The Financial Performance of Selected Investor-Owned and Not-For-Profit System Hospitals Before and After Medicare Prospective Payment

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This article analyzes determinants of cost and profitability, including the influence of Medicare prospective payment (PPS), between 1983 and 1985 for nearly 300 hospitals belonging to investor-owned (IO) and not-for-profit (NFP) systems. Using approaches that assure comparability of financial data, and including case mix, quality, competition, and regulation measures, the findings indicate that (1) in both years, competitive environment, case mix, age of facility, and scope of diversified services were important determinants of average cost, while a process measure of quality was insignificant and the independent effect of ownership type was insignificant for cost; (2) effects of HMO competition and hospital strategy were stronger in 1985 than in 1983; (3) operating margins for all types of hospitals showed increases, with a somewhat greater improvement for NFP system members; and (4) significantly greater declines in volume of care occurred for IO system members. Implications for future research are discussed.

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INTRODUCTION

This article analyzes some major dimensions of hospital strategy and performance that are likely to be strongly influenced by the Medicare Prospective Payment System (PPS). Specific motivating questions include: (1) the degree to which PPS has affected hospital costs and profitability; (2) whether effects observed for investor-owned (IO) hospitals differ from effects for not-for-profit (NFP) hospitals, by location (for example, urban versus rural) and related sociodemographic characteristics of the communities served; (3) whether the effects are conditioned by the degree of local market competition and intensity of preexisting regulation; and (4) whether hospital strategic responses—and what types of responses—play a role in the financial outcomes to date.

Recent syntheses and advances of empirical research on hospital cost and profitability variation have been limited to the pre-PPS period.[1] There have been limitations in the ability to assure comparability of financial data and to take into account case mix, diversified services, competition, regulatory factors, and quality measures. This article attempts to overcome these limitations.

We offer evidence about impacts of Medicare PPS and other determinants of cost and profitability in a group of about 300 hospitals for fiscal years 1983 and 1985, years bracketing the initiation of the PPS. The hospitals were owned or leased members of three IO and five NFP corporations. It should be borne in mind that these hospitals are not necessarily representative of all short-stay hospitals in the nation, nor are they representative of all hospitals in multihospital systems. The hospitals, however, are spread over 45 states (although few are located in the Middle Atlantic and New England regions).

Our general approach is outlined below, followed by a review of relevant research, description of data and methods, and presentation of findings.

CONCEPTUAL APPROACH

A basic economic model of cost-minimizing behavior would restrict attention to input prices, the mix and levels of outputs, and environmental factors leading to efficiency differences as determinants of total cost of an enterprise. For many applications in the hospital industry, such a model is too narrow. Because of the influences of public regulatory agencies, philanthropists, and "parent" sponsors such as religious associations, hospital executives may have less freedom to minimize cost or maximize profit. Moreover, it is generally recognized that com-

petition among hospitals has not been based primarily on price but rather on amenity and "quality" levels designed to attract physicians and patients.

A realistic model of hospital behavior can begin with several performance measures used by groups that influence hospital policy. Equity owners, donors, and public agencies have varying degrees of influence over individual hospitals, affecting the trade-offs among major performance measures, such as net financial return, costliness of services, quality of care, and charitable care to indigent patients. Physicians and patients affect hospital financial performance through their utilization decisions. Given the influences of demand for services, regulation, and ownership, strategic managerial choices might be grouped into the following major categories: (1) cost-minimizing input decisions for given levels of utilization and quality; (2) establishment of quality and amenity levels that affect cost and also affect demand; (3) pricing decisions for the current mix of services; and (4) choices about the mix of services offered, markets in which to compete, and planned growth or curtailment of services. The latter category of corporate behavior can be approached with objective measures of "realized" strategy represented by an institution's case-mix and scope-of-services measures, and by measures of "intended" strategy regarding product and market diversification that are more difficult to obtain.

Differences in costliness associated with investor ownership versus not-for-profit ownership are receiving increased attention, as indicated in the report sponsored by the Institute of Medicine (1986). Our study attempts to capture differences in strategies and environment that would "explain" performances otherwise attributed to ownership; but we continue to test for unmeasurable effects of ownership. In the context of multihospital systems, the greater potential of for-profit hospitals in general to raise capital and achieve various managerial economies of scale would tend to be neutralized. Remaining differences due to ownership might result from differing standards of labor productivity in IO hospitals and perhaps stronger or more rapid adjustment by IO hospitals to competitive pressures and the financial incentives of third-party payers.

SPECIFIC HYPOTHESES

Within the framework of environmental and strategic differences thought to influence financial outcomes, key hypotheses are briefly summarized in the following categories for purposes of discussion and literature review.

Case-Mix, Volume, and Facility Characteristics. Building upon extensive previous economic research on hospital costs, we expect average cost per case, adjusted by an input price index, to be strongly affected by case-mix measures, scope of services offered, and volume of adjusted admissions. Age of facility is expected to increase costs because of accounting for depreciation on the basis of historical costs exceeded by replacement costs. Central city location is expected to be an additional proxy for higher input costs.

Environmental Pressures of Regulation and Competition. We expect regulatory and competitive pressures to affect costs (not necessarily to reduce them, since previous studies indicate that hospitals compete on amenities and quality, and regulatory programs may protect higher-cost firms from competitive entrants).

Strategy. Adaptations of recent methodologies in the field of corporate strategy analysis offer several alternative ways to distinguish those strategies that concentrate on efficiencies and growth in existing services from those directed at diversification into newer areas. The latter strategies are expected to generate higher observable costs in the short run. Longer-run effects may do the opposite by contributing to survival in an increasingly competitive marketplace. Cost differences associated with ownership are expected to be relatively small or insignificant once the explanatory variables of "realized" and "intended" strategy are included.

We expect operating margins before income taxes to be higher for hospitals in IO systems, independent of other determinants, achieved primarily by pricing differences rather than quality or efficiency differences. We expect nonoperating income, estimated taxes, and allowance for duration of system membership to reduce these differences.

Effects of Medicare PPS. We begin with two hypotheses about the effects of Medicare PPS, which encourage cost containment more strongly than any previous third-party hospital financing technique. *First,* we expect all hospitals in the study to realize greater operating margins in the short term due to the prospective prices, consistent with statistics already released by federal officials and the American Hospital Association. Investor-owned hospitals might respond more strongly to cost containment because of greater interest in maximizing net financial returns. *Second,* with reduced "slack" in hospital costs, one would expect financial results to become more strongly determined by case mix, volume of care, competitive pressures, and the strategic intention measures affecting service mix and utilization.

