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Authors

Snail, Timothy S
Robinson, James C

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ORGANIZATIONAL DIVERSIFICATION IN THE AMERICAN HOSPITAL

Timothy S. Snail and James C. Robinson

School of Public Health, University of California, Berkeley, California 94720;
e-mail: snail@uclink.berkeley.edu; jamie@uclink4.berkeley.edu

KEY WORDS: horizontal integration, vertical integration, diversification, physician-hospital organization, physician-hospital integration

ABSTRACT

This paper outlines a conceptual framework of organizational diversification and assesses the state of empirical research on hospital organizational change. The literature on economic organization of hospitals, one of the most developed branches of health services research, still has only weak ties to economic theory. Evolving physician-hospital organizations do not fit into existing frameworks based on horizontal integration, vertical integration, or diversification. Empirical research has primarily focused on horizontal integration, and cause-effect relationships are often obscured by models that depart from economic theory and lack controls for self-selection bias. Recent empirical studies indicate that hospital mergers had moderate, rather than dramatic, effects on the rate of change in operating costs, staffing, and scale. Mergers rarely resulted in hospital closure, but were as likely to result in acute care consolidation and restructuring as in conversion to non-acute inpatient uses. While administrative costs were higher in for-profit than non-profit system hospitals, total costs were similar. System hospitals had lower marginal and average costs per stay than independent hospitals. Hospital vertical integration into subacute care was largely an artifact of the governmental uniform pricing system, which encouraged vertical integration. Hospitals that shared governance or financial risks with physicians outperformed those with high levels of physician governance and financial integration (e.g. stock ownership). Formal physician-hospital organizational arrangements often served to coordinate managed care contracting or to forge links with primary care group practices. Hospital diversification into related services improved short-term financial performance over unrelated diversification, although long-term performance was similar.

INTRODUCTION

Hospitals have undergone pervasive changes in organization over the past decade due to consolidation through merger or linkages to larger health care systems, diversification into new products or markets, and vertical (and virtual) integration. The pace of change is quickening under pressure from managed care contracting and purchaser concentration, and hospitals are becoming a less central component of more comprehensive and integrated delivery systems that place greater emphasis on primary care and preventive service needs of larger populations. By the end of 1995, one quarter of community hospitals participated in a health network and nearly half of urban hospitals had joined, joint-ventured, or contracted with a health care system (5). Despite a vast literature on organizational change and diversification in general, there has been little research on the relationships between hospitals and other organizations. Empirical evidence on the causes and effects of these changes is surprisingly mixed, raising serious concerns for both hospital strategy and public policy, whose decisions are contingent upon efficiencies in delivery systems and coordination of care. The purpose of this review is to outline a conceptual framework of organizational diversification, to assess research methods used, and to review the state of empirical research on hospital organizational diversification.

CONCEPTUAL FRAMEWORK OF ORGANIZATIONAL DIVERSIFICATION

The past decade has also witnessed great advances in our understanding of the dynamics of economic organization through the literatures on industrial organization and business strategy; Chandler's reflections on scale, scope, and organizational capabilities in the evolution of modern industrial enterprise (9); Williamson's development of the ramifications of transaction costs and the mechanisms of governance (53,55); and Milgrom & Robert's synthesis of the determinants of the boundaries and structure of the firm (31), to name a few. These insights have just begun to be applied to the study of hospital organization, and the gap between theory and empirical modeling is even wider. Despite the profound influence of organization on economic performance, empirical analyses of hospitals usually treat organizational change and diversification as a black box: Incentive and control mechanisms within organizations are rarely identified in detail, and the economic basis of organizational change (e.g. joint production of inputs) is rarely worked out. For example, while Newhouse (37) long ago demonstrated that the behavior of non-profit hospitals is better described by output maximization than the profit-maximizing objective function of the proprietary hospital, most empirical research continues to use

one objective function for all forms of ownership, attempting to capture all the variation due to organization in a dummy variable.

This section describes three commonly recognized forms of organizational diversification (horizontal integration, vertical integration, diversification), explains how physician-hospital organization distinctly differs from these forms, and briefly discusses the economic basis of each form.

Horizontal Integration

Horizontal integration is the combining of several organizations whose outputs are substitutes from the perspective of consumer demand (13). It can take the form of specialization in a particular stage of production or distribution of a product, rather than involvement in successive stages (as in vertical integration). Hospital mergers, chains, and alliances are prominent examples of horizontal integration, as is the merger of a physician group practice with the outpatient department of a hospital (13). Horizontal integration may be achieved through ownership or contractual alliance, although contractual forms leave the hospital partners as competitors if they operate in the same markets. The scope of horizontal integration may be within or across markets (45).

WITHIN MARKET Within market integration is the merger of two firms producing the same product in the same market, as is in local hospital mergers. Merging firms may seek economies or scale in purchasing (e.g. volume discounts) and production, specialization in labor or management techniques, and reduced duplication of facilities and higher capacity utilization through service consolidation and coordination. Diseconomies may result from difficulties in coordinating activities and providing performance incentives (45). Increased market penetration or horizontally coordinated pricing policies may raise concerns of market power or collusion under antitrust law.

ACROSS MARKET Across market integration is the merger of two firms producing the same product in different markets, as in regional or national hospital chains, alliances, or networks. Most economies of within-market integration apply to across-market integration, although increased capacity utilization is only pertinent if the merged entity becomes a center of excellence in a specialized service that draws patients from several markets or if a chain closes a facility and consolidates the patients within its other facilities in the same market. Chains may also gain reputational advantages from standardization of products and brand name recognition.

Vertical Integration

Vertical integration involves linking together successive stages in the production of a product, such as materials procurement to production, or production to

distribution and marketing. For example, a home health care agency could partially vertically integrate by acquiring a durable medical equipment company to supply walkers and other equipment needed by its home health patients. A hospital-based delivery system could vertically integrate by acquiring all the means of producing, distributing, and marketing its services, from employing hospital-based physicians to developing insurance products. Many of the factors influencing vertical relationships are described in Conrad et al (13), which draws from the health services research, economics, and organizational sociology literatures.

The mode of vertical integration is contingent upon the “make or buy” decision—the comparative efficiency of pursuing the linkage through arms-length market transactions, long-term contracts, or unified ownership. Various modes of organization may establish different performance incentives and administrative controls, with distinct efficiency ramifications. Williamson (54) describes how the make or buy decision rests on tradeoffs between technical efficiency in production and the costs and capabilities of governance mechanisms, with transaction costs arising from negotiating agreements, coordinating activities, monitoring performance, and enforcement. The tradeoffs may vary under different market conditions.

CHAIN OF PRODUCTION To discuss vertical integration for a particular product, its chain of production or value chain, as it is called by Porter (40), must be defined; components span raw materials, intermediate products, production, and distribution and marketing. Clement (11) illustrates the difficulty of defining health care production processes: Patterns of production are variable, and patients may skip or return to prior stages of production during an episode of illness. Organizational distinctions in the distribution and marketing of health care services are often blurred since they involve physician organizations and third-party payers (not just patients as consumers), and access to distribution channels is often provided by organizations that play a role in production (e.g. health plans). It is also difficult to define and measure “outputs” of health care production processes: Hospital output measures often mask the multiproduct nature of hospital care (e.g. an inpatient day measures care provided under one of several hundred DRG-product lines), whereas “health” as an output encompasses nearly all production processes. Vertical integration is more accurately defined by the linkage of intermediate products into a package of health care services (11), or the linkage of production with distribution and marketing.

BACKWARD VS FORWARD INTEGRATION Vertical integration can cause linkages to earlier stages of production (backward integration) or later stages (forward integration). Backward integration includes hospital integration into

components of the inpatient production process (i.e. supplies, materials, labor). Hospital forward integration often involves distribution and marketing channels through insurance products (PPO, HMO). The motivations for vertical integration differ depending on the stages of production involved. Backward integration is often done to reduce the transaction costs of procuring production inputs or to better coordinate production, whereas forward integration is often done to protect product quality or firm reputation in the hands of distributors or to gain access to distribution and marketing channels.

Diversification

A firm diversifies by increasing the heterogeneity of its outputs, either by producing a new product that is not a substitute for its existing products or by entering a new market with the same product. For example, a hospital could diversify beyond its inpatient acute care services into ambulatory surgery, post-acute care (e.g. subacute care, home health care, hospice care), primary care and preventive services, or community wellness programs, or it could market its inpatient services to new geographic areas to counteract changing medical practice patterns that result in shorter inpatient stays and lower occupancy rates. Conglomerate diversification is a polar extreme of multiproduct diversification wherein the new product is unrelated to existing products of the firm. The predominant rationales for diversification include economies of scope, economizing on transaction costs, financial synergies (e.g. balancing risk or cash flow), and managerialism, whereby managerial discretion and control allow pursuit of goals that are not profit maximizing for the firm (19). Empirical studies often investigate economies (or diseconomies) of scope in producing or distributing specific combinations of products, or how economic performance differs between more or less diversified firms.

