospital's net revenue per HMO admission is the price the HMO actually pays the hospital for the admission.
7. Until recently, instrumental variables methods commonly used by economists to address the issue of endogeneity bias were not used in health services research; however, this appears to be changing (McClellan and Newhouse 2000). Nevertheless, identifying appropriate instruments is a challenging requirement for this type of analysis (see, generally, Staiger and Stock 1997).
8. We recognize that stronger instruments not available in this study could possibly lead to a rejection of the null hypothesis that price is exogenous in the analysis.
9. We subtracted the mean market value from the focal hospital value (rather than divide the hospital value by the mean market value as we did for price) because in some markets only one hospital had one or more of the high tech services. In such cases the use of division would have resulted in our assigning to the one hospital in the market with high tech services an index value of zero.
10. As noted, previous research suggests that in metropolitan areas patients typically do not travel more than approximately 15 miles to obtain most routine hospital services.
11. In the previously noted University of Minnesota study, the researchers conducted two separate analyses of competition for HMO business, one analysis for whether a hospital had any HMO business, and another analysis for the amount of HMO business a hospital had. Since we had few hospitals that did not have any HMO business, we did not conduct separate analyses in this manner.

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