REVIEW OF PREVIOUS RESEARCH

Policy-relevant questions of efficiency differences in the production of hospital services have sparked much research over the past two decades. Originally, many econometric hospital cost models focused primarily on the issues of optimal scale of hospitals, proper adjustments for case mix, and the cost of an empty bed—that is, on the difference between short-run, marginal cost and average cost. More recently, greater attention has been given to ownership differences, and to competitive and regulatory environments.

SCALE ECONOMIES AND MARGINAL COST

Early econometric studies of hospital cost focused on concerns over whether the not-for-profit form of organization would lead to an overabundance of institutions of suboptimal scale (see Feldstein, 1981; Lave and Lave, 1978). A major drawback of the earliest studies was their relatively unconvincing control for case mix, which itself tended to make larger hospitals look more expensive. With increased attention to case mix, both in cross-sectional and longitudinal studies, economies or diseconomies of scale (average cost as a function of bed capacity or total volume of care), except at very low bed-sizes, were found to be rather small.[2]

OWNERSHIP AND SYSTEM MEMBERSHIP

The more recent research emphasizing differences in hospital cost associated with ownership and system membership broadens the concept of hospital environment beyond that of consumer and physician demands to regulatory and competitive factors that may prompt different responses from different types of enterprises. Systems may be able to respond more effectively because of better access to capital and to the sharing of management expertise. While there is no consensus among observers, one might expect that investor-owned hospitals would respond more quickly to competitive challenges and opportunities; however, an alternative response of IO systems could be to acquire or divest facilities depending on their competitive success. Implications for cost depend on what the policy environment is rewarding. Under cost-based reimbursement, competitive success may involve higher costs that improve the attractiveness of services and permit higher prices to commercially insured patients. Under certificate of need, certain types of capacity investment in the industry (by new enterprises, particularly) may be limited, but established

hospitals perceiving growth in demand may generate higher costs of service.

Research has proceeded by use of groups of hospitals matched by considering regional location, bed capacity, and teaching affiliation, *inter alia,* but differing by ownership (see Lewin et al., 1981; Sloan and Vraciu, 1983), and by use of regression models (Watt et al., 1986; Coelen, 1985). Intensive descriptive detail from reported costs and charges to state agencies has also received much attention (Pattison and Katz, 1983). Recent reviews of this literature (Ermann and Gabel, 1984; Institute of Medicine, 1986) suggest that IO hospitals are not more cost-efficient, and that significant economies of scale for systems are lacking. In addition, prices and markups are generally found to be higher for IO hospitals. The major caveat to this tentative consensus is that when a large proportion of care was reimbursed on the basis of accounting costs, it might have been quite rational to use any gains in efficiency on service enhancements to compete with other providers on the basis of quality and amenities.

PROFITABILITY

Coyne (1983) provides useful decomposition techniques to summarize how IO systems generate more internal funds (rate of return on equity) than NFP systems. For the systems in his study, the difference in rate of return on equity was remarkable—29 percent versus 6 percent. The difference was attributed to multiplicative factors of leverage (debt/equity ratios of 1.67 versus 1.06) and profit margin (10 percent versus 3 percent); both operating and financing factors were quite important, whereas asset levels and asset composition proved to be unimportant.

A recent study by Herzlinger and Krasker (1987) attempted to compare the social return on assets utilized in IO and NFP hospitals in 14 large systems in 1977 and 1981. They found substantially lower financial returns on assets for the NFP hospitals, after adjusting for inflation and subsidized cost of capital, and they argued that social subsidies are "spent" on lower labor productivity and on higher resource support for physicians. We note that their not-for-profit sample is dominated by the Kaiser system, which may be substantially unrepresentative of that ownership category (for example, in terms of charitable care to the indigent).

DATA AND METHODS

The descriptions and analyses presented here are necessarily abbreviated, and they constitute one component of a broader investigation of strategies, structure, and performance in multihospital systems. More background on the study is given in Shortell et al. (1986) and in unpublished reports available from the authors.

HOSPITAL FINANCIAL DATA

Each system responded to our request for standardized internal hospital-specific data on costs, revenue, assets, and volume of care. Specific line-item references were made to Medicare cost reports, and supplementary data were requested that are not available from that source. Patient care expense, revenue, and assets were distinguished from other transactions and totals. Such data are not available for managed hospitals and they are excluded from this analysis.

Depreciation was provided on the straight-line method required by Medicare; contractual allowances, uncollectible bills, and free care were deducted from gross patient revenue. Interest expenses, including intracompany interest and other imputations for capital cost, and home office costs (sometimes called "management fees") were obtained.

For a sample of more than 50 hospitals in three systems in 1983, total hospital cost was compared among the internal system data, *S*, reports of state commissions in Florida and California, *C*, and the AHA annual survey, *A*. In the state of Florida, where audited reports are used, in 15 of 18 cases *S* differed from *C* by less than 1 percent. However, *A* differed from *C* by an average of more than 10 percent in absolute value. This appeared to be due primarily to a high proportion of inaccurate estimated values by the AHA due to incomplete reporting of financial data on the annual survey.

Corporate "home office" and divisional costs ranged between 2.4 percent and 6.4 percent of net patient revenue across the eight systems in 1983. In each system, the standard deviation of this percentage was only about one-third of the mean. This was smaller than expected, but we did find an expected significant correlation of these imputed costs with the proportion of revenue from Medicare in 1983 ($P < .05$). We proceeded to aggregate net revenue and the home office cost within each system and to use the resulting ratio to impute a substitute value for this cost item for each included hospital. Thus, the variance within

the system that may be due primarily to "strategic accounting" was eliminated.

A similar approach was taken for interest expense and other capital transfers. These expenses varied widely, from 4.5 to 15.4 percent of net assets, and variance within systems was quite substantial in relation to the mean value. Since capital borrowing policies are assumed to be largely directed by corporate headquarters, we again eliminated the within-system variation in the interest expense ratio to net assets. We found quite small variation between systems and within systems for depreciation in relation to net assets (the overall average was 7.5 percent). Therefore, depreciation is included in all cost measures.

Costliness of patient care is calculated as cost per adjusted patient admission. We followed the AHA formula of weighting admissions and outpatient visits by charges in order to obtain a measure of volume. Both the volume and gross revenue data were obtained directly from the systems. The methodology for calculating adjusted admissions is becoming less satisfactory both because outpatient billings are now tending to exceed 15 percent and because the presumption of prices proportional to cost across services is becoming more questionable. Yet case studies find considerable arbitrariness and discretion in the accounting methods used for apportioning costs between inpatient and outpatient care (Young et al., 1982). For this study, we continue to use the simpler charge-based composite of inpatient and outpatient volume, recognizing that if outpatient care is generally "underpriced" (due to greater competitive alternatives, or to the desire to attract patients who have less insurance coverage for outpatient services), then systems with greater outpatient care will appear artificially to be somewhat more "costly" per adjusted admission.