PRODUCTS, MARKETS, AND RELATEDNESS Empirical analyses of diversification begin by defining the pertinent products and markets, as with vertical and horizontal integration. Diversification also requires a metric for the degree of relatedness (or unrelatedness) of existing activities to new products, new markets, or both. Relatedness in hospital diversification has been defined using many typologies, although most focus either on production technologies and market geography or consumer characteristics (2, 11), management style and skills (50), or core versus non-core lines of business of a traditional acute care inpatient hospital (13). The degree of diversification of a firm is often measured by market share, share of investment within the firm, or counts of related versus unrelated lines of business.

Although hospitals are multiproduct firms, not all engage in the same activities to the same degree. Thus a particular product (e.g. home health care) may

be a related diversification venture for some hospitals but unrelated for others, depending on their prior experience beyond inpatient acute care. Studies of the overall performance of diversified firms, instead of the effects of incremental addition of a specific product line, are easily confounded by different mixes and changing portfolios of diversified activities. The ability to successfully diversify depends not only on relatedness to the hospital's product-market portfolio, but on the ability to selectively transfer production and management techniques from existing activities that result in more economies than diseconomies of scope.

Operational definitions of diversification are often inconsistent since health care organizations typically serve multiple production processes, in particular, inpatient and outpatient processes (e.g. IPA/medical group practice, MRI center, insurance products), and since many health care products are to some degree both substitutes and complementary products.

DIVERSIFICATION AND INTEGRATION Diversification is not mutually exclusive with horizontal or vertical integration. The impetus for horizontal growth and expansion may arise from hospitals' experience with diversification or vertical integration (e.g. shared diagnostic imaging facilities, development of physician-hospital organizations, integration into insurance products), as hospital systems seek to apply their competencies to other markets (48). However, horizontal integration is unlikely to pave the way for future vertical integration and diversification, as geographic breadth may make additional vertical depth too costly. Local hospital systems formed through horizontal integration have the potential to develop into regional systems of care, which are designed to rationalize and integrate services (27). Most regional systems have looser forms of organization than is typically implied by unified ownership, including contractual relations, joint ventures, and consortia. Geographical proximity allows hospitals in local hospital systems to seek economies from market coordination and specialization through both horizontal and vertical integration.

Physician-Hospital Organization

The difficulty in classifying organizational arrangements as vertical integration or diversification is best illustrated by physician-hospital organizations, which involve multiple forms of organizational diversification. Physician-hospital organizations give hospitals a vehicle to vertically integrate into physician practices, to develop networks to supply inpatient admissions, to diversify into non-hospital services, to negotiate managed care contracts, and to market and distribute hospital services. Hospital-physician organizations are most common in areas where there is substantial managed care contracting (39). The

main forms of organizational arrangements between hospitals and physicians are the physician-hospital organization (PHO), management services organization (MSO), foundation, integrated healthcare organization (IHO), hospital owned or affiliated group practices, and physician ownership or equity shares in hospitals (8). Hospitals may engage in several types of physician-hospital organizational arrangements, and arrangements exhibit substantial variation in characteristics between and within forms. The following discussion focuses on three dimensions along which physician-hospital organizations differ: ownership and control arrangements, the provision of administrative and clinical support services, and roles in managed care contracting.

Although some PHOs are joint ventures between hospitals and physician organizations (e.g. IPAs or medical groups), the typical PHO is hospital-sponsored and involves a single hospital and its medical staff. By the end of 1994, single hospitals were sole owners of 20% of PHOs, had at least 50% ownership in four-fifths, and provided start-up funds in 85% of PHOs (18). While PHOs primarily serve as contracting vehicles with managed care plans and employers, they may provide a wide range of services (e.g. utilization review and quality assurance, physician credentialing, claims processing, marketing, fee-schedule development) or offer a means of owning a managed care plan or of owning or operating other health care facilities (e.g. ambulatory care or ancillary service center) (8). The typical PHO, which is less than a year old, has some administrative integration but virtually no clinical integration (18); integration is much higher in PHOs with a high share of revenues from capitated contracts (39). PHOs have limited abilities to influence practice patterns as individual physicians have little financial stake in the PHO (39) and the degree of integration is low.

An MSO provides administrative services and (sometimes) practice management services to one or more medical practices, and is often owned by one or more hospitals, by investors, or jointly by a large group practice (18). In 1994, one third of MSOs were solely owned by a hospital (41). Three quarters of all MSOs negotiated with managed care plans on behalf of physicians (41). In MSOs the separate physician organization usually executes contracts with payers and managed care plans and handles the revenues (8). Hospitals or investors may use MSOs to purchase physician practices or just their physical assets (36). Aside from providing administrative services, MSOs are a vehicle for transferring capital to physician organizations (8).

Foundations are separate (usually non-profit) corporations organized as an affiliate or subsidiary of a hospital; typically they provide facilities, administrative/financial/marketing services, employ nonmedical personnel, and negotiate a professional services contract with a physician group. The foundation negotiates contracts with payers and managed care organizations, and usually

both hospitals and physicians are capitated. The physician owns none of the MSO physical assets, and has little participation in governance (particularly for non-profits due to IRS restrictions) except through the professional services agreement. However, foundations offer a higher degree of alignment of incentives and sharing of risks between physician and hospital than the PHO or MSO (8).

An IHO is a separate legal entity, usually with three subsidiaries: a hospital organization, medical services organization, and educational and research foundation (8). The hospital subsidiary performs most administrative services (marketing, finance, management information systems) and provides capital for expansion. The medical subsidiary is a non-profit entity with a physician-controlled board, employs all physicians on a salaried basis, and performs quality assurance, utilization review, and peer review. The IHO board has representatives from the subsidiary boards and the community, and ratifies budgets and coordinates activities of the subsidiaries. IHOs often sponsor their own PPO or HMO, usually through joint ventures with their medical and hospital subsidiaries. IHOs provide the highest degree of alignment of incentives between physicians and hospitals of the various forms of physician-hospital organizations, and the greatest potential for developing comprehensive, integrated delivery systems.

Hospital owned or affiliated group practices are a means for hospitals to develop physician leadership among the medical staff, promote physician loyalty to the hospital, expand into new markets, and to improve marketing, quality assurance, utilization review, recruitment of primary care physicians (8). A hospital owned or affiliated independent practice association (IPA) may serve the same purposes, although physicians may belong to multiple IPAs. In 1994 over one in three hospitals owned at least one physician practice (15), whereas one in ten physicians reported their practice to be at least partly owned by a hospital (41).

Physicians have owned or had equity shares in hospitals for many years, especially in proprietary hospital chains (8). These arrangements give physicians a financial stake in the health of the hospital, and hospitals hope to attract their hospital admissions.

MODELING CAUSES AND EFFECTS OF ORGANIZATIONAL DIVERSIFICATION

The types of models used in empirical analyses of organizational change and diversification can be grouped using a combination of criteria: the implied direction of causality, the type of dependent variable, and the objective function being modeled. Four broad types of models are evident, and are described

below. Empirical studies use a wide range of analytic and modeling techniques,¹ some based on established theory but most on ad hoc models. The lack of theoretical foundation for most models makes it difficult to interpret estimated coefficients and to understand the dynamics of the underlying organizational behavior.

Cause-of-Change Models

Cause-of-change models have as a dependent variable the type of organizational change or diversification (e.g. horizontal merger) or the degree of change (e.g. degree of diversification). Determinants of change are derived from the characteristics of hospitals and their markets wherein change occurs, or the pre-change objectives of managers. Qualitative or limited dependent variable econometric models are often employed, and the dependent and independent variables of empirical cause-of-change models in this review are shown in Table 1.

In these cross-sectional models the direction of the cause-effect relationship between organizational change and hospital performance (e.g. operating costs and revenues) is often unclear, and the models are prone to self-selection bias whereby the characteristics of the hospitals in the study sample are driven by relationships that not are being modeled. Some models also omit important variables (usually aspects of market structure), which may lead to biased coefficient estimates.

Cost Function and Financial Performance Models

Cost function models attempt to measure the change in expenditures associated with organizational change for hospital systems, hospitals, or hospital subunits. These models are typically estimated using a functional form derived from economic theory or a hybrid form, with a wide variety of independent variables (see Table 2). Financial performance resulting from organizational change includes models whose dependent variable is some measure of financial performance other than costs (e.g. operating margin). Treatment effects models are usually estimated, using a set of independent variables similar to those for models of costs.

