

THE INFLUENCE OF MERGERS ON FIRMS' PRODUCT-MIX STRATEGIES

RANJANI A. KRISHNAN,^{1*} SATISH JOSHI² and HEMA KRISHNAN³

¹ Eli Broad Graduate School of Management, Michigan State University, East Lansing, Michigan, U.S.A.

² College of Agriculture and Natural Resources, Michigan State University, East Lansing, Michigan, U.S.A.

³ Williams College of Business, Xavier University, Cincinnati, Ohio, U.S.A.

This study draws on the institutional and resource-based theories of the firm and examines whether multi-product firms use mergers as a strategic tool to reconfigure their product-mix toward high-profit products. We propose that mergers facilitate product-mix reconfiguration by relaxing institutional and organizational constraints on resource redeployment. Analysis of data from the U.S. hospital industry reveals that, relative to non-merging hospitals, merging hospitals increased their presence in profitable, insured services but did not shift away from low-profit services used by the uninsured. Copyright © 2004 John Wiley & Sons, Ltd.

INTRODUCTION

A considerable body of research examines the motives for horizontal mergers and acquisitions and their consequences. Research in the economics of industrial organization views market power and/or efficiency gains through scale economies as major motives for horizontal mergers (Lynk, 1995; Dranove and Shanley, 1995). Research in business strategy argues that firms often use acquisitions to reconfigure the acquiring firm or target firm's business (Capron, Dussage, and Mitchell, 1998; Karim and Mitchell, 2000) and help change the mix of products and services offered to facilitate growth (Bowman and Singh, 1990, 1993; Lubatkin and O'Neill, 1988). Wernerfelt (1984) and Salter and Weinhold (1979) draw on the resource-based view (RBV) of the firm and discuss acquisition strategies that involve obtaining more of the

firm's existing valuable resources (related supplementary), and resources that combine effectively with the firm's existing resources (related complementary). These resource acquisition strategies are aimed at improving a firm's ability to enter and/or dominate attractive product markets.

Institutional theorists posit that organizations require social acceptability, credibility, and legitimacy in addition to material resources and technical information if they are to survive and thrive in their social environment (Meyer and Rowan, 1977), and that the institutional environment constrains firm behavior by defining legal, moral, and cultural boundaries. In general, institutional and other organizational theorists argue that businesses face substantial constraints in internal development and efficient allocation of resources. We combine insights from resource-based, institutional, and other organizational theories, and propose that mergers relax many institutional and organizational constraints on firm behavior and product portfolio choices, and that business reconfiguration through aggressive product-mix changes by exploiting these relaxed constraints is another strategic motive driving horizontal mergers.

Key words: mergers; institutional theory; resource-based theory; hospitals; product-mix

*Correspondence to: Ranjani A. Krishnan, Eli Broad Graduate School of Management, Michigan State University, N251, North Business Complex, East Lansing, MI 48824, U.S.A. E-mail: Krishn15@msu.edu

Finance and strategy researchers have empirically analyzed financial outcomes of horizontal mergers (Chatterjee and Lubatkin, 1990; Chatterjee and Wernerfelt, 1991; Ravenscraft and Scherer, 1987; Singh and Montgomery, 1987; Sirower, 1997). Similarly, resource-based theory has been used to examine redeployment of resources following mergers (Capron *et al.*, 1998; Capron, Mitchell, and Swaminathan, 2001), and diversification to utilize excess resources (Chatterjee and Wernerfelt, 1991). However, surprisingly little research examines the effects of mergers on a firm's product-mix, and whether post-merger resource redeployment translates into favorable changes in the product portfolio or increases in the firm's share of attractive product markets. One notable exception is a study by Karim and Mitchell (2000), who analyze continuation of product lines following mergers. However, they do not analyze product-mix changes in terms of sales quantities or market share of existing product lines. Our study addresses this empirical lacuna and complements their study.

We empirically examine if merging firms are able to reconfigure their product-mix more aggressively and achieve a relative advantage over their rivals. We use data from the U.S. hospital industry, a complex multi-product industry that has recently undergone major changes in its institutional environment and thus provides a rich setting for studying organizational responses to institutional change (Ginsberg and Buchholtz, 1990). We evaluate if merging hospitals reconfigured their product-mix more successfully by increasing their share of high-profit services and decreasing their share of low-profit services in the year following the merger or acquisition. We also examine effects of market concentration on the changes in post-merger product-mix. While earlier studies of hospital mergers have examined the role of market power (Keeler, Melnick, and Zwanziger, 1999; Krishnan, 2001; Lynk, 1995) and cost reduction (Dranove, 1998), none examine post-merger changes in product-mix. Thus this paper also makes a contribution to the literature on hospital mergers.

THEORY

The RBV and institutional view of the firm emphasize different aspects of an organization's

struggle for viability and competitive advantage. RBV posits that firms differ in their possession of resources, some of which are rare, inimitable, and tied semi-permanently to the firm, and that if used effectively this resource asymmetry can be a source of sustained competitive advantage (Amit and Schoemaker, 1993; Barney, 1991, 2001; Collis and Montgomery, 1995; Conner, 1991; Grant, 1991; Hall, 1992). Compared to conventional economic analysis, the RBV considers a broader set of resources, capabilities, and competencies, including intangible resources such as brand names, in-house knowledge, technical and marketing capability, reputation, customer loyalty, and management skills (Mahoney and Pandian, 1992; Penrose, 1959; Wernerfelt, 1984). Institutional theorists, however, differentiate between 'economic rationality' and 'normative rationality' and suggest that while resource-based theory assumes that managers make economically rational choices motivated by efficiency and profitability, institutional theory assumes that managers commonly make normatively rational choices induced by historical precedent and social justification (Oliver, 1997). Institutions constrain firm behavior by defining legal, moral, and cultural boundaries, setting off the legitimate from the illegitimate. The institutional restraints can be regulative (coerced through rules, laws, and sanctions), normative (prescriptively imposed through codes of conduct, accreditation, or certification), or cultural-cognitive (mimetic common beliefs, customs, and logic of action) (Scott, 2001). Organizations conform to institutional pressures by incorporating structural elements, which are legitimized externally, rather than in terms of efficiency, and by employing ceremonial assessment criteria to define the value of structural elements (Meyer and Rowan, 1977). Conforming organizations are rewarded through increased legitimacy, stability, reduced uncertainty, resources, and survival capabilities (Meyer and Rowan, 1977; North 1990; Scott, 2001).

However, institutional theorists also recognize that institutional expectations do not apply uniformly to all organizations. Meyer and Rowan (1977) conceive of organizations ordered along a continuum. At one end are production organizations with strong technical environments where success depends primarily on efficient management and coordination of market relational networks and work processes, and rewards are based

on outcomes. At the other end are organizations with strong institutional environments, where success depends mainly on the confidence and stability achieved through isomorphism with institutional rules. In highly institutionalized organizations significant attention is directed away from control and coordination of technical processes and toward conformity to externally defined requirements or regulations (Scott and Meyer, 1983).

Not unlike institutional theory, which suggests that firms face external constraints on efficient use of resources, organizational theory recognizes that businesses also confront substantial constraints on internal development of resources and their efficient allocation. For instance, Nelson and Winter (1977, 1982) stress that a firm's irreversible investments and limited range of operating routines constrain its ability to use resources efficiently. Others have argued that operating routines can either provide firm value, or create constraints on how businesses change their resources (Mitchell, Dussauge, and Garrette, 1999; Williamson, 1999), depending upon whether they embody inimitable, tacit, knowledge and organizational learning, or represent inertial, historical, and inefficient decision processes.

Mergers and product-mix

Research in business strategy has used the RBV framework to argue that firms use acquisitions to reconfigure the acquiring firm or target firm's business, (Capron *et al.*, 1998; Karim and Mitchell, 2000), change the mix of products and services offered, and facilitate growth (Bowman and Singh, 1990, 1993; Lubatkin and O'Neill, 1988). When two firms merge, their resources interact and create a combination of resources, which may not be easily replicated by other firms. Within the consolidated organization, the existence of this uniqueness and the transfer of resources from one unit to another along with divestiture of obsolete resources may provide the basis for competitive advantage. Several empirical studies analyze such resource redeployment following mergers (Capron *et al.*, 1998; Helfat, 1997; Karim and Mitchell, 2000; Seth, 1990).

Priem and Butler (2001) assert that resources are antecedents to products and a firm can exploit opportunities, combat threats, and ultimately realize value, through appropriate and timely changes in its product portfolio. Hence

mergers and associated resource acquisitions are aimed at product-mix reconfiguration by entering and/or dominating attractive product markets and reducing the presence in unattractive product markets. In other words, the success or failure of a merger and the associated resource redeployment can be assessed by observable changes in the product-mix. In fact, Karim and Mitchell (2000), in their analysis of path-dependent and path-breaking resource reconfigurations following acquisitions in the U.S. medical sector, treat product lines themselves as a measure of resources and underlying routines.

Institutional and organizational theories suggest that resource acquisition and allocation decisions and consequent product-mix outcomes are subject to formal and informal institutional and organizational constraints, in addition to technical and market constraints. These institutional constraints can impact the product-mix either directly, for instance by demanding or prohibiting certain product lines, or indirectly by affecting the organizational routines and processes that govern product-mix decisions. For example, auto companies are mandated to produce and sell a certain percentage of 'environmentally friendly' low-emission and alternative-fueled vehicles, even when neither consumer demand nor product profitability justifies such production. Similarly, unprofitable services like organ transplants and emergency care are often justified as necessary for maintaining the reputation or image of hospitals. Economically suboptimal product-mixes can thus result from 'normatively rational' decision processes governed by history, tradition, and external institutional demands; or 'boundedly rational' decision processes governed by cognitive sunk costs, limited range of operating routines, limited information, causal ambiguity, and lack of absorptive capacity (Cyert and March, 1963; Cohen and Levinthal, 1990; Oliver, 1997).

We posit that while firms constantly attempt to acquire and allocate resources to refocus on attractive product lines and attain competitive advantage, mergers further facilitate this refocus, as several organizational and institutional constraints that restrain or delay product-mix adjustments relax in many ways following a merger. First, the Federal anti-trust regulations against collusive pricing and exercise of market power become less relevant to a merged firm, although the merging firms often have to cross the hurdle of anti-trust

review prior to the merger. The merged firms hence have greater flexibility to internally coordinate and manage prices and quantities of different services offered when compared to non-merging firms. This regulatory relaxation would, however, require merging the organizational boundaries and cannot be achieved through market transactions.

Second, merged organizations can reduce costs and technical inefficiency associated with ceremonial structural elements by reducing the duplication of these structural elements across the two merging entities. In other words, there may be economies of scale in meeting the institutional expectations. For example, accreditation or institutional legitimacy may require presence of certain services such as emergency care facilities in hospitals. The merged organization can often satisfy these requirements by maintaining these services at only one of the two merging entities and eliminating them at the other. While non-merging firms can arrange these services through subcontracting, the issues of loss of reputation, accreditation, and legitimacy arising from not owning these facilities are often substantial.

Third, when the institutional environment is changing, mergers can facilitate the movement of a firm from the institutional end towards the technical end in the Meyer and Rowan (1977) continuum. That is, mergers can accelerate changes toward cost efficiency, technical process control, and market discipline, and away from conformity to externally defined institutional requirements. The need to redefine roles, rules, and policies in a short time following a merger disturb the cultural status quo and force critical, mutual, and external evaluation of values and traditions, and can potentially alleviate inefficiencies due to inertial, unreflective, and socially defined behavior. Mergers can thus facilitate the change from 'normative rationality' towards 'economic rationality' (Oliver, 1997). Further, reconstitution of the top management team following a merger often offers an institutionally acceptable opportunity to corporatize the board by bringing in more management professionals. These changes in the top management team and subsequent changes in the regulatory regime are often the way organizations bring about rapid changes in organizational culture and create competitive advantage.