Variation in input prices is an important determinant of cost variation geographically. Indexes of local area wage rates have been produced with the support of the Health Care Financing Administration for hospital cost research and regulations, but adequate measures of input price variation other than wage rates are not available. This should lead to some caution in interpreting effects of variables on cost that might be confounded by locational differences in nonlabor costs, but the problem is mitigated by the following considerations: (1) variation in significant costs such as energy and food are at least partially reflected in wage rates, which must compensate workers sufficiently for differences in household costs of living; and (2) a location indicator such as urban central city location will serve as an additional proxy variable for input cost differences.

Two approaches to comparing net financial returns are used in

this study, and neither is wholly satisfactory. In the first approach, operating margin is calculated as net patient revenue less expenses and is expressed as a proportion of net revenue. This ignores the substantial level and variation of nonoperating revenue for NFP systems, and the substantial level of federal income tax liability for the IO systems. The second approach estimates income to include net operating revenue and nonoperating revenue. The nonoperating revenue for each system is typically found in annual reports, and an overall ratio to operating revenue for the corporation was applied to each hospital in the study. For IO systems, an average of about 40 percent of operating income is allowed for federal income taxes in the annual reports. We applied both of these assumptions in estimating net income after taxes as a proportion of total income. This could be misleading in that some nonoperating income of the corporation may be restricted with regard to which hospitals can use these funds.

SCOPE OF DIVERSIFIED SERVICES AND QUALITY

Original data were obtained from each hospital on its nontraditional diversified health services (other than acute inpatient care, emergency, and primary clinic visits) offered in 1985. Examples include ambulatory surgery centers, home health programs, geriatric day care, and health promotion programs. Information was obtained on when each service was implemented, how the service was provided, the number of encounters or procedures, percentage of charity care, and whether or not the service was profitable.

Structure and process indicators of quality of care were developed on the basis of data obtained from the Joint Commission on Accreditation of Healthcare Organizations (JCAHO). Eleven senior officials of the JCAHO were asked to select a subset of standards felt to be most strongly associated with patient care outcomes and, at the same time, for which considerable variation existed in hospital compliance. The resulting 22 standards clustered into four categories: (1) medical staff policies and standards, (2) nursing care policies and practices, (3) quality assurance standards, and (4) medical records criteria. For full compliance with each standard, a hospital received a score of 2, for partial compliance a score of 1, and for noncompliance a score of 0. Each JCAHO official was also asked to rate each standard on a scale of 1 to 5, where 1 indicated little probability that noncompliance with the standard would result in an adverse patient outcome, and 5 indicated a high probability that lack of compliance would result in an adverse patient outcome. A cumulative score was derived for each hospital by

multiplying its compliance score (0,1,2) with each of the 22 standards by the importance weight (1-5) and then summing over the 22 items. The higher the score, the higher the hospital's structure/process quality measure.

CASE-MIX AND FACILITY CHARACTERISTICS

Case mix is measured by the 1984 unpublished HCFA case-mix index for each hospital, which was the first such information based on 100 percent reporting and believed to represent more accurate data than in earlier years. Unfortunately, we were not able, therefore, to use separate 1983 and 1985 case-mix measures and investigate changes over time that might be important. In a more elaborate dynamic model, case mix (or any other variable in the class we have called "realized" strategy) could be influenced by cost as well as causing cost differences—for example, if costs are unusually high in some area because of unhealthy lifestyles in the population, a hospital in that area might find it profitable to reduce the number of inherently risky operative procedures that have high case-mix weights. In general, we would view the long-run feedback influence of cost on case mix as relatively weak and gradual.

We also considered the proportion of inpatient-days in obstetrical units, pediatric units, and psychiatric units, the proportion of surgeons to total active and associate medical staff, the number of medical and dental residents per adjusted admission, and whether the hospital has AMA residency certification. Approved residency programs may be correlated both with the costliness of the case mix of patients and the quality of medical supervision. The correlations among these various measures are not very high. However, we do not include all possible case-mix measures in regressions where missing data may seriously reduce the degrees of freedom for the estimation.

Two other facility characteristics are expected to have an influence on the measured costs. Older facilities may have lower costs because depreciation does not fully measure replacement cost of assets. The "economic age of investment" is measured by the ratio of accumulated depreciation to current annual depreciation. A cautionary note is that this could represent, for some hospitals, not the age of real capital assets but the age of intangible assets (the "goodwill" of a going concern) reflected in the initial purchase price of a facility. In the latter case, little effect on cost per case would be expected. Whether the hospital is a new or old member of a system is different from the age of the facility itself, and is likely to influence observed cost in view of the

time required to achieve training (or reallocation) of staff and to reach operating efficiencies.

Other authors have used a case-mix measure in their regressions of hospital cost. Two noteworthy studies (Watt et al., 1986; Coelen, 1985) find ownership differences in cost remaining after allowing for case mix. However, these studies have limitations in addressing environmental differences that would affect cost, to which we now turn.

ENVIRONMENT–COMPETITION AND REGULATION

The degree of competition in the market for hospital inpatient services is measured by the number of competing hospitals perceived by the chief executive officer, within a radius of 15 miles around the hospital's location. Previous research using a similar definition of market areas reported by Robinson and Luft (1985) found significant positive effects of the number of competing hospitals on average cost even with thorough attention to differences in case mix and local population characteristics.

Given the growth in the number of nonhospital competitors, we also considered it important to include a measure of ambulatory care competition. For this purpose, we used the presence in the same zip code of a freestanding ambulatory surgery center or emergency/urgent care center. We obtained from each trade association a zip code list of the location of its members, and matched the zip codes to those of our study hospitals. About 25 percent of all the hospitals in our study have at least one of the two types of ambulatory surgery or urgent care centers in the same zip code area.

Measures of regulatory intensity by state where the hospital is located were taken from previous research (Chapko et al., 1984; Shortell, Morrisey, and Conrad, 1985). One intensity measure pertains to certificate-of-need (CON) programs—this type of regulation may inhibit the scope of services and bed capacity more than the costliness of care. Specific factors combined into the CON measure included the scope of regulatory activity, stringency of review, degree of enforcement, dollar value of threshold limits, and length of time that the regulation had been in existence. The second regulatory measure is the intensity of state rate review programs, which may be mandatory or voluntary, and may use rigid formulas, complete budget reviews, or other methods to determine appropriate rates.