There is a large body of economic literature on health care cost function estimation: Grannemann et al (24) describe extension of cost functions for multiple outputs, Keeler & Ying (25) discuss nonlinearities and the objective function, Gertler & Waldman (22) focus on measures of omitted quality, and Newhouse (38) reviews a wide range of issues. Most of the empirical models reviewed here suffer from three methodological problems. Many models are not based on any established theory or they make unjustified departures from

¹The econometric issues raised in this section are discussed in most econometric texts including Kennedy (26).

Table 1 Variables used in models of causes of hospital organizational change

| | |
|---|--|
| Dependent variables | Methodological concerns |
| Merger, consolidation | <i>Self-selection bias</i> |
| System affiliation (acquisition, management contract) | |
| Vertical integration (subacute care) | |
| Diversification (form or degree) | |
| Independent variables | |
| <i>Operating costs and revenues</i> | <i>Cause-effect relationship, feedback</i> |
| Payroll/total expenses | |
| Revenue/expenses | |
| <i>Scale and capacity utilization</i> | |
| Beds | |
| Occupancy rate | |
| <i>Ownership and control</i> | |
| For-profit/non-profit/government | |
| Teaching hospital | |
| Community/specialty hospital | |
| Strategy | |
| <i>Integration and diversification</i> | |
| In system (for/non-profit) | |
| Years in system | |
| New product/new market diversification | |
| <i>Market structure</i> | <i>Omitted variables</i> |
| HMO penetration | |
| Payer mix | |
| Population aged ≥ 65 | |
| Per capita income, education | |
| Unemployment rate, mix | |
| Births/population | |
| Urban/rural | |
| Geographic region | |
| Hospital concentration | |
| Amb. surgery, urgent care competition | |
| Physicians/population | |
| State rate setting program, CON program | |

theory, which obscures the mechanisms for the observed effects. This results in models with irrelevant variables (e.g. input quantities in addition to input prices), omitted variables (e.g. quality, multiple outputs), endogeneity, unclear cause-effect relationships, and heterogeneity in variables (e.g. aggregation of multiple outputs). Second, most of these models suffer from self-selection bias (e.g. hospitals are selected as merger partner candidates based on their prior financial performance, not just the independent variables in the model). Third, many models do not properly account for what can be called latent effects: either because the period of observation is too short to measure the emergence

Table 2 Variables used in models of hospital costs and financial performance

| | |
|--|--|
| Dependent variables | Methodological concerns |
| Expenses (total, per patient day, per discharge) | <i>Self-selection bias</i> |
| Depreciation and interest expenses | <i>Latent effects</i> |
| Financial ratios (stock value, operating margin) | |
| Occupancy rate | |
| Independent variables | |
| <i>Output quantities</i> | <i>Omitted variables, heterogeneity</i> |
| Inpatient days, discharges | |
| Outpatient visits, revenue share | |
| High/low-technology service volumes | |
| Occupancy rate | <i>Endogeneity</i> |
| <i>Input prices</i> | <i>Omitted variables</i> |
| Wage rate | |
| <i>Input quantities^a</i> | <i>Objective function</i> |
| Beds | |
| Physicians per bed | |
| <i>Ownership and control</i> | |
| For-profit/non-profit/government/religious | |
| Teaching | |
| <i>Integration and diversification</i> | <i>Cause-effect relationship, feedback</i> |
| In system | |
| Physician organization diversification | |
| <i>Market structure</i> | <i>Omitted variables</i> |
| Casemix index | |
| HMO penetration | |
| Payer mix | |
| Per capita income | |
| Urban/rural | |
| Hospital concentration (HHI) | |
| <i>Fixed effects or stratification variable</i> | |
| State (regulation) | |

^aIncluding beds makes for a short-run cost function; other input quantities violate cost function assumptions.

of the effects (e.g. long-term capital spending or restructuring), or studies may have a lengthy period of observation without controlling for secular trends (e.g. technology change).

Operational Change Models

Studies of operational changes resulting from organizational diversification include models whose dependent variable is a type of organizational restructuring that is not a direct measure of costs or financial performance (e.g. discontinuation of a line of business, closure of a facility, changes in staffing levels). The primary unit of analysis is the hospital, although several studies used the hospital system and one used specific product lines. The dependent variables

Table 3 Variables used in models of hospital operational changes

| Dependent variables | Methodological concerns |
|--|---|
| <i>Operating costs</i> | <i>Cause-effect relationships, feedback</i> |
| Expenses per admission | |
| <i>Staffing</i> | |
| Nurse staffing (per ADC) | |
| Total staffing (per ADC or bed) ^a | |
| <i>Scale and capacity utilization</i> | |
| Admissions | |
| Beds ^a | |
| Occupancy rate ^a | |
| Daily census variability (peak load) | |
| <i>Ownership and control</i> | |
| For/non-profit status ^a change | |
| <i>Service consolidation or change</i> | <i>Latent effects</i> |
| Acute care dropped | |
| Convert to other inpatient uses | |
| Closed, vacated facility | |
| Independent variables | <i>Omitted variables</i> |
| <i>Integration and diversification</i> | <i>Self-selection bias</i> |
| In system (for-profit/non-profit) | |
| <i>Service and market characteristics</i> | |
| Acute care services duplicated | |
| Distance between acute facilities | |
| Direct competition for services or staff | |
| Market competition | |
| Urban/rural location | |
| Time period | |

^aAlso used as independent or stratifying variable in some models.

vary, as do the independent variables and the functional form. These are typically modeled as treatment effect models or qualitative or limited dependent variable models, with the variables shown in Table 3.

The most common problems in these models are self-selection bias (e.g. entry into systems), latent effects (e.g. long-term restructuring after merger), unclear cause-effect relationships (e.g. expenses and organizational change), and omitted variables.

EMPIRICAL FINDINGS ON ORGANIZATIONAL DIVERSIFICATION

This section reports findings from empirical studies of hospital organizational change and diversification. The criteria used in selecting studies for review are that the period of observation occur after the era of cost reimbursement

defined by enactment of DRG payment for Medicare hospital stays in 1982, hypotheses are tested using statistical tests of significance, and the study sample consists of at least ten hospitals or subunits. While earlier studies are still useful in suggesting potential types of economies and diseconomies arising from organizational diversification, there has been dramatic evolution in modes of hospital organization, changes in market structure and competition, substantial consolidation, and regulatory changes that have altered the relative costs of providing different services.

The studies reviewed here used varying sized samples, and different models and analytic approaches. Most have limitations related to the data used or multiple types of methodological problems enumerated above. (See Table 4 for a summary of study designs). As a result, the explained variance (e.g. R^2 statistic) of the models in different studies cannot be compared.

Empirical findings on horizontal integration, vertical integration, diversification, and physician-hospital organization are presented separately, and for each topic studies on both economic causes and effects are reviewed. For studies using statistical tests, only statistically significant findings are reported unless noted otherwise. The empirical findings are compared to results from selected case studies and other qualitative research.

Horizontal Integration

Most empirical research on hospital organizational change has focused on mergers and multihospital system growth, although few studies distinguish between different forms of growth such as horizontal merger versus consolidation or local, regional, and national hospital chains. Markets are typically measured by geographic boundaries (e.g. county, MSA), distance between hospitals, or on the basis of patient origin data (21).

CAUSES The determinants of horizontal integration (merger, consolidation, management contracts, multihospital systems) have been the subject of many case studies but few statistical analyses. While some studies interviewed hospital managers to elicit the objectives of horizontal integration efforts, most analyzed the characteristics of hospitals using samples drawn from cross-sectional secondary data; from this the authors infer the likelihood of future horizontal integration among similar facilities. Horizontally integrating hospitals are usually found to be atypical of the average hospital on most dimensions. As a result, studies of cost, performance, and operational change that compare integrating versus non-integrating hospitals are difficult to interpret unless specific measures are taken to minimize the effects of self-selection bias.