Fourth, mergers weaken many organizational constraints on improving technical efficiency. Mergers force the two firms and involved

actors to redesign roles, routines, and allocation rules that define the combined organization. The process of combining, critically evaluating, selectively retaining, and abandoning routines often helps firms to recognize and address inefficiencies arising from the organizational constraints and inertia. Mergers serve to minimize issues of bounded rationality and time compression diseconomies that affect the content and speed at which people learn (Capron *et al.*, 1998; Dierickx and Cool, 1989). When internal development of knowledge is slow, expensive, and uncertain, large-scale grafting-on of new knowledge through acquisition of a whole organization is often very effective (Simon, 1945). Oliver (1997) proposes that periodic evaluations of the effectiveness of long-standing resources will alleviate the effects of cognitive sunk costs and are more likely to lead to optimal use. Mergers force such a comprehensive evaluation. Mergers also reduce causal ambiguity by reducing the strategic decision space and uncertainty. Mergers reduce the number of competing firms and thereby the number of strategic responses that need consideration in decision making; combining customer information reduces market related uncertainty, and increased monopsony power reduces supplier related uncertainty. Large-scale knowledge transfer and sharing of such strategic, confidential information is seldom feasible without dissolving organizational boundaries through a merger.

Merging firms will be able to exploit these relaxed institutional and organizational constraints to redeploy resources more effectively, which ultimately should translate into favorable changes in the product portfolio. Juxtaposing the above insights from resource-based, institutional, and organizational theories we formulate the following proposition:

While all firms constantly attempt to refocus their product-mix towards high profit product lines, merging firms will be more successful in shifting their product-mix towards attractive product lines, relative to non-merging firms.

In the following sections, we provide a brief background on the U.S. hospital industry, elucidate the proposition, and develop specific testable hypotheses using the hospital industry as the context.

U.S. hospital industry

The U.S. hospital industry has witnessed several major changes since 1982, which have critically affected the viability and financial performance of hospitals, forcing them towards cost control and efficiency (Gilbert, 1995). These changes include: the shift in the reimbursement system from cost-based to fixed-fee (Prospective Payment System) for Medicare inpatients who accounted for 40 percent of total U.S. hospital revenues in 1995; the growth in the number of patients covered by managed care plans from 18.9 million in 1985 to 56 million in 1995; growth in the uninsured population; and improvements in medical technology which considerably reduced the average length of inpatient stay.

One of the ways in which hospitals have responded to the above environmental changes is through increased merger and acquisition activity. Since 1990, over 45 percent of U.S. hospitals have been involved in mergers and acquisitions (Jaspen, 1998). Mergers can improve the financial performance of hospitals in three ways: through price increases made possible by increased market power, cost reduction through economies of scope, scale, and monopsony power, and favorable adjustments in product-mix. Indeed, empirical and anecdotal evidence suggests that price increases do occur after hospital mergers (Clement *et al.*, 1997; Dranove and Ludwick, 1999; Dranove and Shanley, 1995; Krishnan, 2001; Winslow, 1998). At the same time, empirical evidence also shows that hospital mergers do not result in substantial cost reductions (Dranove, 1998; Dranove and Shanley, 1995).

While hospital mergers may indeed be motivated by factors such as efficiency and market power, we hypothesize that reconfiguring the product-mix toward high profit services is an additional strategic motive in hospital mergers. In the modern hospital industry, appropriate product-mix is critical for survival and financial health, as each product (defined as a specific diagnosis and treatment) yields different profit margins. Some hospital services are consumed primarily by fully insured patients (example, back and neck procedures), some others are consumed mainly by patients covered under public programs such as Medicare (example, hip replacement) and Medicaid (example, nutritional and metabolic disorders in children), while others are consumed to a

greater degree by the uninsured (example, alcohol or drug abuse detoxification) (Elixhauser, Duffy, and Sommers, 1996). A hospital's overall financial health depends on the proportion of patients from each patient pool, the reimbursement contracts with payers from each pool, default rates, and the hospital's cost structure.

Services used by uninsured patients tend to be less profitable than services used by the fully insured mainly for two reasons: first, high rates of default and higher collection costs, and second, the high cost of emergency services, which are used to a greater extent by the uninsured (Langland-Orban, Gapenski, and Vogel, 1996). In an empirical examination of hospital failure, Gruca and Nath (1994) find that hospitals that failed had much higher proportions of uninsured patients. In many public hospitals, uncompensated care as a percentage of expenses is as high as 20 percent (Nichols, 1999). Services used by insured patients tend to be profitable and attractive because of low default rates, and negotiated prices, which typically provide a mark-up over average costs.

In the pre-managed care and pre-Prospective Payment System (PPS) era, hospitals could simply shift costs of treating the uninsured to the fully insured or Medicare patients (Dranove, 1988). However, under the current PPS and managed care environment where the hospital receives a fixed payment regardless of reported costs, such cost shifting will not help. As a result, the product-mix defined as the proportion of services used by high-profit patients, and services used by low-profit patients can be a major source of strength or weakness, and hospitals have to refocus their service-mix to survive and prosper. However, hospitals face strong institutional and organizational constraints against aggressive product-mix changes.

Institutional and organizational constraints in the hospital industry

From an institutional perspective, firms operate within a social framework of norms, values, and taken-for-granted assumptions about what constitutes appropriate or acceptable economic behavior (Meyer and Rowan, 1977; Oliver, 1997). This is especially true of the hospital industry because of its historical evolution. Meyer and Rowan (1977) portray hospitals and schools as examples of organizations dominated by institutional factors. Most hospitals have roots in the Church with a strong

'serve to the poor' culture. About 80 percent of the community hospitals in the United States are not-for-profit organizations, which imply that these hospitals are expected to be socially responsible (Rose-Ackerman, 1996) and not overtly stress profit maximization. Rose-Ackerman (1996) argues that the non-profit organizational form attracts altruistic managers who are not focused on wealth maximization, but rather on reifying their ideological beliefs without being accountable to profit-seeking investors. The professional value-system of physicians, who are the providers of most of the services of hospitals, is rooted in the Hippocratic Oath, i.e., providing the best quality of care and service. Similarly, the dominant logic of federal involvement and public financing of healthcare, especially following the Medicare/Medicaid Act (1965), was improving access to healthcare for poor, indigent, elderly, and vulnerable populations. Hospitals were set up, financed, and promoted to serve that objective. Additionally, voluntary ethos, a complex of beliefs, links hospitals and other healthcare organizations to charitable work, community service, and philanthropic funding sources (Scott *et al.*, 2000). These historical institutional forces and osmosis of the underlying values and norms to organizational decision premises constrain aggressive product-mix changes away from unprofitable services used by the poor and indigent.

DiMaggio and Powell (1983) and Scott (2001) observe that organizations experience pressure to conform to their institutional environments because of coercive regulatory pressures from political institutions, normative pressures from professional and occupational constituencies, and mimetic cultural cognitive pressures from other organizations with whom they compare themselves. Hospitals are subject to all three pressures in their resource deployment and product-mix decisions. Non-profit hospitals typically have Boards of Governors with representatives from the community in which they are located, who formally regulate resource allocation decisions. Federal funding for facilities under Hill-Burton programs formally required hospitals to show specific amounts of care for uninsured or indigent patients, and in general be responsive to the needs of patients within their service areas. Further, this obligation extended far beyond the period of initial funding, typically for 20 years after project completion (Scott *et al.*,

2000). Similarly, donations from private philanthropic organizations are often conditional on providing indigent care. Hospitals are also subject to Federal anti-trust regulations against collusive output control, pricing, and exercise of market power.

Hospitals are subject to normative pressures through voluntary but formalized accreditation processes from professional associations. These accreditation requirements cover a wide spectrum, from general managerial standards required for American Hospital Association (AHA) and Blue Cross Association (BCA) accreditation, to technical standards of medical care and education required for accreditations from the American College of Surgeons (ACS), Accreditation Council for Graduate Medical Education (ACGME), Liaison Committee for Medical Education (LCME), and Joint Commission on the Accreditation of Healthcare Organization (JCAHO), and 26 other specialty associations. These accreditation standards affect product-mix decisions through policy prescriptions such as 'philanthropy should be encouraged as a source of funding,' and program specifications for resident training programs requiring an inventory of clinical components and subspecialty rotations. For example, requirements for residents in anesthesiology include: 1-month rotations in obstetric anesthesia, pediatric anesthesia, neuroanesthesia, cardioanesthesia, and 20 anesthetics for caesarean section. It is noteworthy that these standards are not directly imposed on the residents, but accreditation requires that the technical infrastructure of the hospital support such requirements (Scott *et al.*, 2000). Such accreditation requirements limit hospitals' ability to alter their product-mix. They also create and sustain pressures for isomorphism in structures, decision processes, and strategies (DiMaggio and Powell, 1983; Oliver, 1997).

Not-for-profit community hospitals hence find it difficult to cutback low or unprofitable services, which are more likely to be used by the poor and vulnerable sections of the population. Similarly, relocating to high-income areas is difficult given the public's concern that incursion of business interests into medical decisions will neglect necessary yet unprofitable portions of the healthcare system such as trauma and burn units, graduate medical education, and indigent care (Friedman, 1996; Mechanic, 1994; Scott *et al.*, 2000; Thorpe, 1997). Dumping low-profit services can also project an image of low-quality care. The fear of adverse publicity, loss of social legitimacy, and

loss of accreditation hence complicate product-mix decisions.

A merger offers the involved hospitals a socially acceptable way to consolidate and aggressively alter the product-mix by weakening institutional pressures. Merged hospitals have greater freedom to internally coordinate and manage prices and quantities of different services offered at their hospitals without the fear of regulatory scrutiny from Federal anti-trust agencies. Merged hospitals, by combining resources, facilities and patient flows, and seeking joint accreditation, can also meet the normative pressures from accreditation institutions more easily. For example, merged hospitals can provide access to different subspecialty procedures and rotations to residents across hospitals, alleviating the need to duplicate all services in both hospitals to meet ACGME and LCME accreditation requirements. The added degrees of freedom facilitate more aggressive product-mix changes.

The merger of two governing boards typically broadens the stakeholder group, alters decision criteria and dilutes local community pressures by reducing the total number of board members from each community. Further, the reconstitution of the governing board following a merger often provides a convenient opportunity to professionalize the board by bringing in more professional managers in place of local community leaders and doctors. For example Alexander, Merlock, and Gifford (1988) in their study of 2920 hospitals found that boards of restructured hospitals conformed more to the 'corporate' model found in the business/industrial world and less to the 'philanthropic' model common to most community hospitals. Similarly, Goodstein and Boeker (1991) and Boeker and Goodstein (1991) empirically analyze the impact of changes in management, ownership, and board composition on strategic change in the hospital industry, and find that the scope of hospital services is indeed influenced by changes in the board composition, independent of the influence of managerial change and ownership change. These changes in the top management team and subsequent changes in the regulatory regime are often the way hospitals change their cultural orientation from publicly financed quality care towards cost efficiency, managerial control, and market mechanisms.

As discussed earlier, the need to redefine roles, routines, rules, policies, and resource allocation following a merger disturb cultural status quo

and enable critical, mutual, external evaluation of values and traditions. Mergers can facilitate the change from normative rationality towards economic rationality (Oliver, 1997) as these institutional, cultural, and organizational constraints on 'dumping the poor' and 'focusing on profitable corporate customers' relax following the merger. Merged hospitals can aggressively reconfigure their product-mix by redeploying resources, for example by downsizing facilities such as emergency rooms that are primarily used by less profitable patients, and upgrading facilities used mostly by insured patients. There are several instances of such behavior. For example, after Lorain hospital merged with St Joseph's hospital in Lorain, Ohio, Lorain hospital's emergency room was closed down. A hospital spokesperson announced that the two hospitals had 'merged' their emergency rooms into one facility housed at St Joseph's hospital (Melendez, 1997). Similarly, in Oakland, California, Kaiser Permanente closed down its Oakland Medical Center after a spate of acquisitions of other hospitals and transferred its staff and equipment to other hospitals. Some opponents claimed that the hospital system was choosing to withdraw hospital services from areas with a large number of low-income and uninsured patients while spending money refurbishing hospitals located in communities with higher income (Bowman, 1999). Likewise, a merger can be a vehicle to enhance the brand name and provide superior customer service to the corporations, which are major sources of insured customers to the hospital system. For example, following their merger, Good Samaritan Hospital and Bethesda hospitals in Cincinnati strongly focused on redeploying their marketing resources. Notably, corporate health services were centralized and resources were allocated to build a strong brand name, 'TriHealth', geared towards corporations (www.trihealth.com).