Inferences about the effects of these measures of regulatory intensity in a cross-section regression must be attended with caution. While there is evidence of slower growth of expenses since the mid-1970s in

states with rate review programs, states with relatively high hospital costs for other reasons may have been more aggressive in imposing such programs. Cone and Dranove (1986) argue that the observed association between level of hospital costs and enactment of rate review masks a better explanation of rate review enactment related to the size of Medicaid hospital expenditures per capita. In our sample of hospitals, we found a small correlation between intensity of rate review and either Medicaid eligibility per poor person, or Medicaid hospital payments per recipient. However, if the intensity of rate review has been implemented with a high correlation to deflated costs per case, this would tend to nullify our expected finding of a negative effect on cost.

The above measures are a subset of all the possible measures, embodied in the notion of competitive and regulatory environment, that affect the level of demand and sensitivity to price or qualitative aspects of service at the individual hospital. Other measures of alternative resource availability in the county of each hospital are used in the study, such as active MDs per capita, nursing home beds per capita, and HMO membership. These variables are obtained from the 1985 version of the Area Resource File made available from the Health Resources Administration, except in the case of HMO membership, which is a statewide average taken from the DHHS census of HMOs in 1984. We use these variables in estimating reduced-form equations as determinants of the volume of demand facing an individual hospital.

STRATEGY AND STRUCTURE MEASURES

Strategy can be defined as "the plans and activities developed by an organization in pursuit of its goals and objectives, particularly in regard to positioning itself to meet external environmental demands relative to its competition" (Shortell, Morrison, and Robbins, 1985). We used Miles and Snow's (1978) typology of prospector, analyzer, defender, and reactor as a measure of the hospital's overall strategic orientation because of the typology's broad conceptual appeal (Shortell and Zajac, 1988) and its use in previous hospital studies. A *prospector* organization is one that is consistently first in providing a new product or service. It consistently attempts to pioneer. An *analyzer* is an organization that is seldom first in providing a new product or service but, by carefully analyzing the market and what others are doing, often enters later and attempts to provide the service better or somewhat differently than the early entrants (that is, to create a market niche). The *defender* is an organization that offers a relatively stable set of products and services. It tends to ignore changes that have no direct impact on current

areas of operation and concentrates instead on doing the best job possible in its own area. A *reactor* organization does not have a consistent pattern. Sometimes it is an early entrant into a new market; sometimes it waits until others have entered; sometimes it does not do anything unless forced by external pressures. Perceptions of each hospital's overall strategic orientation (on a scale from 1 to 7) were obtained from each hospital's chief executive officer in 1984. Test-retest reliability on a sample of 19 CEO respondents across the eight systems resulted in agreement in 71 percent of the cases. Additional comparisons of the strategic types with the actual diversification of hospital services (for example, prospectors offering more and defenders less); number of new such services initiated; and related measures indicated a high degree of validity (Shortell and Zajac, 1988).

The extent to which hospitals explicitly undertake diversification strategies (as opposed to market penetration strategies) was measured by the degree of emphasis (a scale from 0 to 100 points) given by chief executive officers to new product/service development and new market development for 15 specific services.[3] Test-retest reliability indicated agreement in 69 percent of the cases.

Recognizing that a hospital's financial viability is affected by its overall mix of services, we also measured each hospital's overall service portfolio. The service portfolio approach is based on the Boston Consulting Group matrix (Henderson, 1973) that groups services into four cells using market share (high/low) and market growth potential (high/low). Services with low market share but high growth potential are considered "wildcats," those with both high market share and high market growth potential are considered "stars," those with high market share but low market growth potential are considered "cash cows," and those with both low market share and low growth potential are labeled "dogs." Responses were examined for each of the 15 services noted earlier in regard not only to its market share and market growth potential but also to its profitability. Test-retest reliability indicated general agreement in 82 percent of the cases for market share, 81 percent for market growth potential, and 92 percent for profitability.

In regard to structure, we measured the degree of centralization of decision making by asking each hospital's chief executive officer for the level at which 12 pretested, standardized decisions were made. Examples of such decisions included: (1) choosing a marketing plan for a new outpatient service at an individual hospital, (2) deciding to involve more physicians in individual hospital governance, (3) acquiring a new hospital, and (4) deciding to add an ambulatory surgery center at an individual hospital. Decision-making levels were ordered from 1 (low)

to 6 (high), beginning at levels below the individual hospital's chief executive officer and ending at the level of the systemwide corporate board.

These measures of strategy and centralization of decision making were hypothesized to have a number of effects on scope of diversified services, quality, cost, and profitability. Since scope of diversification enters the cost function directly, it may subsume some of the strategic differences such as the prospector-defender classification. New product or market development is less geared to achieving short-run efficiencies at increased volume of production and to raising short-run profitability than a strategy of market penetration would be. Similarly, an observed tendency to risk "wildcat" service ventures would be expected to raise short-run costs and reduce profitability. Centralization of decision making is thought to have more complex interactive effects. Decentralization of decisions gives local managers more flexibility in dealing with the cost impact of new services and also gives clearer direct responsibility for performance. Therefore, one might expect other effects on cost (for example, those due to new market development or to wildcats) to be lower for hospitals with greater decentralization of decisions. However, it is not clear that the local managers would be as concerned with cost containment as would central managers.

ANALYSIS AND FINDINGS

Table 1 presents a descriptive data for all of the variables in the study. The first pair of data columns is descriptive of the 290 system hospitals owned for the full year of 1983. The cost and revenue items were adjusted to a common fiscal year definition, using a national HCFA quarterly index of hospital input prices. The second group of data columns pertains to the same hospitals in 1985, after dropping four cases of hospitals that were sold or closed by the systems.

Average cost per adjusted admission, divided by the local area wage index, was about 10.6 percent higher in 1985 than in 1983, and average operating margin increased overall from 7.3 percent to 8 percent. By comparison, the American Hospital Association (1987) reports somewhat higher growth of costs for community hospitals overall during this period (about 16 percent), and operating margins rising from 5.1 percent in 1983 to 6 percent in 1985, falling back to 5.1 percent in 1986. Since our study population is not designed to be representative of all hospitals in the nation, levels of financial performance may differ from broader surveys. It should also be noted that

there is quite substantial variation within our sample where changes for larger hospitals are more important to system results than are changes for smaller hospitals.

Table 2 provides average cost and profitability data after aggregating the numerator and denominator of each ratio across the hospitals belonging in each cell of the table, and provides comparisons between 1983 and 1985 within each ownership class. Table 2 indicates that average cost grew slightly more rapidly for IO hospitals than for NFP hospitals. However, volume declines were much higher for the IO hospitals. Operating margins improved in both ownership categories, although not as dramatically as estimated by the Congressional Budget Office for Medicare patients alone in testimony to the U.S. Senate (1987). The wide difference in operating margins between ownership category is sharply reduced when the net income margin is estimated. If anything, the gaps in income and operating margin narrowed somewhat between 1983 and 1985.