Three studies examined the reasons for hospital merger, consolidation, or entry into multihospital systems. While all three examined pre/post-change

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Table 4 Design of empirical studies of hospital organizational diversification

| First author | Change | Sample | N | Independent variables | Dependent variables | Notes |
|---------------|---------------------|---|---------------|--|---|------------------------------------|
| Alexander (1) | Horiz. merger | 1982-89 US mergers (194 hospitals merged to 92) stratified by size, ownership, and period | 92 | Horizontal merger stratified by beds, for-profit/non-profit/gov't, year | Exp. per adm., RN and total staff per ADC, adm., beds, occ. rate Compare 3 years pre/post merger | Pre/post, random controls, t-tests |
| Alexander (3) | Phys.-hosp. integr. | 1982 US hospitals (rate setting states plus random sample of others; oversample teaching, for-profit) | 1521 | Adj. discharges, avg. payroll exp. per FTE, bed ranges, MDs/bed, for-profit/non-profit/gov't/relig., teaching, region, MD admin., hosp-based MDs, MD govern., MD committees, % MDs on salary | Non-phys. exp. per adj. discharge | OLS |
| Bogue (7) | Horiz. merger | 1983-88 US mergers (120 hospitals merged to 74) with follow up of 60 survivors (81%) in 1991 | 74 | 1) Rural/urban location 2) Staff per bed, beds, occ. rate, service duplication, distance, direct competition for services or staff, market competition | 1) Retain/drop acute, converted inpatient, closed 2) Retain/drop acute | Pre/post, χ^2 and t-tests |
| Clement (10) | Divers. | 1978-83 California non-profit non-teaching non-Kaiser hospitals | ~200/ year | Beds, new product/new market/both, payer mix, income, pop., mkt. bed share, unemployment, phys./bed. hospital, year | 1) Return on assets (ROA) 2) Risk (standard deviation of ROA) | OLS, first diff. |
| Clement (12) | Divers. | 1987 service-producing subsidiaries (162) of non-profit Virginia hospitals (35) spanning 14 products | 162 | For-profit/non-profit, new product/new market/both, % assets in related div./unrelated div./core bus./new mkt., length of affiliation, unempl. rate, mkt. competition | 1) Operating margin 2) Return on assets | OLS, product markets |

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| | | | | | | |
|---------------|---------------------|--|-----------------|--|--|-----------------------------------|
| Dranove (16) | Horiz. merger | 1988 private hospitals (>40 beds) in 7 California SMSAs | 200 | High-tech (11) and low-tech (5) services, for-profit, Medicaid % of adm., charity+bad debt % of rev., in system | Total exp. per adm. Admin. % of total exp., operating margin | SMSA markets, Monte Carlo, OLS |
| Dranove (16) | Horiz. merger | 1988 local hospital systems in 7 California SMSAs | 13 | System identifier | Total exp. per adm. Admin. % of total exp. Operating margin Price-cost margin | Pseudo-system controls, % iles |
| Fournier (20) | Horiz. merger | 1984-86 Florida hospitals | 179 | Admissions, visits, maternity, ER, surgeries, MSA wages rates, capital stock, physicians, for-profit/non-profit, in system, teaching, casemix, payer mix, urban, mkt. competition, year | Total expenses | OLS, 15-mile and MSA markets |
| Goes (23) | Phys.-hosp. integr. | 1981-90 California hospitals (~300/year) | 3232 | Inpatient days, outpatient rev. share, beds, for-profit/non-profit/public, teaching, in system, phys. org. (govern, own, integrate), casemix, capitated med. group, payer mix, income, HHI | Total exp. per day Operating margin Occupancy rate | MLE, ARI time series |
| Lynk (29) | Horiz. merger | 1991-92 DRG-based clinical departments (7) of 4 hospitals for 24 months after merger | 672 | ADC for the clinical service, clinical service identifier | Standard deviation of daily census for the clinical service | OLS, log |
| Menke (30) | Horiz. | 1990 system and independent hospitals | 919, 1281, 2200 | Discharges, days, visits, occ. rate, log of wages, beds, for-profit/non-profit, teaching, in system, casemix, mortality rate, urban, HHI, phys./pop., region, pop., unempl. rate, income | 1) Chain membership probability 2) Log total hospital costs for chain, independent, and all hospitals | Two-stage (probit, translog cost) |

(Continued)

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Table 4 (Continued)

| First author | Change | Sample | N | Independent variables | Dependent variables | Notes |
|-------------------|---------------------|--|----------|--|--|--|
| Morrissey (33) | Horiz. merger | 1982-83 hospital acquisitions and management contracts (plus random nonsystem hospitals) | 392, 491 | Payroll/tot. exp., rev./exp., beds, occ. rate, for-profit/non-profit/gov't, teaching, HMO penet., payer mix, income, pop. 65+, unempl. rate, pop., hosp. concen., phys./pop., rate-setting, CON | Hospital acquired by system, hospital enters management contract (diff. from 5 years pre-change) | Logit |
| Mullner (35) | Horiz. merger | 1980-85 hospital mergers (45 acquired 55) and consolidations (62 combined to 32) | 100, 62 | 1) Beds, occ. rate, for-profit/non-profit/gov't, cmnty/spec. hosp., payer mix, cmnty size, urban, geo. region, rate setting state (1 year pre- and 1 year post-change) 2) Merger, consolidation | 1) Merger, consolidation 2) Current ratio, total margin ratio, net-to-gross-patient-revenue ratio (median 5 years prior vs. 4 after) | No t-tests, pre/post |
| Project HOPE (43) | Phys.-hosp. integr. | 1993 non-federal non-Kaiser hospitals | 1357 | Discharges, wage index, interns & residents/bed, for-profit/gov't, in system, casemix, payer mix, income, urban, adoption by competing hosp., HMO enroll./pop., beds/pop., phys./pop., phys. age, pop. Compare to 2 years pre-adoption | 1) Phys. board memb., phys. partic. in budgeting, salaried phys., PHO, hosp. group prac., phys-hosp joint ventures, hosp. prac. mgmt 2) Total margin, avg. Medicare costs | OLS, logit, 1 st diff., diff. in diff., MSA/contig. rural county mkts |

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|------------------|---------------------|---|-----------|--|---|---|
| Robinson (44) | Vert. integr. (NHs) | 1982-86, 1986-90 California hospitals ≥ 50 beds | 325, 279 | For-profit/non-profit, log hosp. beds, bed vacancy rate, Medicare payer mix, market competition, year | Hospital-based nursing home unit integration | Logit, 3-digit zip markets, first diff. |
| Shortell (51) | Divers. | 1984 hospitals in 8 multiunit systems plus competing hospitals in same markets | 1029, 306 | Beds, for-profit/non-profit, strategy, in system, years in system, new prod./new mkt. div., payer mix, pop. ≥ 65 , income, educ., unemployment, employment mix, births/pop., urban/rural, mkt. competition, phys./pop., rate review/CON state | 1) Full sample: number of diversified services 2) System hospitals: number of diversified services | OLS, 15-mile radius markets |
| Shortell (50) | Divers. | 1985-87 hospitals in 8 multiunit systems covering 40 diversified services | 525 | For-profit/non-profit | Avg. number of diversified services, HMO ownership/sponsorship, joint-ventures | t-tests |
| Woolley (57, 58) | Horiz. merger | 1969-85 for-profit hospital and chain merger announcements and antitrust complaints | 29 | Merger event, return on market stock portfolio 1 year pre/post, week of year | Return on competitors' stocks | OLS, pre/post, event study, market varies |

characteristics of the hospitals involved, only two used multivariate statistical techniques and multiyear changes in premerger hospital characteristics to reduce potential bias in modeling the decision to merge.

Bogue et al (7) studied 120 hospitals that combined into 74 through horizontal mergers between 1983–88, and compared the before and after merger characteristics of facilities that either retained or dropped acute care services; hypotheses were tested using χ^2 and t-tests. This was the only study that surveyed managers to elicit their objectives for merging. Stated objectives for merger included reduction in competition to achieve service complementarities from consolidation, and expansion of local or regional networks to improve marketability to managed care plans in broader markets.

Among system hospitals, non-profit facilities were more likely to merge than for-profits, but no difference was observed for system versus independent hospitals. Government hospitals were rarely involved in merger, perhaps because their unattractive financial characteristics and governance structures inhibit major structural changes. Acquiring hospitals were larger and had higher occupancy rates than the acquired except in the West, where greater competition and experimentation with managed care reduced the degree of differentiation between the acquirers and the acquired.

Bogue et al (7) tested hypotheses regarding the differences between mergers to expand horizontal networks versus to achieve service consolidation economies. Mergers involving hospitals that were geographically further apart, had similar ratios of staff per bed, had similar occupancy rates, or had substantial service duplication were more likely to result in both facilities retaining than dropping acute care services. The hospitals involved were generally financially viable and not in direct competition, suggesting horizontal network development as the motive for merger. Dropping acute care services in one facility after merger, which is expected after service consolidation and rationalization, was usually preceded by a differential degree of specialization (unduplicated services) between merger partners, a weaker hospital partner (different staffing per bed), or a high degree of direct competition between the hospital partners.

While many potential objectives for merger have been identified through interviews with hospital managers, researchers have rarely studied the ability of mergers to achieve the envisioned post-merger operational changes. Bogue et al (7) compared stated objectives for merger to the percentage of merged facilities where one hospital dropped or both retained acute care functions. Mergers with the objective of achieving operating economies usually resulted in only one facility dropping acute care functions, whereas those seeking to expand access to care or system size usually resulted in both retaining acute care functions. No significant differences in post-merger operational changes were

found in those seeking to consolidate services, obtain access to new technology, expand market share, increase access to capital, or reduce bed capacity.