Based on the theoretical arguments and anecdotal evidence outlined above, and prior empirical studies by Lubatkin and O'Neill (1988), Bowman and Singh (1993), and Capron *et al.* (1998) who find that mergers offer firms a vehicle to restructure rapidly, we conjecture that favorable reconfiguration of product-mix will occur after a merger. While all hospitals would like to change their product-mix towards high-profit services, merging hospitals are likely to be more successful in actually shifting the product-mix, since the merger allows them to reconfigure aggressively

by exploiting weakened institutional and organizational constraints. However, we do not suggest that all merged hospitals will become isomorphic entities offering only high-profit services or that there is a unique optimal portfolio of services for all hospitals, but propose that mergers *tend to reduce* a merging hospital's presence in low-profit services and *tend to increase* its presence in high profit services compared to a non-merging hospital. We view product-mix changes as outcomes of relative relaxation in institutional constraints and do not attempt to directly measure changes in these constraints, bearing in mind their informal and complex nature. Hence the following hypotheses are proposed:

Hypothesis 1a: Merging firms will have a greater increase in high-profit services relative to non-merging firms.

Hypothesis 1b: Merging firms will shift away from low-profit services to a greater extent relative to non-merging firms.

In Hypotheses 1a and 1b, we analyze post-merger product-mix changes within the firm; that is, we conduct an intra-firm analysis of product-mix refocus. However, this change in product-mix can be achieved either by increasing the hospital's market share of the high-profit service, or by cutting back on the proportion of patients from all other services. An increase in market share of high-profit services will indicate if the merger improved the firm's dominance of attractive markets. Further, an increase in the market share has additional benefits such as ability to exercise greater market power and raise prices, and improved economies of scale, whereas increases in the proportion of high-profit services without increasing the market share does not offer these benefits. Hence we also analyze the post-merger changes in market share to reveal which of these strategies was being followed by the merging hospitals. We examine the changes in market shares of merging and non-merging hospitals in high- and low-profit services to evaluate if the merger enabled the firm to dominate attractive product markets and withdraw from unattractive product markets. As proposed by the following hypotheses, we expect that merging hospitals will be more successful in increasing their market share in high-profit services and decreasing their market share in low-profit services.

Hypothesis 2a: Merging firms will have greater increase in post-merger market share in high-profit services relative to non-merging firms.

Hypothesis 2b: Merging firms will have greater decrease in post-merger market share in low-profit services relative to non-merging firms.

Effects of competition

Hospital markets vary in terms of the level of competition. In this paper, competition refers to the degree of concentration in the market, measured by the Herfindahl–Hirschman Index (HHI). The HHI is defined as the sum of the squared market shares of all the firms operating in the market (Martin, 1998). Thus, a highly competitive market is one which has low HHI. Some institutional constraints are likely to be less rigid for merging hospitals located in more competitive, i.e., less concentrated markets, compared to merging hospitals located in more concentrated markets. For example, the extent of regulatory oversight by antitrust agencies such as the Department of Justice (DOJ) or the Federal Trade Commission (FTC) depends on the level of concentration in the market where the merger occurs. The 1992 Horizontal Merger Guidelines issued by the DOJ and the Federal Trade Commission (FTC) consider a market with an HHI between 1000 and 1800 to be moderately concentrated. In such a market, a merger that increases the market's HHI by more than 100 points is considered potentially anti-competitive and is scrutinized. If the HHI exceeds 1800, the market is considered highly concentrated, and even a small increase in HHI of about 50 points raises concern about potential anti-competitive effects (Bazzoli *et al.*, 1995) and is carefully scrutinized.¹ Hence, hospitals located in less concentrated markets have greater opportunities to make favorable

¹ For example, in *FTC v. Butterworth Health Corp* (July 8, 1997), the FTC requested to halt the proposed merger of Butterworth Hospital and Blodgett Memorial Medical Center, two non-profit hospitals located in Grand Rapids, Michigan. Because there were only a total of four hospitals in the hospital market and the HHI exceeded 1800, the FTC claimed that the merger would substantially reduce competition in the market. The District Court allowed the merger to go through. However, the merging hospitals had to sign a consent decree which forced them to freeze hospital prices, limited margins over time to a rolling 5-year average of the margins of certain other facilities, tripled the hospitals' baseline funding of indigent care, and imposed a permanent community board requirement on the board of directors of the merged entity (O'Hare, 1997).

product-mix changes due to lower institutional regulatory oversight.

Furthermore, the presence of many other competing hospitals makes such a shift in product-mix less visible and socially less objectionable than in the case of more concentrated hospital markets (Newhouse, 1989). For example, it is easier for a hospital to close down its unprofitable emergency room or detoxification facility, when there are a number of other hospitals offering the services. In more concentrated markets, where there may not be other hospitals that patients can go for these services, institutional pressures force hospitals to continue to offer such less profitable services. Conceptually, the institutional constraints on product-mix adjustment can be viewed as a function of the product range available in the total market rather than at the individual hospital. Hospitals operating in less concentrated markets hence have more relaxed institutional constraints in product-mix adjustments. We therefore hypothesize that merging hospitals located in areas with greater competition will change their product-mix toward high-profit services to a greater extent than merging hospitals located in less competitive markets. Also, such a shift toward profitable patients would occur in terms of both the proportion of high-profit patients within the hospital's patient-mix, as well as the share of the merged hospital in the overall market pool of high-profit patients.

Hypothesis 3a: Merging firms located in markets with greater competition will shift their product-mix in favor of high-profit services to a greater extent than merging firms located in less competitive markets.

Hypothesis 3b: Merging firms located in markets with greater competition will shift their product-mix away from low-profit services to a greater extent than merging firms located in less competitive markets.

Hypothesis 4a: Merging firms located in markets with greater competition will increase their market share in high-profit services to a greater extent than merging firms located in less competitive markets.

Hypothesis 4b: Merging firms located in markets with greater competition will reduce their market share in low-profit services to a greater

extent than merging firms located in less competitive markets.

DATA AND METHODOLOGY

Data from all the urban community hospitals in Ohio covering 3 financial years, 1993–94 to 1995–96, are used in the analyses. We use the Ohio market for several reasons. First, Ohio witnessed significant merger activity involving large-sized hospitals during this period. Second, during the period of this study, Ohio had only non-profit community hospitals. Constraining the geographical and temporal setting also allows us to better control for variations in institutional and technical constraints. Hospitals that were involved in mergers or acquisitions were identified using past issues of the publication *Modern Healthcare*. This list was then verified with the Ohio State Health Department officials.

The unit of analysis is the individual Diagnosis Related Group (DRG). DRGs were established under the PPS as groupings of patient diagnoses that require similar treatment. Classification of patients by different DRGs is used as a basis in determining treatment costs and setting reimbursement rates. This allows for a homogeneous definition of products that is seldom available in other service industries. We define each DRG as a distinct product line and the proportion of patients in different DRGs as the hospital's product-mix.

DRG-level inpatient discharge data for non-government patients were obtained from the Ohio Department of Health. The data include discharge information, gross charges, and average length of stay (LOS) for each DRG where 10 or more patients were discharged. Data from a total of 105 hospitals were used in the analyses, including 22 hospitals that were involved in mergers during the period 1994–95. Federal hospitals such as hospitals belonging to the Veterans Administration (VA), long-term facilities such as nursing homes, and small rural hospitals (fewer than 50 beds) were excluded from the sample because they cater to a specific group of patients and are reimbursed on different bases, and hence the presence of these hospitals in the market does not increase competition in the same manner as the presence of other hospitals. Prior research in healthcare has excluded these hospitals while studying hospital

behavior and competition (e.g. Dranove, Shanley, and White, 1993; Norton and Staiger, 1994).

Identification of high-profit and low-profit DRGs

Ideally, high-profit and low-profit DRGs, or the relative attractiveness of DRGs, should be identified by analyzing the profitability of each DRG. However, data on DRG-level profitability are not available. We classify DRGs into low-profit and high-profit groups based on the proportion of patients who are uninsured and the proportion of patients who are fully covered by commercial insurance. Prior literature suggests that fully insured patients are profitable, and uninsured patients tend to be unprofitable, often a significant fraction ending up as bad debts for the hospital (Norton and Staiger, 1994).

The DRG-level inpatient discharge data set from the Ohio Department of Health did not include information on payer type. We used the Healthcare Cost and Utilization Project (HCUP-3) database obtained from the Agency for Health Care Policy and Research (AHCPR) to identify high-profit and low-profit DRGs. The HCUP-3 (Release 3) database is a stratified probability sample of 10 percent of the U.S. community hospitals, with sampling probabilities proportional to the number of U.S. hospitals in each geographical region. From the database, we identified the top 15 DRGs that are consumed by commercially insured patients and where less than 5 percent of the patients are uninsured. These constitute the high-profit DRGs. Similarly the top 15 services consumed by the uninsured were defined as the low-profit DRGs. Table 1 contains the list of DRGs in each category and the proportion of uninsured and commercially insured in these DRGs.

A 1-year post-merger window was used to analyze the data. The reason for using a 1-year window is that the hospital industry was extremely active in mergers and acquisitions during the period of study with many of the non-merging firms themselves involved in mergers in subsequent years. Several researchers have argued that the time frame for post-merger performance should be limited because adding further years may violate the 'clean data' criterion (Ramaswamy, 1997). Further, merging hospitals have a short time window during which they can exploit the relaxed institutional and social constraints, since many of

the psychological and social factors relaxing these constraints are short-lived.

Dependent variables

Change in proportion of patients

To test Hypotheses 1a, 1b, 3a, and 3b, which state that merging hospitals will shift their post-merger product-mix in favor of high-profit services and away from low-profit services to a greater extent than non-merging hospitals, we examine the change in the proportion of patients from DRG_{*i*} in the total patients of hospital *j* in the post-merger year from the pre-merger year. That is:

$$\begin{aligned} \text{Change in Proportion of Patients}_{ij} \\ = \ln\left[\frac{X_{ijt}/\sum_i X_{ijt}}{X_{ijt-1}/\sum_i X_{ijt-1}}\right] \end{aligned}$$

where *X* = number of patients discharged, *i* = a specific DRG, *j* = a hospital in a given market *k*, *t* = post-merger year, and *t* - 1 = pre-merger year.

Thus, this dependent variable measures the proportion of patients from DRG_{*i*} out of the total patients discharged by hospital *j* in the post merger year (*t*) divided by the proportion of patients from DRG_{*i*} out of the total patients discharged by hospital *j* in the pre merger year (*t* - 1). For example, if 2 percent of the total patients in hospital *j* belonged to DRG112 in the pre-merger year and 2.5 percent of total patients in hospital *j* belonged to DRG112 in the post-merger year, then Change in Proportion of Patients for DRG112 and hospital *j* is $\ln(2.5/2) = 0.22$.

We use a logarithmic transformation because a simple ratio as a dependent variable is constrained to be positive, while a logarithmic transformation can take both positive and negative values. The logarithmic form is hence more consistent with the assumption of normally distributed error terms in regression. The log-linear model is commonly used in econometric estimation of percentage changes (Greene, 2000).