COST EQUATIONS

Our basic approach to hypothesis testing about cost variation is single-equation ordinary least-squares (OLS) regression, as is prominent in most of the literature on cost functions. We recognize that the volume of care and some of the strategy measures might be considered jointly determined (endogenous) with costs—that is, costs affect pricing and demand—and may lead to changes in strategy.[4] The dependent variable in our current analysis is patient care expense per adjusted admission, divided by the area wage index created by HCFA for use in reimbursement adjustments (national average 1.0 in each year). Costs are adjusted to common fiscal year definitions, depreciation is uniformly measured by straight-line methods, and imputed items (interest and home office costs) are "smoothed out" within systems, as explained earlier. A log-linear model is used, with volume (adjusted admissions), scope of diversified services, the JCAHO quality score, and the Medicare case-mix index transformed into natural log values, permitting estimation of proportional and multiplicative effects rather than simple additive effects.

The observations of cost within any particular system are not completely independent because each is somewhat dependent on the activities of the corporate leadership. For example, if the central office of a particular system tends to have a relatively high level of expense for lobbying or related activities, this cost appears (albeit considerably diluted) in the expenses of each member of the system. One approach

Table 1: Descriptive Data for Variables Used in Regressions

Variables	*1983*		*1985*		*Notes on Sources*
	Mean	*S.D.*	*Mean*	*S.D.*	
Cost per adjusted admission, divided by area wage index (log)	7.859	0.269	7.965	0.254	(f)‡ and HCFA
Operating margin, proportion of net revenue	0.073	0.133	0.080	0.116	(f)
Net income after tax, proportion of total income	0.053	0.077	0.060	0.072	(f)
Adjusted admissions (log)	8.657	0.642	8.598	0.630	(f)
Overall scope of services measure (log) 1985	2.178	0.452	2.177	0.450	1985 survey
Quality score, 22 weighted JCAHO measures (log)	4.869	0.113	4.869	0.113	(v)¶
Medicare case mix, FY1984 (log)	0.084	0.083	0.084	0.082	HCFA
AMA-Certified residency (0/1)	0.044	0.206	0.045	0.207	AHA
Economic age of facility (accumulated/annual depreciation)	4.828	4.596	2.940	2.800	(f)
Ambulatory surgery or emergency center in same zip code	0.270	0.460	0.270	0.450	(v)
Intensity of state certificate-of-need program 1981	-2.478	3.519	-2.457	3.518	(v)
Intensity of state rate review program 1981	-3.283	7.311	-3.310	7.303	(v)
Number of perceived competing hospitals	2.341	1.650	2.359	1.646	(v)
Location in central city of SMSA	0.221	0.416	0.215	0.412	(c)†
Location in county not contiguous to SMSA (Non-Met)	0.208	0.407	0.206	0.406	
Proportion of state population in HMOs (1984)	0.067	0.076	0.066	0.075	1984 DHHS survey
Prospector strategy	0.106	0.309	0.229	0.420	(a)*
Analyzer strategy	0.482	0.501	0.614	0.488	(a)
Defender strategy	0.332	0.472	0.013	0.115	(a)
Market penetration strategy score			38.210	18.180	(a)
New service/New market development score			40.790	16.830	(a)
Percentage of wildcat services			31.490	27.190	(a)

Interaction: Decentralization of decisions times new service and new market development	-101.330	47.630	-101.370	47.910	(a)
Interaction: Decentralization of decisions times percent wildcat services	-76.784	68.846	-76.750	68.180	(a)
Member of investor-owned system in study	0.858	0.349	0.857	0.351	
Member of system for two years or less (in 1983)	0.239	0.427	0.238	0.430	
Median family income, deflated 1980 (log) (census place or tract in urban area)	9.906	0.300			(v)
Median years of schooling, persons age 25 +	11.804	0.669			(c)
Percent of population under age 15	23.353	3.939			(c)
Percent of population age 65 and over	1.171	0.499			(c)
Population per square mile	651.187	1,025.217			(c)
Unemployment rate, age 16 +	7.744	2.883			(c)
Medicaid recipients, ratio to poverty population	0.483	0.276			(s)§
Medicaid hospital payments per recipient, ratio to average cost per hospital-day	1.957	0.474			(s)
Active MDs per 1,000 population	1.686	0.904			(c)
Nursing home beds per 1,000 population	5.921	3.113			(c)

Note: Original N of cases for the two samples is 290. With "listwise" deletion for missing data, N is 227 and 223, respectively.

*(a) denotes measures obtained in 1985 strategy survey. Overall strategic orientation was asked for both 1985 and "two years ago."
†(c) denotes county aggregate data from 1985 edition of Area Resource File.
‡(f) denotes financial data collected directly from corporate offices.
§(s) denotes state aggregate data.
¶(v) denotes special constructs explained in text.

Table 2: Comparisons of Average Cost and Net Returns

	Weighted Means			
	IO (N = 228)		NFP (N = 58)	
	1983	1985	1983	1985
Cost per adjusted admission	$2,485	$2,935	$2,838	$3,319
Growth to 1985		18.1%		16.9%
Growth of adjusted admissions to 1985		-7.4%		-0.5%
Operating margin (Percent of net revenue)	11.7%	12.9%	1.3%	3.0%
Estimated income margin after federal income tax (percent of total income)	7.6%	8.4%	5.6%	7.5%

Note:
- Each average is a ratio weighted across hospitals by the denominator of the ratio.
- Income includes nonoperating revenue allocated within each system as a constant proportion of net patient revenue.
- An effective income tax rate of 40 percent is assumed for IO hospitals.

to controlling for this problem would be to include separate dummy variables for seven of the eight systems. We did not take this approach because we find no a priori reasons to expect corporate home offices to differ in cost for reasons other than ownership and centralization of decisions (included in the analysis) and regional differences (subsumed in a number of explanatory variables such as the area wage index, central city location, number of competitors, age of facility, and so forth).

Table 3 offers estimates of a "basic" model for 1983 and for 1985 separately, excluding the strategy measures developed in this study but including the following determinants not frequently found in studies addressing ownership differences: a measure of quality (the process measure based on JCAHO data), scope of diversified services, age of facility (as inferred from depreciation data), and degrees of competition and regulatory pressures, as well as length of time belonging to a system.

Several variables have a pronounced effect on cost. Average cost falls with volume, although the coefficient implies that marginal cost is about 85–88 percent of average cost. This relatively high ratio (albeit

Table 3: Cost Regressions, Basic Model, 1983 and 1985

Dependent Variable: Log of Cost per Adjusted Admission Divided by Area Wage Index.
Method: Ordinary Least Squares.
(Coefficients with Standard Errors in Parentheses.)