Morrisey & Alexander (33) studied entry into multihospital systems via acquisition ($n = 392$) or management contract ($n = 491$) in 1982–1983, comparing the characteristics of multihospital system entrants and random nonsystem hospitals from up to five years before to the time of merger. Hospitals entering into systems had little premerger change in payroll expenses, higher levels of private insurance, and were in areas of high income growth or states with existing for-profit hospital systems; they were generally financially stable facilities in favorable market conditions.

Morrisey & Alexander (33) also reported significant differences between acquisitions and management contracts: payer mix and per capita income played important roles in acquisitions but not in management contracts. The results imply that a 10% increase in private or Medicaid payer mix increases acquisition odds by 9% and 8%, respectively. The factors behind entry into multihospital systems via acquisition and management contract are fundamentally different. Acquisitions are largely a function of favorable local market conditions and financial health of the target hospital, and of location in states without rate-setting programs. Management contracts are a function of prior decisions to enter markets, of location in states without certificate of need (CON) programs, and of government ownership of the hospital. Contract management was not found to be a precursor to acquisition; market factors were more important in acquisition.

Mullner & Andersen (35) reported descriptive statistics on hospital mergers between 1980–1985, including 45 hospitals that acquired 55 others and 62 hospitals that combined into 32 entities. While no statistical tests were performed, changes in financial performance were compared five years before to four years after merger or consolidation. The results were generally consistent with those reported above (7, 33); acquiring and consolidating hospitals were more often non-profit (versus for-profit or government), general community (versus specialty) hospitals, much larger, with higher occupancy rates and lower Medicaid revenues than the acquired. Most mergers and consolidations occurred in rate-setting states, and the new entities formed had larger proportions of Medicare and commercial revenues than the average US hospital.

EFFECTS The effects of horizontal integration on hospital cost, performance, and operations have been the subject of many studies, with much emphasis on economies of scale. Prior empirical studies have demonstrated that economies of scale in the production of hospital inpatient services primarily occur in the 200–400 bed range (14), which lies slightly above the average community hospital size of 170 beds in 1995 (5). Since many hospitals that acquire others

through merger are within or above the range for economies of scale in inpatient services or are already part of a multihospital system, most mergers are unlikely to result in substantial economies of scale in production. There may still be the potential for other scale economies in management, purchasing, and marketing, but most cost function specifications used in empirical research are only able to measure scale economies (or diseconomies) in production.

Five recent empirical studies measured the effects of hospital merger and consolidation on hospital costs and financial performance. Four used multivariate statistical techniques (two with small samples), but only one examined pre/post-change characteristics of the hospitals involved (with no statistical tests). Only two of the studies used traditional cost function estimation.

Dranove & Shanley (16) studied 40 local California mergers of private hospitals in 1988 and the characteristics of the 13 associated hospital systems. Regression models were estimated for a sample of 200 hospitals, and systems compared to matched pseudo-systems using Monte Carlo techniques and percentile rank differences in specific measures. The administrative cost share was higher in for-profit than non-profit systems. Based on analysis of the consistency of staffing and expenditure ratios (i.e. less variation), high-tech versus low-tech product mix, and price-cost margins, the authors concluded that local horizontal hospital mergers have greater benefits in output markets (attributed to reputation) than in production (cost reduction). Thus horizontally integrated systems are more successful in marketing the consistency ("systemness") of their product across their subunits than in reducing production costs. Multihospital marketing economies stemming from product homogeneity and branding reduce search costs to consumers, but also result in higher price/cost margins. No differences were observed in the ability of multihospital systems versus independent hospitals to exploit economies of scale and scope in production.

While this study puts forth a promising approach for reducing self-selection bias in comparing system and nonsystem hospitals, the results cannot be conclusively attributed to reputation effects in output markets. Systems may have more homogeneous hospitals because their governance structures allow more effective implementation of a particular style of management and production processes than collections of independent hospitals, or they may select new members who have similar profiles of characteristics as existing system members. Also, the measures of consistency used (staffing and expense ratios, price-cost margins) may be viewed as a reflection of production efficiencies as readily as output market advantages.

Fourmier & Mitchell (20) studied the effect of hospital competition on costs in 179 Florida hospitals in the mid-1980s using economic cost functions. For-profit hospitals, especially chains, had significantly lower total costs compared to non-profit and government hospitals. Since this study does not control for

self-selection bias, the effects cannot be conclusively attributed to changes in production technologies and management resulting from system membership.

Menke (30) studied the effect of hospital system membership on hospital costs in 1990. A two-stage model was employed: first the probability of system membership was estimated using a probit model with simultaneous determination of costs and system membership. Then cost functions were used to estimate the effects of system membership and other factors for system ($n = 919$), independent ($n = 1281$), and all hospitals ($n = 2200$).

While there were no statistically significant differences in hospital costs among for-profit, non-profit, and public chain hospitals, there were differences among independent hospitals. Compared to independent public hospitals, independent for-profit hospitals had 28% higher costs and non-profits had 11% higher costs. In general, higher costs were associated with higher casemix indexes and higher share of intensive versus subacute discharges; a lower share of acute discharges was associated with higher costs in independent hospitals. Higher shares of Medicare and Medicaid patients were generally associated with lower hospital costs; these results may reflect unmeasured casemix differences. Independent urban hospitals had lower costs than their rural counterparts, and no differences were observed for urban and rural system hospitals; this unexpected finding may be due to the inclusion of numerous other explanatory variables.

System hospitals had lower average and marginal costs per stay than independent hospitals at all output levels; the average cost gap widens with higher numbers of stays. The marginal cost per inpatient day is higher for system than independent hospitals, although the lower cost per stay outweighs this effect. Marginal cost per day is \$200–\$250 lower for system than independent hospitals up to an output level of about 60,000 patient days, after which the gap narrows; system hospitals have lower marginal costs per day above 130,000 patient days. While there is evidence of economies of scale at high levels of stays for both system and independent hospitals, the findings are difficult to interpret at lower output levels since the marginal and average cost curves are U-shaped but upside-down. Average costs per outpatient visit are lower for system than for independent hospitals. Independent hospitals show evidence of slight economies of scale in outpatient visits, with nearly constant returns to scale for system hospitals.

Economies of scope between inpatient and outpatient services occur at all volume levels for system hospitals and up to mean volumes for independent hospitals; at mean levels of stays and visits scope economies reduce costs by 11% for system and 3% for independent hospitals. Prior studies did not find evidence of economies of scope. The findings for economies of scale and scope suggest that system hospitals are more efficient than independent hospitals,

contrary to prior studies. This study also suggests that the standard approach of constraining the regression slope coefficients of system and independent hospitals to be equivalent and estimating the difference in costs by a dummy variable, incorrectly shows higher costs for system hospitals. Split sample regressions lead to the opposite conclusion.

This was the only study to both control for self-selection bias and address several common weaknesses in hospital cost function models such as omitted variables for quality and non-Medicare casemix. The model did not address differences in capital costs of system and independent hospitals since it had no measure of the price of capital, and it was transformed into a short-run cost function by the inclusion of beds (quantity of capital) as an independent variable rather than using the price of capital.

Mullner & Andersen (35) studied the change in hospital financial ratios (current ratio, total margin ratio, net-to-gross-patient-revenue ratio) five years prior to four years after merger or consolidation in 1980–1985. They found that merging and consolidating hospitals had similar changes in median financial ratios compared to the average American hospital. However, ratio analyses cannot detect the change in mix of components (e.g. fixed assets and long-term debt) nor the differences between system-affiliated and independent hospitals [see Reference 2 in (56)]; in short, these financial ratios are poor indicators of underlying financial restructuring. While the pre/post-merger period studied may be too short to observe changes in long-term financial performance, Bogue et al (7) found substantial operational changes (e.g. consolidation, conversion to other uses, closure) over a similar post-merger period, and the changes seem likely to influence the financial ratios. This study did not use multivariate statistical techniques and no statistical tests were performed.

Woolley (57, 58) studied the effect of 1969–1985 merger announcements and antitrust complaints on for-profit hospital stock value before and after merger compared to non-merging hospitals. Merger announcements increased market values of for-profit hospitals and chains over their competitors (1.4%), whereas antitrust complaints reduced them (2.0%). These results may be evidence of either oligopoly pricing or signaling of opportunities to increase efficiency. Vita & Schumann (52) point out that these effects are weak, and argue that the data primarily support an efficiency rationale for merger since the geographic market definitions used may not consistently distinguish between rivalry within market and nonrivalry across markets (as the market definition varies) and the increases in market concentration due to merger were small.

Three other recent empirical studies focused on hospital operational changes as a result of merger. Two of the studies used t-tests to test hypotheses of pre/post-merger hospital characteristics on small samples, while one estimated a regression model to study variation in average daily census across clinical departments after a multihospital merger.