Change in market share

For Hypotheses 2a, 2b, 4a, and 4b, the variable of interest is the change in market share for each DRG. This is defined as the log of the change in

Table 1. DRGs included in the high-profit and low-profit groups

DRG no.	Description of DRG	Proportion of commercially insured	Proportion of uninsured
<i>High-profit DRGs</i>			
13	Multiple sclerosis and cerebral ataxia	0.59	0.05
107	Coronary bypass without cardiac catheterization	0.56	0.05
112	Percutaneous cardiovascular procedures	0.59	0.05
215	Back and neck procedures without complicating conditions (CC)	0.55	0.03
222	Knee procedures without CC	0.63	0.04
257	Total mastectomy for malignancy with CC	0.56	0.04
258	Total mastectomy for malignancy without CC	0.65	0.05
261	Breast procedures for non-malignancy	0.79	0.04
290	Thyroid procedures	0.73	0.04
334	Major male pelvic procedures with CC	0.63	0.02
356	Female reproductive system reconstructive procedures	0.65	0.02
358	Uterine and adnexa procedures for non-malignancy w/o CC	0.72	0.05
359	Uterine and adnexa procedures for non-malignancy with CC	0.76	0.05
410	Chemotherapy without acute leukemia as secondary diagnosis	0.58	0.05
479	Other vascular procedures without CC	0.57	0.04
<i>Low-profit DRGs</i>			
27	Traumatic stupor and coma, coma > 1 hour	0.39	0.26
28	Traumatic stupor and coma, coma < 1 hour with CC	0.32	0.24
94	Pneumothorax with CC	0.40	0.21
202	Cirrhosis and alcoholic hepatitis	0.32	0.20
204	Disorders of pancreas except malignancy	0.39	0.20
254	Fractures, sprains, strain and dislocation of upper arm, lower leg, excluding foot, age > 17 without CC	0.40	0.20
280	Trauma to the skin, subcutaneous tissue and breast, age > 17 with CC	0.29	0.27
281	Trauma to the skin, subcutaneous tissue and breast, age > 17 w/o CC	0.32	0.31
295	Diabetes age 0–35	0.40	0.22
368	Infections, female reproductive system	0.40	0.23
434	Alcohol, drug abuse or dependence detox treatment with CC	0.26	0.26
435	Alcohol, drug abuse or dependence detox treatment without CC	0.29	0.28
449	Poisoning and toxic effects of drugs age > 17 with CC	0.28	0.29
450	Poisoning and toxic effects of drugs age > 17 without CC	0.39	0.30
486	Other OR procedures for multiple significant trauma	0.40	0.22

the market share in hospital market k of hospital j in DRG_i .

$$\begin{aligned} \text{Change in Market Share}_{ijk} \\ = \ln\left[\frac{X_{ijt}/\sum_j X_{ijt}}{X_{ijt-1}/\sum_j X_{ijt-1}}\right] \end{aligned}$$

where X = number of patients discharged, i = specific DRG, j = a hospital in a given market k , t = post-merger year, and $t - 1$ = pre-merger year.

Thus, the *Change in Market Share* variable measures the percentage of the total patients in DRG_i in hospital market k who were treated in hospital j in the post-merger year divided by the total patients in DRG_i in hospital market k who were treated in hospital j in the pre-merger year. For example, suppose the merging hospitals j together

treated 100 patients in DRG_{112} out of a total of 1000 patients in DRG_{112} in the hospital market k in the pre-merger year, that is, the hospitals had a combined total of 10 percent of the market share in DRG_{112} in the pre-merger year. Suppose the combined hospitals increased their market share in DRG_{112} to 11 percent in the post-merger year, then *Change in Market Share* = $\ln(11/10) = 0.095$.

Both *Change in Proportion of Patients* and *Change in Market Share* were computed using combined pre-merger and post-merger numbers of patients, since combined numbers provide a better indicator of the effects of the merger. Further, if the number of patients in the individual hospitals are used, it would be difficult to determine if there really was a change in the post-merger

product-mix, or the hospitals merely rerouted certain types of patients to one of the merging hospitals without affecting the total number of patients treated, i.e., hospitals specialized in certain DRGs after the merger. Further, our definition of the dependent variables provides a weighted average measure for the merging hospitals.²

In studies examining firm behavior under different competitive conditions, an appropriate definition of the market is essential. We define hospital markets based on the actual flow of patients into hospitals as provided by Makuc *et al.* (1991). Makuc *et al.* used patient origin data and employed cluster analysis to group counties into service areas. Their analysis divides the entire country into approximately 800 Health Service Areas (HSA) that are relatively self-contained with respect to the provision of routine hospital care. The market shares of individual hospitals in each DRG were calculated based on this definition.

Estimation model and hypotheses testing

The full model uses data for a total of 5335 DRGs for 2 financial years from 105 hospitals.³ Multiple regression using firm-level fixed-effects procedure was used to estimate the following models:

$$\begin{aligned} \text{Change in Proportion of Patients}_{ij} &= \alpha + \beta_1(\text{MERGE}) + \beta_2(\text{High-Profit DRG}) \\ &+ \beta_3(\text{Low-Profit DRG}) \\ &+ \beta_4(\text{MERGE} * \text{High-Profit DRG}) \\ &+ \beta_5(\text{MERGE} * \text{Low-Profit DRG}) \\ &+ \beta_6(\text{Herfindahl-Hirschman Index}) \\ &+ \beta_7(\text{Herfindahl-Hirschman Index} \end{aligned}$$

² However, results are robust even if the simple average change is used.

³ We have 5335 DRGs per year for 2 years (pre-merger and post-merger year). Because the dependent variables are change variables, the sample size is 5335, or 51 DRGs per hospital. This includes the 15 high-profit, 15 low-profit, and other DRGs consumed by commercially insured and uninsured patients, which are not classified as high- or low-profit. Although there are about 495 DRGs in total, most hospitals offer only about 150 DRGs. For example, there are several DRGs which deal with highly specialized services such as transplants and are offered by less than 5 percent of the hospitals in the nation. Our database only includes DRGs that have at least 10 discharges. DRGs with less than 10 discharges tend to be very specialized procedures and hence are not subject to the usual market forces. Our data suggest that the top 30 DRGs in terms of volume account for over 80 percent of total discharges.

$$\begin{aligned} &* \text{High-Profit DRG}) \\ &+ \beta_8(\text{Herfindahl-Hirschman Index} \\ &* \text{Low-Profit DRG}) + \beta_9(\text{MERGE} \\ &* \text{Herfindahl-Hirschman Index} \\ &* \text{High-Profit DRG}) + \beta_{10}(\text{MERGE} \\ &* \text{Herfindahl-Hirschman Index} \\ &* \text{Low-Profit DRG}) + \beta_K(\text{Controls}) \\ &+ \delta_{(j-1)}(\text{Firm Dummies}) \end{aligned} \tag{1}$$

$$\begin{aligned} \text{Change in Market Share}_{ijk} &= \alpha + \beta_1(\text{MERGE}) \\ &+ \beta_2(\text{High-Profit DRG}) \\ &+ \beta_3(\text{Low-Profit DRG}) \\ &+ \beta_4(\text{MERGE} * \text{High-Profit DRG}) \\ &+ \beta_5(\text{MERGE} * \text{Low-Profit DRG}) \\ &+ \beta_6(\text{Herfindahl-Hirschman Index}) \\ &+ \beta_7(\text{Herfindahl-Hirschman Index} \\ &* \text{High-Profit DRG}) \\ &+ \beta_8(\text{Herfindahl-Hirschman Index} \\ &* \text{Low-Profit DRG}) + \beta_9(\text{MERGE} \\ &* \text{Herfindahl-Hirschman Index} \\ &* \text{High-Profit DRG}) + \beta_{10}(\text{MERGE} \\ &* \text{Herfindahl-Hirschman Index} \\ &* \text{Low-Profit DRG}) + \beta_K(\text{Controls}) \\ &+ \delta_{(j-1)}(\text{Firm Dummies}) \end{aligned} \tag{2}$$

The explanatory and control variables used in the analysis are defined in Table 2. MERGE is a dummy variable and is coded as 1 if the hospital was involved in a merger, or else 0. High-Profit DRG is a dummy variable, which takes the value of 1 if the DRG is a high-profit DRG and is 0 otherwise. Similarly, Low-Profit DRG is a dummy variable for low-profit DRGs. Competition is measured by the Herfindahl-Hirschman (HHI) concentration index, a popular measure of competition (Dranove *et al.*, 1993).⁴ For easier interpretation

⁴ Because our unit of analysis is the individual DRG and our measure of competition is computed at the level of the DRG, the HHI is the most appropriate measure of competition for the

Table 2. Definition of explanatory and control variables

Variable	Definition
High-Profit DRG	A dummy variable coded as 1 if the DRG is one of the high-profit DRGs, otherwise it is coded as 0
Low-Profit DRG	A dummy variable coded as 1 if the DRG is one of the low-profit DRGs, otherwise it is coded as 0
MERGE	A dummy variable coded as 1 if the hospital was involved in a merger, else 0
Herfindahl–Hirschman Index (HHI)	The HHI of concentration for the hospital market defined at the DRG level as the sum of squared market shares (proportion) of all the hospitals operating in the hospital market (pre-merger year).
Change in HHI	The change in HHI in the post-merger year defined as $\log(\text{Post-merger year HHI}/\text{Pre-merger year HHI})$
Discharges (DISCHARGE)	The total discharges for the hospital in the post-merger year as a control for hospital size
Length of Stay (LOS)	The average length of stay in the post-merger year for the hospital (DRG level)
Change in LOS	The log of change in length of stay in the post-merger year. This is defined as $\log(\text{post-merger year LOS}/\text{pre-merger year LOS})$
Case-Mix Index	The Medicare Case Mix Index
TECHNOLOGY	The level of technology in the hospital measured on a 0–5 scale
MEDICARE	Proportion of Medicare patients in the total patient mix
MEDICAID	Proportion of Medicaid patients in the total patient mix
SYSTEM	A dummy variable coded as 1 if hospital is a part of a multi-hospital system, else 0
HMO	Proportion of patients from managed care plans

of the coefficients, we measure market share in proportions to calculate the HHI.

Based on prior literature, we include a number of control variables (e.g., Dranove, 1988; Lynk, 1995). The total number of discharges from the hospital in 1995 (DISCHARGES) is included as a control for hospital size. Prior research, which also uses discharges as a measure of hospital size, finds that larger hospitals were less likely to reap efficiency benefits from mergers (Dranove, 1998) and hence these hospitals may use the merger to increase their presence in high-margin DRGs to improve their post-merger performance. *Length of Stay* is the number of days between the admission date and discharge date and is included because prior research suggests that it has a substantial

effect on prices and margins (Lynk, 1995). Furthermore, higher LOS is usually associated with greater complexity or severity. *Change in Length of Stay*, defined as $\log(\text{post-merger year LOS}/\text{pre-merger year LOS})$ controls for the effect of an increase or decrease in LOS in the post-merger year on the dependent variables. The *Case-Mix Index* is a measure of the complexity of the cases treated by a hospital relative to the complexity of the national average of all hospital cases. Each DRG is assigned a weight based on the relative complexity and cost of treatment. Hospitals with higher case-mix index are likely to have higher costs of treatment, greater financial risk in the case of default, and hence higher incentive to reconfigure. MEDICARE and MEDICAID control the extent to which the hospital's revenue is derived from government patients. A hospital with a greater proportion of government payers and associated declining reimbursement rates may have incentives to increase the proportion of fully insured patients. The technology variable (TECHNOLOGY) controls for the level of technology in the hospital and is measured on a scale of 0–5. Five technology-intensive services, namely positron emission tomography, magnetic resonance imaging, radiation therapy, cardiac

purposes of our study. The number of facilities may be a noisy measure because, although there may be many hospitals offering a particular service in a hospital market, not all hospitals may be equal players—some may have a larger market share. Thus, the number of hospitals may overstate the extent of competition in a market. Prior literature suggests that the HHI is a superior measure of competition because it offers a more complete view of market conditions compared to alternatives such as the four-firm concentration ratio. The HHI combines information about both the number and distribution of firms (Martin, 1998; Schmalensee, 1977; Weinstock, 1982). Furthermore, antitrust agencies such as the FTC and the DOJ use the HHI measure of competition (Bazzoli *et al.*, 1995).

catheterization, and organ transplant, were selected and each hospital was assigned a score depending on the availability of that service in the hospital. A score of 5 indicates the availability of all five technology-intensive services, while a score of 0 indicates the availability of none of the services. High-tech hospitals with higher fixed costs have greater incentives to reconfigure their product-mix. SYSTEM controls whether or not a hospital is a member of a multi-hospital network. Hospitals belonging to a system may have already reaped some of the merger-related benefits due to the presence of multiple facilities, and as a result may have lower opportunities to shift their product-mix. HMO controls for the proportion of patients covered by HMO plans, which may also limit a hospital's ability to shift its product-mix. We estimate a fixed effects model with $n - 1$ hospital dummies to control for hospital-specific effects.