Independent Variables	*1983*		*1985*	
Adjusted admissions (log)	-0.125**	(.029)	-0.162**	(.030)
Scope of services (log)	0.084*	(.036)	0.111**	(.037)
Quality—weighted JCAHO measures (log)	0.153	(.125)	0.011	(.136)
Medicare case-mix index (log)	0.926**	(.219)	1.107**	(.218)
Facility age	-0.010**	(.003)	-0.003	(.007)
AMA-approved residency	0.194**	(.070)	0.252**	(.068)
Number of competing hospitals	0.037**	(.011)	0.038**	(.011)
Location in central city	0.131**	(.048)	0.050	(.040)
Location outside SMSA	-0.002	(.041)	-0.022	(.038)
Competition from ambulatory care centers	0.005	(.033)	0.031	(.033)
C.O.N. intensity index	0.006	(.004)	0.009*	(.004)
Rate review intensity index	0.009**	(.002)	0.011**	(.002)
HMO share of population in state	0.001	(.002)	-0.007**	(.002)
Investor-owned system	-0.009	(.044)	0.039	(.052)
System member for two years or less (in 1983)	0.055	(.033)	0.052	(.033)
Intercept	7.890**	(.625)	8.927**	(.534)
Adjusted R^2		0.39		0.34
Residual degrees of freedom		224		221

Costs have been adjusted to common fiscal year end.
Corporate office costs and interest expense have been reallocated across facilities.
Depreciation is measured with "straight-line" method.
Medicare case-mix index is for FY1984.

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

not quite as high as if depreciation were the only fixed cost) is typical of cross-sectional studies. The scope of diversified services has a significant effect on cost, as expected. The Medicare case-mix index has an elasticity of nearly 1.0 in both years, indicating that it was closely proportional to average cost, even controlling for so many other factors and recognizing that Medicare represents less than half of the workload of most hospitals.

The quality measure had a positive effect on cost that was not significant. The crude correlation of the process quality measure with average cost was only .077, and the correlation with other independent variables was typically less than .10 in absolute value, so it is unlikely that the regression finding was due primarily to multicollinearity of the independent variables. Absence of a significant effect on cost can suggest that structure and process aspects of quality have been maintained at a rather high level so that the variation in our JCAHO measure represents only a relatively small component of expenses on quality assurance. Presence of an approved residency program, which may be an indicator of quality of medical supervision, had a strong positive influence on average cost in both years.

The positive effect of the number of competing hospitals is consistent with the view that nonprice competition required hospitals to spend more on amenities and quality in more competitive localities (Robinson and Luft, 1985). Neither competition from ambulatory care centers nor the HMO membership rate in the state was found to be significant for cost in 1983. But for 1985, a significant negative effect of HMO market share appeared, suggesting an increase in price competition associated with HMOs. This would be a plausible manner for price competition to spread in the hospital industry as a response to well-informed, large-volume buyers of inpatient services. More convincing and quantitatively generalizable results will require intensive study of market shares and negotiations in local market areas.

The positive coefficient for rate review was unexpected in terms of both the cost-containment goals of such programs and the general thrust of past research on the effects of the early rate review programs. We view this finding with the cautions already noted about unmeasured geographic differences in adoption of rate review as a response to relatively high costs. The positive significance of CON in the latter year suggests that the long-term effects of such regulation could be "protective" of established hospitals with higher costs.

Facility age had a significant negative effect on observed cost in 1983, as expected, and central city location had a significant positive coefficient for 1983. Neither coefficient was significant for 1985. The

impression one obtains from these changes is that hospitals under PPS have been able to neutralize some cost-increasing factors while managing resources more closely in accord with case mix, volume changes, and competitive challenges.

The independent effect of investor ownership was not significant, nor was the duration of system membership, although the latter had higher coefficients. This indicates that the model does tend to improve understanding of ownership differences in cost by considering locational contexts, strategic choices of diversified services, case mix, and response to competition.

Table 4 provides results from an expanded model with inclusion of the intended strategy measures. Because we were interested in determining the specific dimensions of strategy most strongly associated with cost per adjusted admission, we used the regression technique of backward elimination. Starting with all variables in the model, insignificant variables are dropped one at a time until only those variables with a significance level of .10 or higher are retained. Therefore, any inference drawn about a particular variable is free of the reservation that it is hiding the influence of a variable that would simultaneously be significant.

An important finding is that investor-ownership remains insignificant. Other coefficients reflect no changes in the inferences drawn from the basic model. Of the strategy measures, none had a significant independent effect in 1983, but in 1985 the defender strategy was associated with substantially lower cost. Recall that this measure indicates those hospitals with managers aiming at better performance in traditional service lines as opposed to expansions into newer services and markets. The proportion of "stars" and "cash cows" in the list of major hospital services was inversely related to cost, as hypothesized due to effects on capacity utilization.

PROFITABILITY REGRESSIONS

Assessing profitability raises some complex issues. Conceptually, we do not assume that hospitals seek the same profit margin, since they are willing to trade for other outcomes such as care of the indigent. Moreover, historical reimbursement policies, philanthropy, and barriers to entry and exit have permitted varying levels of margins. We suggest that, given the controlling influences at the individual hospital level, varying targets of profitability (which are not measured) are established. This has consequences both for regression methodology and for interpretation of results. We are primarily interested in estimating

Table 4: Cost Regressions, Expanded Model, 1983 and 1985

Dependent Variable: Log of Cost per Adjusted Admission Divided by Area Wage Index.
Method: Ordinary Least Squares, with Backward Elimination, Tolerance Level .10.
(Coefficients with Standard Errors in Parentheses.)

Independent Variables	*1983*		*1985*	
Adjusted admissions (log)	-0.102**	(.029)	-0.128**	(.032)
Scope of services (log)	0.085*	(.037)	0.098**	(.035)
Quality—weighted JCAHO measures (log)				
Medicare case-mix index (log)	0.956**	(.205)	1.039**	(.217)
Facility age	-0.009**	(.003)		
AMA-approved residency	0.177*	(.075)	0.232**	(.069)
Number of competing hospitals	0.042**	(.011)	0.032**	(.010)
Location in central city	0.132**	(.038)		
Competition from ambulatory care centers				
C.O.N. intensity index			0.008	(.004)
Rate review intensity index	0.008**	(.002)	0.011**	(.002)
HMO share of population in state			-0.005**	(.002)
Investor-owned system				
System member for two years or less (in 1983)	0.062	(.034)		
Prospector strategy				
Analyzer strategy				
Defender strategy			-0.309*	(.118)
New service/Market development score			0.001	(.0008)
Penetration strategy score				
Percent wildcat services				
Percent star services			-0.001*	(.0006)
Percent cash cow services			-0.002**	(.0006)
Interaction: decentralization times new service/market strategy				
Interaction: decentralization times percent wildcat services				
Intercept	8.403**	(.238)	8.769**	(.242)
Adjusted R^2	0.39		0.38	
Valid cases	227		222	

Costs have been adjusted to common fiscal year end.
Corporate office costs and interest expense have been reallocated across facilities.
Depreciation is measured with "straight-line" method.
Medicare case-mix index is for FY1984.