Alexander et al (1) studied 194 hospitals that merged into 92 from 1982–1989, comparing their characteristics three years pre/post-merger to randomly selected non-merging hospitals. Merging hospitals had increased expenses per admission and occupancy rates but similar admissions and beds as non-merging hospitals. Few differences were observed after stratifying mergers by size and ownership, but later mergers had larger effects. Mergers had moderate effects on the rate of change of operational characteristics, rather than causing dramatic turnarounds in operating costs, staffing, and scale. There were indications of systematic differences in cost structure between merging and non-merging hospitals before the merger period: Merging hospitals had higher rates of bed reduction, whereas non-merging hospitals had higher rates of cost increases.

Bogue et al (7) studied characteristics of 74 hospitals before and after mergers occurring between 1983–1988. Approximately 42% of acquired hospitals continued to provide acute care services, suggesting service reconfiguration as the likely motivation for merger. Another 41% converted general acute care facilities to other inpatient uses (e.g. psychiatric and substance abuse, rehabilitation, long-term care), perhaps due to more favorable reimbursement policies for the alternative services. The remaining 17% of acquired facilities were closed after merger. The likelihood of continued operation of acute care services in both hospitals after merger was lower in urban (31%) than in rural hospital acquisitions (47%). Hospital mergers rarely resulted in closure, but were as likely to result in acute care consolidation and restructuring as in conversion to non-acute inpatient uses.

These results are strikingly different than those of Alexander et al (1), who did not find evidence of operating changes using more aggregate indicators of performance (operating costs, staffing, scale). It may be that the higher expenses per admission after merger observed by Alexander et al indicate that the high transaction costs of merger and consolidation are commensurate with the short-term gains in productive efficiency, or that merger effects are primarily evident in longer-term measures which account for changes in capital costs due to restructuring and consolidation.

Lynk (29) studied variations in the average daily census (ADC) of 7 clinical “departments” (defined by groups of DRGs) of 4 hospitals monthly for 24 months after their merger in 1991–1992 ($n = 672$). Hospital consolidation may achieve efficiencies beyond service coordination; operation at higher occupancy rates can be achieved by reducing the peak-load problem, whereby each pre-merger hospital must retain enough staff to handle periods of high demand. Variability in average daily census falls with increased ADC levels after clinical departments are consolidated. Every doubling of hospital mean census was associated with a 30% reduction in overstaffing (defined as excess staff above that required for the mean census). This result supports the hypothesis that consolidation of selected clinical departments may result in reductions of staffed

beds greater than could be achieved by the pre-merger institutions. These results come from seven selected clinical “departments” (groups of DRGs including cardiac surgery, orthopedic surgery, newborns, perinatal, oncology, pediatrics, and adolescent psychiatry) in a single multihospital merger. It is not clear to what degree these efficiencies can be achieved by consolidation of a full range of clinical services, nor whether the merger studied is typical of most hospital mergers.

In summary, candidate hospitals for horizontal integration are not typical of the average hospital, and there is great variation in observed operational changes and effects on costs and financial performance. Most empirical research on horizontal integration has looked for economic effects in a relatively short window of time following the integration event, although industry observers suggest that consolidation of the clinical services of large hospitals after merger may take five years or more (G McManis in 28). A recent survey by Deloitte & Touche found that over half of hospitals that merged or joined networks did not consolidate clinical services (28), suggesting other motives for merger or difficulties in bringing about consolidation. Luke (27) argues that current mergers are primarily intended to build local market positions. It follows that the modest effects of mergers observed in empirical research may be a result of strategic choices among merger partners to seek efficiencies other than those resulting from economies of consolidation.

Hospital organizational forms have undergone tremendous evolution in the past decade, with a great expansion in contractual as well as ownership-based forms of organization. While network and alliance forms (instead of merger) have accounted for nearly 80% of hospital horizontal integration events since 1989 (R Luke in 28), the empirical literature is devoid of results on contractual forms of integration. While the transaction costs of entering a network or alliance are probably less than bringing about ownership changes through merger, the weaker governance structures of networks and alliances may make it more difficult to wring out comparable production efficiencies (e.g. through service consolidation). Network and alliance forms may also be more likely to unravel than mergers since they create relatively weak interorganizational linkages (R Luke in 28).

Vertical Integration

Health care services in the United States are increasingly provided through arrangements with a higher degree of coordination along the chain of production, but few empirical studies have focused on vertical integration involving hospitals. Our understanding of hospital vertical integration to date is largely drawn from case studies and descriptive surveys, not from large empirical studies with statistical analyses. The only recent empirical study focused on the

determinants of hospital integration into subacute care. Despite heightened interest in vertically (and virtually) integrated delivery systems, there have been no studies of the effects of vertical integration on hospital costs, financial performance, and operations.

The fundamental research question in studies of vertical integration is how economic coordination and hospital performance will differ under governance arrangements to either “make or buy” (i.e. own or contract for) a particular upstream input (e.g. backward integration into labor and supplies) or the downstream handling of its outputs (e.g. forward integration into distribution and marketing channels). Three important structural dimensions that distinguish vertically and virtually integrated organizations have been identified: the method of coordinating performance among components of the organization, the structure of organizational governance, and the approach to managing clinical integration (46).

Robinson & Casalino (47) found that economic theory and evidence from case studies of health care organizations point to excess capacity and the need for investment capital as the most important short-term determinants of vertical versus virtual integration decisions, whereas long-term effects are driven by economies of scale, risk-bearing ability, transaction costs, and the capacity for innovation in methods of managing care. The deintegration of vertically integrated hospital-centered health care systems may be evidence that, *ceteris paribus*, vertically integrated organizations are disadvantaged under rapidly and fundamentally changing market conditions by slower adaptation than their virtually (contractually) integrated competitors.

CAUSES The causes of vertical integration, and the characteristics of organizations most likely to vertically integrate, have received very little attention in the empirical literature. There has been only one statistical analysis of the determinants of hospital vertical integration.

Robinson (44) investigated the decision of hospitals in California to vertically integrate into subacute care by developing hospital-based skilled nursing facilities (SNFs) over two periods: 1982–1986 ($n = 325$), and 1986–1990 ($n = 279$). Hospitals with relatively high Medicare patient mix or non-profit ownership were significantly more likely to develop a hospital-based SNF in both periods. Scale economies were an important determinant of integration, whereas capacity utilization had a weak influence in the latter period. Market conditions were not a significant factor in the decision to integrate into subacute care.

Neither of the two most common explanations for vertical integration in the transaction cost literature, nonredeployable investments in specialized assets (physical, human, or geographic) or difficulties in writing and enforcing complex contracts, appeared to explain hospital vertical integration into subacute

care. Instead, these decisions were primarily an artifact of the governmental uniform pricing system for skilled nursing care, which disadvantaged market contracting solutions and encouraged vertical integration by preventing hospitals and nursing homes from developing flexible pricing rules to align incentives of buyers and sellers.

Shortell et al (50) reported on a survey of corporate executives in hospitals belonging to eight multiunit health care systems ($n = 525$) from 1985–1987, addressing hospital system forward integration into distribution. Non-profit system hospitals were more likely than for-profits to own or sponsor HMOs; no difference was observed in PPO involvement. The findings were not analyzed using statistical tests of significance.

Diversification

In the 1980s and 1990s, American hospitals have diversified into many health and non-health services not traditionally provided by acute care hospitals and have shed some lines of business, sometimes as a result of failure in earlier diversification efforts. Several economic theories have been proposed to explain the determinants of diversification. Efficiency rationales for diversification include economies of scope (production, marketing and distribution), market entry and development, capital allocation within the firm, and balancing of risk and returns through portfolio diversification. Other rationales are related to managerialism, whereby managerial discretion and control allow pursuit of goals that are not profit maximizing for the firm, an especially significant potential problem in the non-profit sector according to Fama & Jensen (19).

Empirical research on diversification hinges upon whether new products or new markets are related or unrelated to existing activities or traditional competencies of the hospital. A wide range of diversified activities are studied, although the focus is often on the degree of relatedness of the entire hospital portfolio of business activities rather than the determinants and effects of diversification into a particular activity. This may in part be due to the difficulties in allocating hospital costs and outputs to particular products or lines of business.

CAUSES The causes of hospital diversification, and the characteristics of hospitals most likely to diversify, have rarely been addressed in empirical research. Shortell et al (50) interviewed corporate executives in hospitals belonging to eight multiunit health care systems ($n = 525$) from 1985–1987 regarding hospital involvement in approximately 40 diversified services. Non-profit system hospitals were more likely than for-profits to be involved in economic joint ventures and to offer a wider range of diversified services. The services most frequently identified as profitable tend to require complex technologies or a relatively high degree of medical/surgical training (e.g. outpatient respiratory therapy, radiology, neurological diagnostics), whereas unprofitable services tend to

require different styles of management or more nursing, custodial, or public health interventions (e.g. wellness programs, hospice, hospital-sponsored primary care group practice). Physicians generally oppose hospital diversification efforts that compete with existing physician practices, lack physician involvement in decision making, or are perceived as corporate practice of medicine. As this is a cross-sectional study of a nonrandomly selected group of hospitals with no analysis of covariates, it is unclear to what degree ownership influences decisions to diversify.