Hypotheses 1a and 2a predict that merged hospitals will shift their product-mix and market shares in favor of high-profit services (defined as DRGs) to a greater extent than the non-merging hospitals. Hence, the coefficient on the *MERGE * High-Profit DRG* interaction variable should be positive for both *Change in Proportion of Patients* and *Change in Market Share*. Hypotheses 1b and 2b predict that merged hospitals will shift their product-mix and market shares away from low-profit services to a greater extent than the non-merging hospitals. Hence, the coefficient on the *MERGE * Low-Profit DRG* interaction variable should be negative for both *Change in Proportion of Patients* and *Change in Market Share* regressions. Hypotheses 3a and 4a predict that there will be a greater shift toward high-profit services when the level of competition is high. Hence the coefficient on *MERGE * Herfindahl-Hirschman Index * High-Profit DRG* should be negative for both *Change in Proportion of Patients* and *Change in Market Share* regressions. Similarly, Hypotheses 3b and 4b predict that the coefficient of *MERGE * Herfindahl-Hirschman Index * Low-Profit DRG* interaction term will be positive. That is, there will be a greater shift away from low-profit services when the level of competition is high.

Estimation issues

Because we have multiple observations from each hospital, lack of independence may be an issue.

However, the dependent variables in the regressions are differences between post-merger and pre-merger values, which would control for the common error term and associated correlation among DRGs of the same hospital. Further, we use a fixed-effects model with hospital dummies to control for the multiple observations from each hospital.

The dependent variable in our estimations can be viewed as a difference score.⁵ Using difference score as a dependent variable may be subject to regression to the mean effects, i.e., hospitals with high or low shares tend to return to the average over time, which may bias coefficient estimates. We carried out the procedure proposed by Dranove and Cone (1984) and later used by others (Connor, Feldman, and Dowd, 1998; Robinson and Phibbs, 1989) to control for regression to mean effects. First we regressed the pre-merger dependent variable (proportion of patients, and market share) as a function of all the other independent variables. We then included the error terms from these estimations as an additional independent variable in estimating the difference Equations 1 and 2. The correction resulted in very minor changes (in the third decimal place) in our parameter estimates and fit, which were not statistically significant. Hence we conclude that regression to mean effects did not bias our coefficients.

In addition, we conducted the omitted-variable version of the Hausman test to examine whether there is an endogeneity bias in our sample, i.e., whether hospitals that were more likely to change their product-mixes were also more likely to merge (Greene, 2000; Kennedy, 1998). It can be argued that hospitals with a low share of high-profit services are likely to be more eager to add these services and hence are more likely to merge. We conducted a two-stage estimation, where we first regressed the likely endogenous variable, i.e., MERGE, as a function of all the other independent variables in our regressions for *Change in Proportion of Patients* and *Change in Market Share*.

⁵ Edwards (1995) argues that using difference scores as a dependent variable may confound the effects of independent variables. He recommends reconceptualizing the relationship between the levels (instead of difference) of the dependent variable and independent variables, and running separate regressions on the two levels of the dependent variable, instead of the difference equation. However, the main independent variable of interest in our estimation is a dummy variable for merger, whose value is zero for all the pre-merger time period observations. Hence the confounding effect is unlikely to arise.

Because the likely endogenous variable (*MERGE*) is a dummy variable, we used probit estimation in this first-stage analysis. Prior research suggests that in the presence of selection bias the fitted probability values from a probit model serve as good instrumental variables (Barnow, Cain, and Goldberger, 1981; Khanna and Damon, 1999; Lee and Trost, 1978). We then retrieved the fitted probability values from the probit estimation and added them as an additional regressor in the OLS for the *Change in Proportion of Patients* and *Change in Market Share* regressions. The coefficients on the fitted values were not significantly different from zero ($p > 0.40$ for both regressions). Thus we are able to rule out endogeneity bias in our sample. The addition of the fitted values to the regressions did not significantly change the overall fit and the explanatory power of the regressions as measured by the *F*-test (Greene, 2000; Kennedy, 1998). Further, the estimated coefficients for the independent variables and control variables did not change significantly.

RESULTS

Table 3 contains means, standard deviations, and correlations. For the market as a whole, there was a greater increase in the proportion of patients from low-profit services (DRGs) compared to the proportion of patients from high-profit services (DRGs). The increase in the proportion of patients from high-profit DRGs in the post-merger year was about 5 percent, whereas the increase in the proportion of patients from low-profit DRGs was 22 percent. These results are consistent with evidence from the health care literature that the uninsured population in the United States grew at the rate of about 5–7 million new patients per year in the 1990s (Goldsmith, 1998). While, merely increasing the pool of the uninsured does not increase the services demanded in the low-profit DRGs, this result is likely driven by three factors. First, several of the services in the low-profit DRGs (e.g., diabetes, fractures) are often treated at physicians' offices. However, many physicians do not accept uninsured patients. With the rise in uninsured population, many of the newly uninsured patients requiring low-profit DRG services may end up in hospital emergency rooms for treatment. Second, uninsured patients lack access to preventative care for ailments such as diabetes, infections, and

liver problems, which may result in complications that land them in hospitals (Almeida, Dubay, and Ko, 2001; Schoen and DesRoches, 2000). Finally, many of the high-profit DRGs such as knee surgery are elective procedures and thus less likely to be used by the uninsured.

Table 3 also contains the correlations among the independent variables. The correlations between the independent variables (non-interaction variables) are generally low, with the maximum correlation coefficient of -0.50 occurring between the proportion of Medicare patients and Medicaid patients.

Table 4 provides the results for the fixed-effects models for the dependent variable *Change in Proportion of Patients*. The coefficients of the individual hospital dummies have limited interpretation value and hence are not reported. Column 1 of Table 4 contains the results of a model containing only the control variables. Column 2 contains a model that includes the dummy variables for *MERGE*, *High-Profit*, and *Low-Profit DRG*. Column 3 contains the results of a model, which includes the two-way interactions, and column 4 contains the full model with all the control variables, two-way interactions, and three-way interactions. An *F*-test indicates that Model 2 has significantly higher explanatory power than Model 1 ($p < 0.001$), Model 3 has significantly higher explanatory power than Model 2 ($p < 0.05$), and Model 4 has significantly higher explanatory power than Model 3 ($p < 0.001$). In Model 4, the *MERGE* dummy has a significant and positive coefficient, which indicates that merged hospitals increased the proportion of patients in the selected DRGs to a greater extent than non-merging hospitals. This result is also obtained if merging hospitals increased their proportion of patients to a large extent in a few selected DRGs but did not cut back to a large extent from other DRGs. That is, they selectively increased their presence to a large extent from a few selected DRGs but cut back only small amounts from a large number of DRGs. However, this result does not reveal in which DRGs the increase occurred. The coefficient for the *MERGE * High-Profit DRG* (Models 3 and 4) indicates that merged hospitals increased the proportion of patients from high-profit DRGs to a greater extent than non-merging hospitals. These results are consistent with Hypothesis 1a.

For the low-profit DRGs, however, the results fail to support Hypothesis 1b that merged hospitals

Table 3. Means, standard deviations and Pearson correlation coefficients

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Mean (S.D.)																						
1. Change in Proportion of Patients	1.00																					
2. Change in Market Share	0.42	1.00																				
3. Herfindahl-Hirschman Index (HHI)	-0.05	0.02	1.00																			
4. Change in HHI	0.07	0.09	-0.21	1.00																		
5. DISCHARGES	0.12	0.11	0.05	-0.21	1.00																	
6. Length of Stay (LOS)	0.00	-0.01	0.06	-0.09	0.11	1.00																
7. Change in LOS	-0.04	0.06	0.07	-0.05	0.05	0.24	1.00															
8. Case-Mix Index	0.02	0.01	0.06	-0.29	0.42	0.05	-0.04	1.00														
9. Technology	-0.01	0.05	0.07	-0.30	0.33	0.10	0.05	0.25	1.00													
10. MEDICARE	0.13	-0.01	-0.02	-0.04	-0.40	-0.09	0.08	0.14	-0.25	1.00												
11. MEDICAID	-0.06	0.07	-0.06	0.11	-0.04	0.03	0.02	-0.04	0.11	-0.50	1.00											
12. SYSTEM	0.03	0.07	-0.15	-0.02	0.05	0.02	0.01	0.07	0.07	0.04	-0.17	1.00										
13. HMO	-0.01	-0.01	-0.02	-0.04	-0.15	-0.03	-0.01	-0.16	-0.03	0.03	-0.07	0.03	1.00									
14. MERGE DUMMY	0.05	0.06	-0.16	-0.26	0.42	0.09	0.01	0.33	0.17	-0.13	0.13	-0.08	-0.32	1								
15. HIGH-PROFIT DRG	-0.04	-0.02	-0.02	-0.00	0.03	-0.10	0.01	0.05	0.01	0.01	-0.02	0	0	0.04	1							
16. LOW-PROFIT DRG	0.07	-0.01	0.02	0.01	-0.02	-0.04	-0.02	0.03	0.02	0.01	0.02	0.03	0	0.01	-0.17	1						
17. MERGE * High-Profit DRG	0.14	0.05	-0.06	-0.07	0.12	-0.04	0.02	0.10	0.05	-0.04	0.03	0	-0.07	0.29	0.53	-0.04	1					
18. MERGE * Low-Profit DRG	-0.05	0.01	0	-0.01	0.04	0	0	0.06	0.05	-0.03	0.05	0	-0.04	0.20	-0.03	0.52	-0.02	1				
19. HHI * High-Profit DRG	0.05	0.02	0.12	0	0	-0.08	0	0.02	-0.01	0.02	-0.01	-0.03	0	-0.02	0.83	-0.06	0.36	-0.03	1			
20. HHI * Low-Profit DRG	0.03	-0.03	0.18	0	-0.03	-0.02	-0.01	0	-0.01	0.04	0	0	0	-0.16	0.79	-0.03	0.39	-0.05	1			
21. MERGE * HHI * High-Profit DRG	-0.08	-0.03	0	-0.11	0.12	-0.02	0.02	0.09	0.04	-0.05	0.03	0	-0.11	0.24	0.45	-0.03	0.77	-0.02	0.48	-0.02	1	
22. MERGE * HHI * Low-Profit DRG	0.01	0.01	0.10	-0.01	0.03	0.01	0.01	0.06	0.05	-0.04	0.07	0	-0.04	0.16	-0.03	0.03	-0.02	0.75	-0.02	0.53	-0.01	1

Note: All correlations above 0.05 are significant at $p < 0.10$ or better.

¹ High-Profit DRG.

² Low-Profit DRG.