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

effects of strategy and environment on actual profit margins independent of the target levels.

Over the period of a year, managers would have opportunities to modify budgets, prices, and other strategies to reduce discrepancies between actual and desired profit margins. As a result, observed implementation and intermediate outcomes of intended strategy, such as scope of diversified services, volume of service, and process measures of quality, would be determined simultaneously with actual profitability level. This would lead to potential problems in confounding causes and effects; therefore, these other outcome variables are excluded from the profitability analysis. We add variables predictive of demand and insurance coverage, such as family income and education levels, Medicaid coverage, and proportion of elderly in the local population. This approach is essentially a "reduced form" model, although, depending on the length of the time period, any facility characteristic and case-mix index could be considered endogenous.

There is no particular specification of the functional form most compelling for these regressions. We measure financial performance in two ways—net operating margin before taxes as a proportion of patient care revenue (NBT), and net income margin after estimated federal income taxes as a proportion of total income (NIM). We do not use a return-on-equity measure, because the allocation of debt across the balance sheets of hospitals owned by a multiunit corporation is essentially arbitrary. Moreover, the debt issued by the system or the hospital may be used to finance ventures other than the patient care addressed in this study.

Regression results for NBT are compared between 1983 and 1985 in Table 5. The explanatory power of the regression is somewhat larger in 1985. The large difference associated with IO hospitals previewed in Table 2 remains significant in the multivariate context, and it did not change meaningfully between the two years. The significantly lower profitability of newer system members is also noteworthy, and warrants attention in any study where system hospitals are being compared with freestanding hospitals.

The competitive environment, indicated by variables such as the number of competing hospitals and HMO membership, were not significant, but nursing home bed availability had a significantly negative effect on hospital margins. While nursing home beds may permit earlier hospital discharges with some beneficial cost savings under Medicare PPS, the overall effect of nursing home beds as an alternative site of care appears to reduce margins in both years. Rate review intensity had no significant effect on margins, which may mean these

Table 5: Operating Margin of System Hospitals, 1983 and 1985

Dependent Variable: Operating Income before Taxes as a Proportion of Net Revenue.
Method: Ordinary Least Squares ("Reduced Form" Model, with Backward Elimination).
(Coefficients with Standard Errors in Parentheses.)

Independent Variables	*1983*		*1985*	
Community Demand Factors				
Median family income, deflated	0.002	(.001)	0.004**	(.001)
Median years of schooling				
Medicaid recipients per poor person				
Medicaid payment generosity				
Percent of population age 65 and over			0.005**	(.001)
Supply and Competition				
Active MDs per thousand population				
Number of competing hospitals				
Location in central city				
Location outside SMSA			-0.032	(.017)
HMO membership per capita				
Nursing home beds per thousand	-0.008**	(.003)	-0.005*	(.002)
Competition from ambulatory care centers				
C.O.N. intensity index	0.005*	(.002)		
Rate review intensity index				
Facility Characteristics, Strategy				
Facility age				
Medicare case-mix index, 1984	0.293**	(.085)	0.168**	(.070)
Prospector strategy	-0.050*	(.025)		
Analyzer strategy				
Defender strategy			-0.084	(.049)
Score for new service/market strategy				
Score for market penetration strategy	0.001*	(.0006)		
Percent wildcat services			-0.0005*	(.0002)
Percent star services	0.0007	(.0003)	0.0009**	(.0003)
Percent cash cow services			0.0005*	(.0003)
Interaction: decentralization times new service/market strategy	-0.0004*	(.0002)		
Interaction: decentralization times percent wildcat services				
Interaction: investor-owned times number of competing hospitals				
Investor-owned system	0.097**	(.023)	0.110**	(.018)
System member for two years or less (in 1983)	-0.061**	(.018)	-0.059**	(.014)
Intercept	-0.39**	(.109)	-0.31*	(.083)
Adjusted R^2	0.20		0.32	
Residual degrees of freedom	238		237	

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

programs are more successful in regulating prices than in restraining costs.

Medicare case mix has a somewhat lower but still significant coefficient in 1985. The significance of the case-mix index suggests that those services provided to patients with more intensive needs and procedures tended to bear higher profit margins. This may be due to higher use of ancillary services that are typically billed to non-Medicare payers at higher ratios of charge to cost. The short-term effect of Medicare PPS on margins is also inferred from the significant coefficient in 1985 for the percent of elderly population in the local county population.

The significant positive effect of median family income reflects better ability to pay (probably due to health insurance coverage rather than wealth per se), and therefore greater potential for the hospital to compete on quality and amenities and to cross-subsidize for care to the indigent. It is interesting that this demand predictor was more important in 1985 than in 1983.

The influence of strategy measures on profitability is of particular interest. In 1983, a prospector strategy was clearly associated with lower profitability, and a market penetration strategy had significant positive effect. However, in 1985, neither the prospector strategy nor the market penetration score had an association with profitability—but the defender strategy was associated with lower profitability. Percentage of "wildcat," "star," and "cash cow" services also become more important as determinants of profitability in 1985. As predicted, wildcat services are associated with lower overall hospital profitability, while stars and cash cows are positively associated with profitability.

The regressions for net income margin are presented in Table 6. The differences associated with investor ownership do not appear in the same fashion in the two years. For 1985, there is a simple independent difference of 6.3 percent. In 1983, competition from other hospitals had a depressing effect that was mitigated for IO hospitals, as indicated by the positive coefficient of the interaction term. The other results in this table are essentially similar to the findings for operating margin in Table 5. The defender strategy was clearly associated with lower margins in 1985; the prospector strategy had been less profitable in 1983.

In view of our tentative findings that a more defensive strategic orientation had a negative effect on profitability in 1985 compared to 1983, we have briefly examined the change in strategy between the two years and have compared these changes between ownership types. Over our sample of 290 hospitals surveyed in 1985, roughly half, 143,

Table 6: Net Income Margin of System Hospitals, 1983 and 1985

Dependent Variable: Net Income after Taxes as a Proportion of Total Income.
Method: Ordinary Least Squares ("Reduced Form" Model, with Backward Elimination).
(Coefficients with Standard Errors in Parentheses.)