Shortell et al (51) conducted an earlier survey of hospitals in the same eight systems plus a set of competing hospitals in the same markets. Results were analyzed using multivariate regression models from the full sample ($n = 1029$) and just the system hospitals ($n = 306$); the dependent variable was the number of diversified services, whereas the independent variables included a vector of sociodemographic, ownership and control, strategy, market structure, and regulation variables. Diversification of hospital services was strongly influenced by state Medicaid policies and selected hospital characteristics (non-profit system affiliation, inpatient service volume, severe casemix) and market competition (especially for hospitals in systems).

More diversified services were provided in non-profit system than independent hospitals, and in hospitals that were large, urban, with severe casemix, high inpatient volume, high Medicaid payer mix hospitals, and in areas with high education; fewer diversified services were provided in states with higher rate review intensity. For system hospitals, more diversified services were provided for hospitals that had high inpatient volume, and were in urban areas or those with higher market competition; fewer diversified services were provided in states with higher certificate of need (CON) regulatory intensity.

EFFECTS The effects of diversification on hospital financial performance have been studied, but not effects on hospital costs in particular. Clement (10) investigated the effect of related and unrelated diversification on 1973–1983 hospital financial performance ($n \approx 200$ per year) using profits measured by return on assets (ROA) and risk by the log of the standard deviation of ROA. Diversification was not associated with differences in profitability or financial risk, nor was market competition. Higher physicians per bed were associated with lower operating margins and higher risk. Less profitable hospitals had more variation in return on assets. Diversification did not increase short-term profits, or the profits were not used to augment the hospital's internally generated capital. A separate model showed that diversification did not improve profits of financially weak hospitals.

Clement et al (12) studied the effect of related and unrelated hospital diversification on the financial performance of 162 service-producing subsidiaries, spanning 14 products, of 35 non-profit Virginia hospitals in 1987. This was

the only study reviewed with the product line, instead of hospital or system, as the unit of analysis. Regression models were used to estimate effects on operating margins and return on assets, with explanatory variables for various measures of product (not market) related diversification, ownership, and market factors (unemployment rate, hospital bed concentration). While related diversification was associated with better short-term financial performance (operating margins) than unrelated diversification, no difference was observed in long-term performance (return on assets). Hospital parent-subsidiary non-profit ownership and market competition had stronger influences than diversification on long-term financial performance indicators. The larger assets and larger spread between assets and revenues in non-profit firms may have influenced the ownership-related differences.

Shortell et al (50) studied hospital diversification in eight multiunit health care systems in 1985–1987 regarding approximately 40 diversified services. Non-profit and for-profit system hospitals had similar proportions of profitable diversified services. Profitable services generally involved a greater degree of physician involvement than unprofitable ones (e.g. ambulatory surgery vs home health care). Successful diversification usually involved services related to existing acute care clinical and managerial competencies. Partially related diversification ventures required different governance structures and greater autonomy in management to succeed.

Physician-Hospital Organization

Recent empirical studies have focused on integration of physicians into hospital governance, with only one study identifying specific forms of physician organization. Although some of the most dramatic recent evolution in hospital organization involves changes in the structure of hospital relationships with physician organizations and vertically (and virtually) integrated delivery systems, none of these phenomena has been subjected to multivariate statistical analysis. Results from several surveys and multisite case studies of hospital-physician organizational arrangements are reviewed below, although the findings are primarily descriptive.

This research deficit is partly attributable to the lag in availability of research data on physician-hospital relationships, which have undergone their most rapid burst of evolution over just the past few years. A survey of physician-hospital organizations in 1994 by Ernst & Young found that over 75% were less than two years old, and nearly half were less than one year old (18); a 1996 survey (n = 287) by the American Association of Physician-Hospital Organizations/Integrated Delivery Systems and Tyler & Co. found that 57% of PHOs were less than two years old, and 12% were less than six months old (4). Long-standing sources of secondary data on hospitals for research, such as annual

surveys by the American Hospital Association, have just begun to collect measures that differentiate contractual from ownership integration. Survey measures currently capture any type of hospital participation in physician-hospital relationships, but not the degree of participation (e.g. percentage of affected physicians, contracts, or services).

CAUSES The determinants of physician-hospital integration have rarely been studied. A recent study by Project HOPE for the Prospective Payment Assessment Commission (43) examined adoption of 16 physician-hospital organization strategies in 1993 ($n = 1357$). Market characteristics were only associated with physician participation in hospital budgeting, which was higher with greater HMO penetration and lower in areas with greater beds per capita; market characteristics were not associated with adoption of PHOs. Hospitals were twice as likely to adopt most physician-hospital strategies if a competing hospital also adopted the strategy, and were four or more times as likely to adopt PHOs, hospital-sponsored group practices, physicians on salary, and physician participation in management. Of hospitals adopting physician-hospital organization strategies since 1991, adoption was negatively related to prior total margins and positively related to prior average Medicare costs per discharge. This study did not control for state regulatory differences, and it examined only three specific forms of physician-hospital organizations (PHO, hospital-sponsored group practice, joint venture for ambulatory care).

Several recent surveys have examined the determinants of physician-hospital organizations. Ernst & Young's 1994 survey (18) found that the hospital's objective in most PHOs is to improve relationships with physicians, share financial risk, or raise quality; achieving economies of scale and scope were less important. A survey of physicians by Project HOPE for the Prospective Payment Assessment Commission (42) in 1994 found that only half of recent linkages to hospitals ($n = 141$) were undertaken as a means of increasing access to capital or offering their own insurance plan; the overwhelming majority were for negotiating managed care contracts with health plans. In a recent survey of 17 hospitals, Coopers & Lybrand (6) found that hospitals that acquired physician practices were incurring annual losses of \$97,000 per physician, yet each year since 1994 American hospitals have acquired over 5000 physician practices (mostly primary care practices, which do not result in substantial admissions to the hospital). The short-term losses may be due to the high purchase prices resulting from intense competition among buyers of physician practices, and the initial drop in physician productivity after acquisition when physicians are shifted to flat salaries or income guarantee arrangements. Many hospitals believe they must acquire practices before their competitors do or be left out of the increasingly competitive market for bidding on managed care

contracts. While some hospital chains, such as Columbia/HCA, prefer to offer independent physician organizations an ownership stake in hospitals instead of acquiring practices, many of the hospitals they purchase come with previously acquired practices.

Morrisey et al (34) reported on a 1993 survey by the Prospective Payment Assessment Commission (ProPAC) on hospital-physician relationships ($n = 1495$), supplemented with data from the American Hospital Association. The survey used a stratified random design, with 16 strata defined by four census regions within four types of hospitals (sole community, major teaching, investor-owned, other community). Only 23.3% of hospitals participated in at least one form of physician organizational arrangement. Of these hospitals, 64.4% had a physician-hospital organization (PHO), 32.6% a management services organization (MSO), 15.5% a foundation, and 11.2% an integrated healthcare organization (IHO). The most tightly linked forms of organization are the least prevalent. Hospitals with more than 15% of revenues from managed care contracts were twice as likely to participate as those below this threshold. This cross-sectional study did not subject any of the reported differences to tests of statistical significance, control for potential covariates, or address issues of self-selection bias and the direction of causality.

EFFECTS The effects of physician-hospital integration on hospital costs and financial performance have been the subject of four recent empirical studies. There were no empirical studies of the effects on hospital operations. Few studies to date have identified specific forms of hospital-physician organizational arrangements (e.g. physician-hospital organization, management services organization), though most address general characteristics such as participation in governance and financial relationships.

Alexander & Morrisey (3) studied the effects of hospital-physician integration on hospital costs in 1982 ($n = 1521$). The sample included all hospitals in rate-setting states, plus a random sample from other states; teaching and for-profit hospitals were oversampled. Hospital-physician integration was defined as physician participation in hospital administration, hospital-based physicians, physician governance participation, physician committee participation, and proportion of physicians on salary; no specific types of relationships with external physician organizations were studied.

Hospital costs per discharge were higher for hospitals that were large, for-profit, or teaching facilities and for those with high nurse wages, physicians per bed, physician participation in administration, proportion of physicians on salary, and casemix. By most measures, hospital-physician integration was not associated with lower hospital costs per discharge, and often was associated with higher costs.

This study did not control for self-selection bias, and made several departures from traditional multiproduct cost function specifications (only one output quantity, input quantities included, no market structure characteristics to adjust for quality), making interpretation of the coefficients difficult.