Table 4. Fixed-effects analysis of Change in Proportion of Patients

Variable	Parameter estimate (standard errors)			
	Model 1 Controls	Model 2 Direct effects	Model 3 Two-way interactions	Model 4 Three-way interactions
DISCHARGES (number of patients discharged from the hospital)	0.34E ⁻⁵ (0.22E ⁻⁵)	0.65E ^{-5*} (0.29E ⁻⁵)	0.66E ^{-5*} (0.29E ⁻⁵)	0.66E ^{-5*} (0.30E ⁻⁵)
Length of Stay	0.01*** (0.20E ⁻²)	0.01*** (0.16E ⁻²)	0.99E ^{-2***} (0.16E ⁻²)	0.98E ^{-2***} (0.16E ⁻²)
Change in Length of Stay	-0.10*** (0.02)	-0.10*** (0.02)	-0.09*** (0.02)	-0.09*** (0.02)
Case-Mix Index	-0.05 (0.36)	0.73E ⁻³ (0.36)	0.52E ⁻² (0.37)	0.40E ⁻² (0.37)
TECHNOLOGY (level of technology of the hospital)	-0.02 (0.06)	0.02 (0.06)	0.02 (0.06)	0.02 (0.06)
MEDICARE (proportion of Medicare patients)	0.22E ⁻² (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)
MEDICAID (proportion of Medicare patients)	0.01 (0.02)	0.01 (0.02)	0.01 (0.02)	0.02 (0.02)
SYSTEM (1 if the hospital is a member of a multi-hospital system, else 0)	0.06 (0.21)	-0.11 (0.23)	-0.11 (0.23)	-0.12 (0.23)
HMO (proportion of managed care patients)	0.12E ⁻³ (0.72E ⁻²)	0.48E ⁻² (0.80E ⁻²)	0.50E ⁻² (0.80E ⁻²)	0.49E ⁻² (0.79E ⁻²)
Herfindahl–Hirschman Index	0.05 (0.03)	0.05 (0.03)	0.05 (0.03)	0.04 (0.03)
Change in Herfindahl–Hirschman Index	0.90E ⁻³ (0.70E ⁻³)	0.77E ⁻³ (0.29E ⁻³)	0.88E ⁻³ (0.74E ⁻³)	0.39E ⁻³ (0.74E ⁻³)
MERGE (1 if the hospital merged, else 0)		0.31* (0.15)	0.30* (0.15)	0.29* (0.15)
High-Profit DRG (1 if the DRG is a high-profit DRG, else 0)		-0.04* (0.02)	-0.04* (0.02)	-0.20*** (0.04)
Low-Profit DRG (1 if the DRG is a low-profit DRG, else 0)		0.11*** (0.02)	0.10*** (0.03)	0.15*** (0.05)
MERGE * High-Profit DRG			0.09* (0.04)	0.27*** (0.08)
MERGE * Low-Profit DRG			0.05 (0.06)	0.11 (0.09)
Herfindahl–Hirschman Index * High-Profit DRG			0.40*** (0.09)	0.41*** (0.09)
Herfindahl–Hirschman Index * Low-Profit DRG			-0.15 (0.09)	-0.14 (0.09)
MERGE * Herfindahl–Hirschman Index * High-Profit DRG				-0.80*** (0.26)
MERGE * Herfindahl–Hirschman Index * Low-Profit DRG				-0.23 (0.19)
Adjusted R ²	0.0839	0.1303	0.1359	0.1447
N	5335	5335	5335	5335

$p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

decrease the share of low-profit patients. The coefficient on the *MERGE * Low-Profit DRG* dummy is not statistically different from zero (Models 3 and 4), thereby indicating that, relative to the non-merging hospitals, the merging hospitals did not shift their product-mix away from low-profit DRGs after the merger.

Hypothesis 2a states that merging hospitals will try to increase their market share to a greater extent in services used by high-profit patients. The regression in Table 5, which has *Change in Market Share* as the dependent variable, contains the test of this hypothesis. Column 1 of Table 5 contains the results of a model containing only the control variables, Column 2 contains a model which includes the direct effects of *MERGE*, *High-Profit*, and *Low-Profit DRG*, Column 3 contains the results of a model which includes the two-way interactions, and Column 4 contains the full model with the direct effects, two-way interactions, and three-way interactions. *F*-tests suggest that Model 2 has significantly higher explanatory power than Model 1 ($p < 0.001$), Model 3 has significantly higher explanatory power than Model 2 ($p < 0.001$), and Model 4 has significantly higher explanatory power than Model 3 ($p < 0.001$). In Model 4, the *MERGE* dummy has a positive coefficient, indicating that the merging hospitals increased their market share, but it does not convey much information about the DRGs in which the changes occurred. The two-way interaction *MERGE * High-Profit DRG* dummy is positive and a significant predictor of *Change in Market Share*, indicating that merging hospitals indeed increased their market share in high-profit services to a greater extent than the non-merging hospitals. These results are consistent with Hypothesis 2a. For testing Hypothesis 2b, we examine the coefficient on the *MERGE * Low-Profit DRG*. This coefficient is not statistically different from zero, indicating that, relative to the non-merging hospitals, the merging hospitals did not reduce their market shares in the low-profit DRGs. These results fail to support Hypothesis 2b.

Effects of competition

To see whether merging hospitals located in more competitive markets behave differently from merging hospitals located in less competitive markets, we examine the relationship between *MERGE * Herfindahl–Hirschman Index * High-Profit DRG* interaction and *Change in Proportion of Patients*.

The negative and significant coefficient on the *MERGE * Herfindahl–Hirschman Index * High-Profit DRG* interaction in Table 4, Model 4, reveals that hospitals located in areas with greater competition, i.e., markets with a lower HHI, increased their proportion of high-profit DRGs to a greater extent, which is consistent with Hypothesis 3a. For Hypothesis 3b to be supported, the coefficient on *MERGE * Herfindahl–Hirschman Index * Low-Profit DRG* interaction should be positive, which would indicate that merging hospitals in more competitive markets (i.e., less concentrated markets) shifted their product-mix away from low-profit services to a greater extent than merging firms in less competitive markets. The *MERGE * Herfindahl–Hirschman Index * Low-Profit DRG* interaction is not statistically significant (Model 4), suggesting that merging hospitals located in areas with greater competition did not shift their product-mix away from low-profit DRGs. Thus Hypothesis 3b is not supported.

Similarly, when the dependent variable is *Change in Market Share* (Table 5, Model 4), the results indicate that merging hospitals located in areas with greater competition increased their market share from high-profit DRGs to a greater extent as proposed by Hypothesis 4a. However, Hypothesis 4b is not supported as evidenced by the *Merge * Herfindahl–Hirschman Index * Low-Profit DRG* coefficient, which is not significantly different from zero.

We use the coefficient estimates from the full models in Table 4 (Model 4) and Table 5 (Model 4) to compute average effect sizes for identical merging and non-merging hospitals. The results are presented in Table 6. These results indicate that merging hospitals located in high-competition markets increased the proportion of patients from high-profit DRGs by about 31 percent relative to medium-profit DRGs, whereas merging hospitals located in markets with lower competition increased their share of patients from high-profit DRGs by about 23 percent. For non-merging hospitals located in highly competitive markets the proportion of patients from high-profit DRGs was lower in the post-merger year. Similar results are obtained for the change in market share variable.⁶

⁶ Results are robust to the exclusion of monopoly markets.

Table 5. Fixed-effects analysis of Change in Market Share

Variable	Parameter estimate (standard errors)			
	Model 1 Controls	Model 2 Direct effects	Model 3 Two-way interactions	Model 4 Three-way interactions
DISCHARGES (number of patients discharged from the hospital)	0.28E ⁻⁵ (0.21E ⁻⁴)	0.62E ⁻⁵ (0.28E ⁻⁴)	0.66E ⁻⁵ (0.28E ⁻⁴)	0.61E ⁻⁵ (0.28E ⁻⁴)
Length of Stay	0.60E ^{-2***} (0.20E ⁻²)	0.51E ^{-2***} (0.15E ⁻²)	0.51E ^{-2***} (0.15E ⁻²)	0.52E ^{-2***} (0.15E ⁻²)
Change in Length of Stay	0.03 (0.02)	0.76E ⁻² (0.21)	0.77E ⁻² (0.21)	0.83E ⁻² (0.21)
Case-Mix Index	-0.44 (0.35)	-0.45 (0.35)	-0.45 (0.34)	-0.50 (0.35)
TECHNOLOGY (level of technology of the hospital)	-0.03 (0.06)	0.03 (0.05)	0.03 (0.06)	0.02 (0.05)
MEDICARE (proportion of Medicare patients)	0.02* (0.01)	0.45E ⁻² (0.01)	0.45E ⁻² (0.01)	0.45E ⁻² (0.01)
MEDICAID (proportion of Medicare patients)	0.01 (0.02)	0.02 (0.02)	0.02 (0.02)	0.03 (0.02)
SYSTEM (1 if the hospital is a member of a multi-hospital system, else 0)	0.11 (0.21)	-0.14 (0.22)	-0.14 (0.22)	-0.15 (0.22)
HMO (proportion of managed care patients)	0.30E ⁻² (0.70E ⁻²)	0.10E ⁻² (0.75E ⁻²)	0.10E ⁻² (0.75E ⁻²)	0.11E ⁻² (0.75E ⁻²)
Herfindahl-Hirschman Index	0.23*** (0.03)	0.24*** (0.03)	0.24*** (0.03)	0.24*** (0.02)
Change in Herfindahl-Hirschman Index	0.11*** (0.80E ⁻²)	0.16*** (0.80E ⁻²)	0.16*** (0.80E ⁻²)	0.16*** (0.80E ⁻²)
MERGE (1 if the Hospital merged, else 0)		0.28* (0.14)	0.28* (0.14)	0.28* (0.14)
High-Profit DRG (1 if the DRG is a high-profit DRG, else 0)		-0.01 (0.02)	-0.01 (0.02)	-0.07* (0.04)
Low-Profit DRG (1 if the DRG is a Low-profit DRG, else 0)		0.06 ^ψ (0.04)	0.05 ^ψ (0.04)	0.13** (0.04)
MERGE * High-Profit DRG			0.10* (0.04)	0.16* (0.08)
MERGE * Low-Profit DRG			-0.07 (0.06)	-0.03 (0.09)
Herfindahl-Hirschman Index * High-Profit DRG			0.22** (0.09)	0.22** (0.08)
Herfindahl-Hirschman Index * Low-Profit DRG			-0.18* (0.09)	-0.22** (0.08)
MERGE * Herfindahl-Hirschman Index * High-Profit DRG				-0.47 ^ψ (0.25)
MERGE * Herfindahl-Hirschman Index * Low-Profit DRG				0.27 (0.20)
Adjusted R ²	0.1644	0.2469	0.2582	0.2753
N	5335	5335	5335	5335

^ψp < 0.10; * p < 0.05; ** p < 0.01; *** p < 0.001

Table 6. Analysis of effect sizes for the high-profit DRGs^a

Panel A

	Value of dependent variable 'Change in Proportion of Patients'	
	Low competition market (Herfindahl–Hirschman Index = 0.35)	High competition market (Herfindahl–Hirschman Index = 0.15)
Non-merging hospital	-0.05	-0.13
Merging hospital	0.23	0.31

Panel B

	Value of dependent variable 'Change in Market Share'	
	Low competition market (Herfindahl–Hirschman Index = 0.35)	High competition market (Herfindahl–Hirschman Index = 0.15)
Non-merging hospital	-0.05	-0.04
Merging hospital	0.23	0.33

^a Effect sizes are calculated using the coefficients from the full model provided in Table 4, column 4 and Table 5, column 4. For example, the value of the dependent variable 'Change in Proportion of Patients' for high-profit DRGs for a merging hospital located in a high-competition area will be: $0.29(MERGE) - 0.20(High-Profit\ DRG) + 0.27(MERGE * High-Profit\ DRG) + 0.41(Herfindahl-Hirschman\ Index * High-Profit\ DRG) - 0.80(MERGE * Herfindahl-Hirschman\ Index * High-Profit\ DRG) + 0.00039(Change\ in\ Herfindahl-Hirschman\ Index) + 0.0000066(DISCHARGES) + 0.0098(Length\ of\ Stay) - 0.09(Change\ in\ Length\ of\ Stay) = 0.31$. For a non-merging hospital located in the same market, the value of the dependent variable 'Change in Proportion of Patients' for high-profit DRGs will be: $-0.20(High-Profit\ DRG) + 0.41(Herfindahl-Hirschman\ Index * High-Profit\ DRG) + 0.00039(Change\ in\ Herfindahl-Hirschman\ Index) + 0.0000066(DISCHARGES) + 0.0098(Length\ of\ Stay) - 0.09(Change\ in\ Length\ of\ Stay) = -0.13$. For the variables *Change in Herfindahl–Hirschman Index*, *DISCHARGES*, *Length of Stay*, and *Change in Length of Stay*, the mean values are used in the computations. These effect sizes are with reference to medium-profit DRGs in non-merging hospitals.