Independent Variables	*1983*		*1985*	
Community Demand Factors				
Median family income, deflated	0.002*	(.0007)	0.003**	(.0007)
Median years of schooling				
Medicaid recipients per poor person				
Medicaid payment generosity				
Percent of population age 65 and over			0.003**	(.0009)
Supply and Competition				
Active MDs per thousand population				
Number of competing hospitals	-0.012**	(.005)	0.011*	(.006)
Location in central city				
Location outside SMSA			-0.021	(.012)
HMO membership per capita				
Nursing home beds per thousand	-0.004**	(.001)	-0.003*	(.001)
Competition from ambulatory care centers				
C.O.N. intensity index				
Rate review intensity index				
Facility Characteristics, Strategy				
Facility age				
Medicare case-mix index, 1984	0.202**	(.052)	0.123**	(.048)
Prospector strategy	-0.027	(.014)		
Analyzer strategy				
Defender strategy			-0.073*	(.032)
Score for new service/market strategy				
Score for market penetration strategy	0.0007*	(.0003)		
Percent wildcat services	-0.0003	(.0002)		
Percent star services			0.0005**	(.0002)
Percent cash cow services			0.0003	(.0002)
Interaction: decentralization times new service/market strategy	-0.0004**	(.0001)		
Interaction: decentralization times percent wildcat services	0.0001	(.0001)		
Interaction: investor-owned times number of competing hospitals	0.014*	(.005)	-0.013*	(.006)
Investor-owned system			0.063**	(.017)
System member for two years or less (in 1983)	-0.041**	(.010)	-0.036**	(.009)
Intercept	-0.221*	(.061)	-0.121**	(.058)
Adjusted R^2	0.21		0.26	
Residual degrees of freedom	238		237	

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

perceived a change in strategic orientation after 1983. Of those with changes, 100 became more aggressive by moving from analyzer to prospector (32 cases) or from defender to analyzer (68 cases). In general, IO hospitals were more likely to have moved to the prospector category in 1985, as were hospitals that were newer members of systems in 1983.

An intriguing question is why the IO corporations in our study did not improve in financial performance between 1983 and 1985 (as shown in their annual reports) to the degree that their individual owned and leased hospitals did. A possible reason may lie in the disappointing financial performance of some of the corporate diversifications into insurance, HMO management, pharmacies, and related ventures (major "restructurings" were reported in the *Wall Street Journal* and *Modern Health Care* in the summer and fall of 1986). Qualitative data from interviews with system executives in late 1986 suggest that IO systems, especially, are retrenching from alternative care arrangements and focusing again on the base hospital business and closely related local market initiatives.

CONCLUDING DISCUSSION

The present findings represent the first analysis of the performance of IO and NFP system hospitals before and after Medicare PPS. Specific hypotheses about the determinants of average cost per adjusted admission were significantly supported with regard to case mix, volume, scope of diversified services, central city location, and age of facility. A measure of structure/process quality was not significantly associated with cost, contrary to expectation. Further work addressing "cost/quality" trade-off issues is clearly needed.

The positive association of cost with number of competitors supports the idea that competition continued to be based primarily on "amenities" and quality rather than price. Anecdotal evidence suggests that price or cost competition is only beginning to take effect, particularly in markets heavily penetrated by HMOs and related managed care systems. For example, we find a negative impact on costs in 1985 associated with higher HMO market penetration in the state. Intensity of state rate review had a positive association with cost, which may be less reflective of the effects of regulation than of persisting geographic cost differences that led to variations in intensity of regulation.

As hypothesized, the results suggest no differences in cost per adjusted admission between IO and NFP system hospitals, after allow-

ing for the specific determinants already discussed as well as for diversification and growth strategies. The IO system hospitals do experience higher operating margins. The differences, however, between IO and NFP system hospitals are reduced greatly when one estimates total net income after taxes. Further, the differences appeared to narrow between 1983 and 1985, when volume of adjusted admissions fell more sharply for the IO system hospitals than for the NFP system hospitals in our study. These findings about volume and margin change by ownership category may not reflect generalized national experience—the decline in volume of adjusted admissions for our NFP hospitals appears to be substantially less than the national average in that ownership category. Four of the five NFP systems in our study have one or two "flagship" institutions that are market leaders in their areas, while the remainder of the system hospitals are much smaller.

As expected, all operating margins improved between 1983 and 1985, and the proportion of elderly in the local population was significantly associated with margins in 1985. These early findings may soon be reversed as the federal government reduces annual rates of increase in payment rates, and regional variation in impact should become more prominent with the blending of payment rates with national as well as regional cost-based rates.

In a cost-plus reimbursement environment, hospitals did not have to think or behave strategically. In the new competitive environment, hospital strategic behavior becomes increasingly important. Our preliminary findings on the influence of strategy suggests that while a defender strategy is associated with lower costs in 1985, it is also associated with lower profitability. This suggests that "hunkering down" to protect one's turf is only part of the formula for survival. At the same time, one may need to adopt more aggressive marketplace strategies, which balance cost-containment features with new services distinct from those of the competition based on technical quality and consumer access, convenience, and comfort. Ongoing research is needed to examine the effects of these strategies on cost, profitability, quality, and patient outcomes.

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NOTES

1. For a review of findings concentrating on multihospital systems, see Ermann and Gabel (1984). A review concentrating on methodology issues with some new results is Cowing et al. (1983). One of the most thorough recent studies with a large national sample of hospitals is Watt et al. (1986).
2. Previous cross-sectional research finds that marginal cost tends to be very close to average cost. In time series evidence for individual hospitals or groups, average cost is much less than proportional to volume, implying relatively low marginal cost. A rationale for the discrepant evidence, based on a distinction between expected versus unexpected changes in volume, is tested successfully in Friedman and Pauly (1983). The conclusion to be drawn is that one can expect to observe marginal cost quite close to average cost in cross-sectional studies or in time series data when hospitals have had some months to anticipate or adjust to demand shifts.
3. The list of services was as follows: inpatient surgery, inpatient general medical, inpatient obstetrics, inpatient pediatrics, inpatient psychiatric, outpatient renal dialysis, outpatient diagnostic centers, home health care, long-term care, ambulatory surgery, urgent care centers, inpatient or outpatient rehabilitation, inpatient and outpatient alcoholism treatment, and health promotion.
4. In a supplementary report available from the authors, we provide two-stage least-squares regression estimates, and in later work we would attempt to study the effects over time of cost and margins on changes in demand and strategic choices.

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