Goes & Zhan (23) investigated the effects of hospital-physician integration on hospital costs, operating margins, and occupancy rates using California hospitals from 1981–1990 (approximately 300 per year). Physician integration was defined as physician involvement in governance, physician ownership, and physician-hospital financial integration; while no specific forms of hospital-physician organizations were identified, the integration measures do address differences between governance and financial participation.

Physician governance was associated with higher operating margins and occupancy rates. Financial integration was associated with lower operating margins, and direct ownership with higher costs and lower operating margins (particularly in small hospitals). The results suggest a tradeoff between lower hospital financial performance associated with physician ownership and improved performance under shared governance or limited financial integration.

While the time-series design of this model makes it more likely that the observed effects are a result of the explanatory variables instead of selection bias (compared to cross-sectional models), other methodological concerns make interpretation of the coefficients difficult. No specific theory was used to justify the specification of the model, although it resembles an economic cost function with a few important departures: Input quantities rather than input prices were included, and no regulation variable was included despite the implementation of the prospective payment system and selective contracting during the period of observation.

Project HOPE (43) studied the effects of changes in hospital and market characteristics over two years on the 1993 total margin and average Medicare costs in hospitals that either adopted or did not adopt physician-hospital organization strategies. While bivariate analyses show most of the strategies to have a significantly different effect on hospital financial performance of adopters and nonadopters, few significant differences were found in multivariate analyses: Operating margins were higher when clinical department heads were held accountable for profits and losses and when medical staff developed clinical guidelines, whereas growth in average Medicare costs was lower when hospital boards had greater physician membership and when hospitals offered practice management services to physicians.

While the difference-in-difference models used to compare adopters to nonadopters control for selection bias, they make several departures from economic cost and profit functions: The only output is hospital discharges despite the focus on physician-hospital organizations that provide substantial ambulatory

care, input quantities and prices are included, and no regulatory variable was included. The direction of causality between financial performance and adoption is also unclear, as the study also reported an association between prior financial performance and adoption.

Shortell et al (49) reported on a cross-sectional case study of 11 evolving delivery systems. Preliminary findings suggest that systems have better financial performance across a number of dimensions when they have higher levels of physician-system integration (defined as the extent to which physicians identify with a system, use it, and actively participate in its governance). A series of bivariate correlation analyses show that higher physician-system integration is associated with lower staffing per admission, and higher clinical integration (i.e. coordination across operating units) is associated with lower staffing per admission and higher net revenue. The measure of physician-system integration relates to the degree of physician involvement in the system and its governance, and thus corroborates the results of other studies. However, this study did not control for potential covariates nor address issues of self-selection bias and the direction of causality.

DISCUSSION

Previous reviews of hospital organizational change and diversification have primarily focused on horizontal integration; there is not yet a critical mass of research on other forms of organizational change. Ermann & Gabel (17) conducted a thorough review of empirical studies on multihospital systems and horizontal integration through the early 1980s, generally finding that hospital systems had higher costs than independent hospitals. Shortell (48) also reviewed studies of systems through the early 1980s, finding no consistent evidence that system hospitals operated more efficiently than independent hospitals. The more recent studies in this review detected lower marginal and average costs per stay in system than independent hospitals, and higher administrative costs but similar total costs in for-profit versus non-profit system hospitals. The findings may in part reflect the time period studied, but also closer adherence to economic theory and use of more rigorous methodological techniques. Recent hospital mergers had moderate, rather than dramatic, effects on the rate of change in operating costs, staffing, and scale. Mergers rarely resulted in hospital closure, but were as likely to result in acute care consolidation and restructuring as in conversion to non-acute inpatient uses.

While physician-hospital integration was traditionally undertaken by hospitals to increase admissions or by physicians to get access to capital, recent formal physician-hospital organizational linkages are more likely to be for the negotiation of managed care contracts. While hospitals continue to acquire substantial numbers of physician practices each year, most are primary care

practices that produce few inpatient services. Physician-hospital organizations are often formed in response to activities of specific hospital competitors, who seek to bring physicians into their networks. The effects of specific forms of physician-hospital organization have not yet been the focus of large empirical studies, although some general characteristics of ownership and control arrangements have been observed. High levels of physician governance or financial integration (e.g. stock ownership) are associated with lower hospital financial performance, but shared governance and limited financial integration are associated with improved performance.

Recent hospital vertical integration into subacute care was largely an artifact of the governmental uniform pricing system, which encouraged vertical integration.

Despite a substantial body of literature on hospital organization, important emerging forms of organizational diversification, such as physician-hospital organizations, do not fit into existing conceptual frameworks. Few empirical papers on hospital organizational diversification fit even basic methodological criteria; most suffer from unclear direction of causality, lack of foundation in economic theory, model specification errors, and self-selection bias.

Rapid changes in hospital organization are under way without rigorous empirical study. There is a compelling need for more systematic research into the causes of hospital organizational diversification and, ultimately, to their effects as data become available. The bridge between policy analysis demands and economic theory is still missing in the health services research literature, although this problem extends beyond the study of hospitals. This is ironic in light of the intense interest in hospital vertical integration, horizontal merger and system formation, diversification, and antitrust, and the burgeoning literature in organizational economics.

APPENDIX

GLOSSARY

CONSTANT RETURNS TO SCALE A production process where a change in input quantities causes a proportionate change in output.

COST FUNCTION MODEL Describes the relationship between costs of inputs and cost of output of the organization's production process.

DIFFERENCE-IN-DIFFERENCE MODEL Compares the difference in outcomes within the "treatment group" to the difference in outcomes within the "control group"; under certain conditions this difference-in-difference model correctly measures the effect of the treatment even in the presence of self-selection bias (32).

ECONOMIES OF SCALE A reduction in long-term average cost per unit of production when output quantity is increased; hospitals may achieve economies of scale by such means as specialized labor, volume discounts on inputs, and improved management techniques.

ECONOMIES OF SCOPE Occurs when a given quantity of two goods or services can be produced jointly at lower total cost than if produced separately; this includes benefits arising from improved coordination of related activities, such as inpatient and ambulatory surgery.

ENDOGENEITY An independent variable is endogenous if its value is determined by other independent variables in the model or lagged (i.e. prior) values of the dependent variable; thus an endogenous variable is determined “within” the model. Without corrective measures, it is unclear whether the observed effects are due to the relationship between the dependent and independent variables or the endogenous relationship that is not being modeled; ordinary least squares estimation may result in biased or inconsistent parameter estimates. Models with endogenous variables require specification by a set of simultaneous equations.

GOVERNANCE STRUCTURE A mechanism for coordinating organizational activities, characterized by its incentive structures and administrative controls. Generic forms of governance are often described in terms of markets, hybrids, and hierarchies. The most efficient governance structure for a transaction is one that minimizes production and transaction costs, compared to feasible alternative structures, in a specific environment.

INPUT The factors of production (labor, capital, supplies, etc) that are combined to produce output of goods and services; inputs may include clinical and managerial expertise.

INTERMEDIATE PRODUCT In a production process with several stages, intermediate products are the outputs of one stage used as inputs to the next stage of production; for example, a laboratory test may be one of the intermediate products used to produce an outpatient visit.

MISSPECIFICATION The formalization of a behavioral relationship into an econometric model that can be estimated is the specification process. A model is misspecified if it does not represent the “true” behavioral relationship. Misspecification can arise for many reasons, including measurement error, omitted variables, endogeneity, and self-selection (26). Depending on the type of specification error, the econometric model may have biased parameter estimates, incorrect signs on parameters, higher standard errors, or other problems.

NONREDEPLOYABLE INVESTMENTS Investments which cannot be put to different uses without substantial loss in value; these assets may be physical (specialized buildings, equipment, or location; dedicated capacity), human (knowledge, a network of providers, etc), or reputation.

OBJECTIVE FUNCTION Describes the behavioral relationship being modeled in the form of a mathematical function; the logical structure of the model is usually derived from an underlying theory. In economics the behavior of an organization is often portrayed as cost-minimizing, profit-maximizing, or output-maximizing.

OUTPUT MAXIMIZATION Characterizes the behavior of an organization as attempting to maximize output for a given total cost of inputs to production.

OUTPUT The goods and services produced by the organization; hospitals produce various forms of inpatient and ambulatory care.

PRODUCTION PROCESS The method used by an organization to combine inputs to produce outputs.

SELF-SELECTION BIAS A case where individuals or organizations under investigation select themselves into the study sample in a nonrandom way, the selection process influences the dependent variable in the model, and the selection process is not part of the model. The model incorrectly attributes the effects of the selection process to the explanatory variables, resulting in biased parameter estimates.

TRANSACTION COSTS The comparative costs of planning, adapting, and monitoring task completion under alternative governance structures. Transaction costs include not only the costs of negotiating agreements, but the ongoing costs of governance arising from setting up and running governance structures, securing and enforcing commitments, and maladaptation costs of misaligned incentives.

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