Limitations

Conclusions from this estimation procedure should consider some of its limitations. First, because of lack of data on individual DRG-level profitability, we define high- and low-profit services based on the proportion of fully insured and uninsured patients. While fully insured patients are more profitable than uninsured patients, it is possible that the uninsured patients still generate positive cash flows. Second, hospitals may differ in their efficiency in performing a particular service, and hence the profitability of a particular DRG may differ across hospitals. However, we feel that our assumption that for any given hospital, fully insured patients are more profitable than uninsured patients, is reasonable. Prior literature examining hospital costs has typically used variables such as case-mix and patient-mix to examine differences between hospitals' costs (e.g., Dranove and Shanley, 1995; Robinson and Phibbs, 1989). Our analysis includes controls for both the patient-mix (Proportion of Medicare and Medicaid patients) and case-mix, and is hence consistent with the prior

literature. In addition, our dependent variable is the ratio of pre-merger and post-merger values and our models include hospital-level dummies (fixed-effects model) as independent variables, both of which control for differences in efficiencies. Third, in this study, we define product-mix in terms of individual DRGs. Some substitution may occur across closely related DRGs, which we assume is minimal as correct diagnosis is critical for appropriate treatment of patients. Fourth, the linkage conceptualized in our theoretical model is of the form: merger relaxes institutional and organizational constraints on firm behavior, which in turn leads to successful product-mix changes. Our regression model directly estimates the relationship between mergers and product-mix changes, and interprets the strength of the relationship as results of relaxation of these constraints. Ideally, the institutional constraints should be included explicitly in the model. In view of the difficulties in defining, isolating, measuring, and aggregating formal and informal institutional pressures, we refrain from quantitative representation of these constraints.

DISCUSSION AND CONCLUSIONS

This paper draws on institutional and resource-based theories to argue that the realizable value of a firm's resources is influenced by the market, institutional, and organizational context of resource decisions. We examine the organizational and institutional constraints faced by multi-product firms that hamper their ability to redeploy their resources to focus on attractive product lines. We propose that mergers relax many of these constraints and allow merging firms to more successfully redeploy their resources, favorably change the product portfolio, and increase the firm's dominance of attractive product markets. First, mergers allow the merged firms greater flexibility to internally coordinate and manage prices and quantities of different services offered without the fear of anti-trust regulatory constraints on collusive pricing and exercise of market power. Second, merged organizations can exploit scale economies in meeting institutional expectations by reducing the duplication of ceremonial structural elements and thereby improve technical efficiency. Third, mergers facilitate the movement of a firm from the institutional end towards the technical end of the Meyer and Rowan (1977) continuum, when the institutional environment is changing. Fourth, mergers force a large-scale revaluation and transformation in organizational structure, culture, and routines and procedures, allowing the merged firms to overcome organizational constraints arising from limited routines, bounded rationality, and lack of absorptive capacity. We develop these ideas using the U.S. hospital industry as a context.

Hospitals in the United States are struggling to cope with changes in the regulatory and competitive environment, and finding ways to increase the proportion of profitable, fully insured patients is a key to their future survival. We hypothesize that mergers facilitate reconfiguring the product-mix toward high-profit services, by relaxing institutional and organizational barriers. Empirical analysis of mergers in the state of Ohio reveals that merging hospitals shifted their product-mix and market shares towards high-profit services to a greater extent relative to non-merging hospitals. However, hospital mergers have not resulted in product-mix adjustments away from the low-profit services used by the poor and uninsured.

Our results suggest that, although mergers relax some of the institutional and organizational constraints on resource redeployment toward attractive product lines, they do not appear to relax the constraints on elimination of unprofitable product lines. The institutional factors inhibiting elimination of unprofitable product lines appear to be more resilient, likely due to non-profit status of the firms in our sample. Non-profit hospitals with their historical strong ties to the Church and the local community are expected to serve the indigent and the poor, constraining product-mix changes away from the unprofitable services. While resource redeployment and mergers might be socially legitimate ways to pursue additional profitable, insured patients paid for by the big corporations, using them to turn away poor, uninsured, individual patients may not be acceptable. Merging hospitals may be *unwilling* to move away from the low-profit DRGs due to their perceived social costs, especially in the short run following the merger when the public scrutiny is likely to be high. Dumping poor patients may also signal poor-quality care, which may affect demand for other services (Scott *et al.*, 2000). Also, as Zwanziger, Melnick, and Simpson (1996) suggest, the range and sophistication of services provided is a critical element of identity in the hospital industry, hence hospitals may be reluctant to make changes to the range of services. Additional plausible reasons for not reducing exposure to low-profit services may be that the low-profit services may still generate positive cash flows by adequately covering variable costs, or these services may already be at the level of efficient scale economy and further reduction in service levels is uneconomic. Alternatively, the increased market power from the merger may allow the merging firms to increase the profitability of these services through an increase in prices over the long run.

The strategic motive behind mergers hence appears to be to gain a greater share of the insured market, thereby improving the hospitals' bargaining position *vis-à-vis* the insurers and employers. Further, previous studies indicate that hospitals with greater service-specific volume experience lower mortality (Hannan *et al.*, 1989; Hughes *et al.*, 1988; Luft, Bunker, and Enthoven, 1979; Showstack *et al.*, 1987), which would further improve a hospital's position in high-profit services by signaling higher quality.

The large number of hospital mergers and acquisitions that have occurred recently has also resulted in a debate about the appropriate anti-trust treatment of hospital mergers, and whether hospital mergers and acquisitions should be treated differently from mergers in other industries (Dranove *et al.*, 1993; Gaynor and Vogt, 2000; Lynk 1995). In the hospital industry, the anti-trust issue is complicated by the predominance of non-profit hospitals, which have multiple objectives and presumably are not motivated by profits alone. A major public concern has been that market-based incentives and focus on cost containment tend to neglect unprofitable but necessary, important, and often under-served portions of the healthcare system, such as trauma, burn units, graduate medical education, and indigent care (Friedman, 1996; Mechanic, 1994; Scott, 2001; Thorpe, 1997). This paper contributes to the ongoing debate about the appropriate treatment of mergers among not-for-profit hospitals by providing evidence on the effects of such mergers on the service-mix. The result that hospitals do not reduce the provision of low-profit services suggests that hospital mergers may not significantly reduce access to care for the poor and underprivileged. However, further research analyzing the effects of mergers of for-profit hospitals, which are less subject to social pressures, on product-mix is necessary.

While the existing literature suggests that other organizational forms such as joint ventures and alliances also allow firms to acquire complementary resources necessary for entry into new and attractive product-markets (Salter and Weinhold, 1979), we believe that mergers are essential to facilitate the relaxation of institutional and organizational constraints that hamper such product reconfiguration. For example, the increased freedom to coordinate and manage prices and product-mix without anti-trust review would require merging of the organizational boundaries. Similarly, compared to other organizational arrangements, merged organizations can more easily reduce the duplication of ceremonial structural elements without suffering a loss of reputation, accreditation, and legitimacy. Mergers also facilitate drastic changes in the top management team and subsequent rapid changes in the organizational structure, culture and routines.

Our findings can be generalized beyond the hospital industry. Other industries such as the electric utilities, telephone services, airlines, and

education have a similar history of high government and public involvement followed by deregulation/privatization with a view to improve efficiency. These industries are subject to similar high institutional and organizational pressures, and extensive merger and acquisition activity has occurred in the electric utility, airline, and telecom industries following deregulation. Reconfiguring product-mix towards high-profit product lines or market segments and dumping unprofitable product lines by exploiting reduced institutional constraints is a likely motive in these mergers. Dumping of less profitable but vulnerable customers by these industries has been a similar public concern.

Our theoretical argument that mergers facilitate resource deployment and product-mix reconfiguration by relaxing institutional and organizational constraints is applicable to mergers in general. For example, anecdotal evidence reveals that Exxon and Mobil used their merger as an opportunity to shed some of their low-profit retailing and refining operations in order to create a stronger competitor for oil exploration, the most profitable section of the business (Howe, 1999). However, very little empirical research examines how the product or service-mix in the combined entity is reconfigured after an acquisition. In other industries that are subject to fewer institutional pressures, there might be greater movement away from unprofitable products, although it is also possible that firms in such a setting would not need a merger to undertake such realignment. Future research examining these questions in other industries is warranted.

ACKNOWLEDGEMENTS

We thank workshop participants of the 2001 American Accounting Association Conference, the University of Pittsburgh, and the University of Texas at Dallas for their comments. We also thank Associate Editor Will Mitchell, Leslie Eldenburg, Harry Evans, Vivian Ho, Brian Pentland, and two anonymous reviewers for their valuable advice.

REFERENCES

- Alexander JA, Merlock LL, Gifford BD. 1988. The effects of corporate restructuring on hospital policy-making. *Health Services Research* **23**: 311–337.

- Almeida RA, Dubay LC, Ko G. 2001. Access to care and use of health services by low-income women. *Health Care Financing Review* **22**(4): 27–47.
- Amit R, Schoemaker PJH. 1993. Strategic assets and organizational rent. *Strategic Management Journal* **14**: 33–46.
- Barney JB. 1991. Firm resources and sustained competitive advantage. *Journal of Management* **17**: 99–120.
- Barney JB. 2001. Is the resource-based view a useful perspective for strategic management research? Yes. *Academy of Management Review* **26**(1): 41–56.
- Barnow BS, Cain GG, Goldberger AS. 1981. Issues in the analysis of selectivity bias. In *Evaluation Studies Review Annual*, Stromdorfer W, Farkas G (eds). Sage: Beverly Hills, CA; 43–59.
- Bazzoli GJ, Marx D, Arnould RJ, Manhiem LM. 1995. Federal antitrust merger enforcement standards: a good fit for the hospital industry? *Journal of Health Politics, Policy and Law* **20**: 137–169.
- Boeker W, Goodstein J. 1991. Organizational performance and adaptation: effects of environment and performance on changes in board composition. *Academy of Management Journal* **34**: 805–826.
- Bowman C. 1999. Rally over closing of Kaiser Hospital. *San Francisco Chronicle* May 6: A20.
- Bowman EH, Singh H. 1990. Overview of corporate restructuring: trends and consequences. In *Corporate Restructuring*, Rock L, Rock RH (eds). McGraw-Hill: New York; 1–16.
- Bowman EH, Singh H. 1993. Corporate restructuring: reconfiguring the firm. *Strategic Management Journal*, Summer Special Issue **14**: 5–14.
- Capron L, Dussauge P, Mitchell W. 1998. Resource redeployment following horizontal acquisitions in Europe and North America, 1988–1992. *Strategic Management Journal* **19**(7): 631–661.
- Capron L, Mitchell W, Swaminathan A. 2001. Asset divestiture following horizontal acquisitions: a dynamic view. *Strategic Management Journal* **22**(9): 817–844.
- Chatterjee S, Lubatkin M. 1990. Corporate mergers, stockholder diversification, and changes in systematic risk. *Strategic Management Journal* **11**(4): 255–268.
- Chatterjee S, Wernerfelt B. 1991. The link between resources and type of diversification: theory and evidence. *Strategic Management Journal* **12**(1): 33–48.
- Clement JP, McCue MJ, Luke RD, Bramble JD, Rossiter LF, Ozcan YA, Pai C. 1997. Strategic hospital alliances: impact on financial performance. *Health Affairs* **16**: 193–203.
- Cohen WM, Levinthal D. 1990. Absorptive capacity: a new perspective on learning and innovation. *Administrative Science Quarterly* **35**: 128–152.
- Collis DJ, Montgomery CA. 1995. Competing on resources: strategy in the 1990s. *Harvard Business Review* **73**(4): 118–128.
- Conner KR. 1991. A historical comparison of resource based theory and five schools of thought within industrial organization economics: do we have a new theory of the firm? *Journal of Management* **17**: 121–154.
- Connor RA, Feldman RD, Dowd B. 1998. The effects of market concentration and hospital mergers on hospital costs and prices. *International Journal of the Economics of Business* **5**: 159–180.
- Cyert RM, March JG. 1963. *A Behavioral Theory of the Firm*. Prentice-Hall: Englewood Cliffs, NJ.
- Dierickx I, Cool K. 1989. Asset stock accumulation and sustainability of competitive advantage. *Management Science* **35**: 1504–1511.
- DiMaggio PJ, Powell WW. 1983. The iron cage revisited: institutional isomorphisms and collective rationality in organizational fields. *American Sociological Review* **48**: 147–160.
- Dranove D. 1988. Pricing by nonprofit institutions: the case of hospital cost shifting. *Journal of Health Economics* **7**: 47–57.
- Dranove D. 1998. Economies of scale in non-revenue producing cost centers: implications for hospital mergers. *Journal of Health Economics* **17**: 69–83.
- Dranove D, Cone K. 1984. Do state rate setting regulations really lower hospital expenses? *Journal of Health Economics* **4**: 159–165.
- Dranove D, Ludwick R. 1999. Competition and pricing by nonprofit hospitals: a reassessment of Lynk's analysis. *Journal of Health Economics* **18**: 87–99.
- Dranove D, Shanley M. 1995. Cost reduction or reputation enhancement as motives for mergers: the logic of multihospital systems. *Strategic Management Journal* **16**(1): 55–74.
- Dranove D, Shanley M, White W. 1993. Price and competition in hospital markets: the switch from patient-driven to payer-driven competition. *Journal of Law and Economics* **36**: 179–204.
- Edwards JR. 1995. Alternatives to difference scores as dependent variables in the study of congruence in organizational research. *Organizational Behavior and Human Decision Processes* **64**: 307–324.
- Elixhauser A, Duffy SQ, Sommers JP. 1996. *Most Frequent Diagnoses and Procedures for DRGs, by Insurance Status*. Agency for Health Care Policy and Research, publication no. 97-0006.
- Friedman E. 1996. A matter of value: profits and losses in healthcare. *Health Progress* **77**(3): 28–34.
- Gaynor M, Vogt WB. 2000. Antitrust and competition. In *Handbook of Health Economics*, Culyer AJ, Newhouse JP (eds). North-Holland: Amsterdam; 1405–1478.
- Gilbert RA. 1995. Responding to structural change: a call for a review of the competitive consequences of hospital mergers. Comments before the Federal Trade Commission hearings on global competition policy, November 14, 1995.
- Ginsberg A, Buchholtz A. 1990. Converting to for-profit status: corporate responsiveness to radical change. *Academy of Management Journal* **33**: 445–477.
- Goldsmith J. 1998. Three predictable crises in the health care system and what to do with them. *Healthcare Forum Journal* November: 42–46.
- Goodstein J, Boeker W. 1991. Turbulence at the top: a new perspective on governance structure changes and strategic change. *Academy of Management Journal* **34**: 306–330.

- Grant RM. 1991. The resource-based theory of competitive advantage: implications for strategy formulation. *California Management Review* **33**: 114–135.
- Greene WH. 2000. *Econometric Analysis* (4th edn). Prentice-Hall: Englewood Cliffs, NJ.
- Gruca TS, Nath D. 1994. Regulatory change and constraints on adaptation and organizational failure: an empirical analysis of acute care hospitals. *Strategic Management Journal* **15**(5): 345–363.
- Hall R. 1992. The strategic analysis of intangible resources. *Strategic Management Journal* **13**(2): 135–144.
- Hannan E, O'Donnel JF, Kilburn H, Bernard HR, Yazici A. 1989. Investigation of the relationship between volume and mortality for surgical procedures performed in New York State hospitals. *Journal of the American Medical Association* **262**: 503–510.
- Helfat CE. 1997. Know-how and asset complementarity and dynamic capability accumulation: the case of R&D. *Strategic Management Journal* **18**(5): 339–360.
- Howe PJ. 1999. Merger of Exxon Mobil okayed. *Boston Globe*, December 1: C7.
- Hughes RG, Garnick DW, Luft HS, McPhee SJ, Hunt SS. 1988. Hospital volume and patient outcomes: the case of hip fractures. *Medical Care* **26**: 1057–1061.
- Jaspens B. 1998. An off year for consolidations. *Modern Healthcare* **28**: 40–48.
- Karim S, Mitchell W. 2000. Path-dependent and path-breaking change: reconfiguring business resources following acquisitions in the U.S. medical sector, 1978–1995. *Strategic Management Journal*, Special Issue **21**(10–11): 1061–1081.
- Keeler EB, Melnick G, Zwanziger J. 1999. The changing effects of competition on non-profit and for-profit hospital pricing behavior. *Journal of Health Economics* **18**: 69–86.
- Kennedy P. 1998. *A Guide to Econometrics* (4th edn). MIT Press: Cambridge, MA.
- Khanna, M, Damon LA. 1999. EPAs voluntary 33/50 program: impact on toxic releases and economic performance of firms. *Journal of Environmental Economics and Management* **37**: 1–25.
- Krishnan R. 2001. Market restructuring and pricing in the hospital industry. *Journal of Health Economics* **20**(2): 213–237.
- Langland-Orban B, Gapenski LC, Vogel B. 1996. Differences in characteristics of hospitals with sustained high and sustained low profitability. *Hospitals and Health Services Administration* **41**: 385–399.
- Lee L, Trost RP. 1978. Estimation of some limited dependent variable models with application to housing demand. *Journal of Econometrics* **8**: 357–382.
- Lubatkin M, O'Neill H. 1988. Merger strategies, economic cycles, and shareholder value. *Interfaces* **18**: 65–71.
- Luft HS, Bunker JP, Enthoven AC. 1979. Should operations be regionalized? The empirical relationship between surgical volume and mortality. *New England Journal of Medicine* **301**: 1364–1369.
- Luft HS, Robinson JC, Garnick DW, Maerki SC, McPhee SJ. 1986. The role of specialized clinical services in competition among hospitals. *Inquiry* **23**: 83–94.
- Lynk WJ. 1995. Nonprofit mergers and the exercise of market power. *Journal of Law and Economics* **38**: 437–461.
- Mahoney JT, Pandian JR. 1992. The resource-based view within the conversation of strategic management. *Strategic Management Journal* **13**(5): 363–380.
- Makuc DM, Haglund B, Ingram DD, Kleinman JC. 1991. *Vital and Health Statistics: Health Service Areas for the United States* DHHS publication no. (PHS) 92–1386; National Center for Health Statistics; Series 2, no 112, Centers for Disease Control.
- Martin S. 1998. *Advanced Industrial Economics*. Blackwell: Malden, MA.
- Mechanic D. 1994. Managed care: rhetoric and realities. *Inquiry* **31**: 124–128.
- Melendez MM. 1997. Changing the prescription: Lorain county's oldest hospital shuts emergency room doors in Health Partners consolidation. *The Plain Dealer*, October 16: 1B.
- Meyer JW, Rowan B. 1977. Institutionalized organizations: formal structure as myth and ceremony. *American Journal of Sociology* **83**: 340–363.
- Mitchell W, Dussauge P, Garrette B. 1999. Creating and protecting resources: scale and link alliances between competitors in telecom-electronics industry and other sectors. Working paper, University of Michigan.
- Nelson RR, Winter SG. 1977. In search of useful theory of innovation. *Research Policy* **6**: 36–76.
- Nelson RR, Winter SG. 1982. *An Evolutionary Theory of Economic Change*. Belknap Press: Cambridge, MA.
- Newhouse J. 1989. Do unprofitable patients face access problems? *Health Care Financing Review* **11**: 33–42.
- Nichols LM. 1999. What price health quality? *USA Today*, January 19: 50–51.
- North DC. 1990. *Institutions, Institutional Change and Economic Performance*. Cambridge University Press: Cambridge, UK.
- Norton EC, Staiger DO. 1994. How hospital ownership affects access to care for the uninsured. *RAND Journal of Economics* **25**: 171–176.
- O'Hare PK. 1997. Not-for-profit status facilitates hospital merger. *Healthcare Financial Management* **51**(10): 37–38.
- Oliver C. 1997. Sustainable competitive advantage: combining institutional and resource based views. *Strategic Management Journal* **18**(9): 697–713.
- Penrose E. 1959. *The Theory of the Growth of the Firm*. Wiley: New York.
- Priem RL, Butler JE. 2001. Is the resource based 'view' a useful perspective for strategic management research? *Academy of Management Review* **26**(1): 22–40.
- Ramaswamy K. 1997. The performance impact of strategic similarity in horizontal mergers: evidence from the U.S. banking industry. *Academy of Management Journal* **40**(3): 697–716.
- Ravenscraft DJ, Scherer FM. 1987. *Mergers, Sell-offs, and Economic Efficiency*. Brookings Institution: Washington, DC.

- Robinson JC, Phibbs CS. 1989. An evaluation of Medicaid selective contracting in California. *Journal of Health Economics* **8**: 437–455.
- Rose-Ackerman S. 1996. Altruism, nonprofits and economic theory. *Journal of Economic Literature* **34**: 701–708.
- Salter M, Weinhold W. 1979. *Diversification by Acquisition*. Free Press: New York.
- Schmalensee RC. 1977. Using the H-index of concentration with published data. *Review of Economics and Statistics* **59**(2): 186–193.
- Schoen C, DesRoches C. 2000. Uninsured and unstably insured: the importance of continuous insurance coverage. *Health Services Research* **35**(1): 187–206.
- Scott WR. 2001. *Institutions and Organizations* (2nd edn). Sage: Thousand Oaks, CA.
- Scott WR, Meyer JW. 1983. The organization of societal sectors. In *Organizational Environments: Ritual and Rationality*, Meyer JW, Scott WR (eds). Sage: Beverly Hills, CA; 129–153.
- Scott WR, Ruff M, Mendel PJ, Caronna CA. 2000. *Institutional Change and Healthcare Organizations: From Professional Dominance to Managed Care*. University of Chicago Press: Chicago, IL.
- Seth A. 1990. Value creation in acquisitions: a reexamination of performance issues. *Strategic Management Journal* **11**(2): 99–115.
- Showstack JA, Rosenfeld KE, Garnick DW, Luft HS, Schaffarzick RW, Fowles J. 1987. Association of volume with outcome of coronary bypass graft surgery: scheduled versus unscheduled operations. *Journal of the American Medical Association* **257**–285.
- Simon HA. 1945. *Administrative Behavior*. Macmillan: New York.
- Singh H, Montgomery C. 1987. Corporate acquisition and economic performance. *Strategic Management Journal* **8**(4): 377–386.
- Sirover ML. 1997. *The Synergy Trap: How Companies Lose the Acquisition Game*. Free Press: New York.
- Thorpe KE. 1997. The health system in transition: care, cost and coverage. *Journal of Health Politics, Policy and Law* **22**(2): 339–361.
- Weinstock DS. 1982. Using the Herfindahl index to measure concentration. *Antitrust Bulletin* **27**: 285–301.
- Wernerfelt B. 1984. A resource-based view of the firm. *Strategic Management Journal* **5**(2): 171–180.
- Williamson OE. 1999. Strategy research: governance and competence perspectives. *Strategic Management Journal* **20**(12): 1087–1108.
- Winslow R. 1998. Healthcare inflation revives in Minnesota despite cost cutting. *Wall Street Journal* May 19: A1.
- Zwanziger J, Melnick GA, Simpson L. 1996. Differentiation and specialization in the California hospital industry: 1983 to 1988. *Medical Care* **34**: 361–372.