The Influence of Ownership on Incentives to Outsource: An Empirical Analysis

Ramji Balakrishnan*
University of Iowa
Ramji-balakrishnan@uiowa.edu

Leslie Eldenburg
University of Arizona
eldenbur@u.arizona.edu

Ranjani Krishnan
Michigan State University
krishn15@msu.edu

Naomi Soderstrom*
University of Colorado at Boulder
Naomi.Soderstrom@colorado.edu

*Corresponding author

We thank Kenny Kwong from California's OSHPD and workshop participants at Rice University and Georgia State University.

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Abstract

Literature in accounting, economics, and strategy has identified several factors that drive firms' decisions to outsource including the cost implications, risk, potential for hold-up, quality, and an assessment of key competencies. This paper adds to this literature by exploring variations in the outsourcing decision associated with differences in ownership. Governance, incentives, and the types of institutional constraints faced by the firm are all affected by ownership. Therefore, ownership is likely to influence major decisions such as outsourcing. We examine the effects of ownership form on firms' outsourcing decisions in response to competitive and financial pressures.

Using panel data from hospitals, we explore outsourcing of non-clinical and clinical services, as well as financial implications of outsourcing. We find differences in the extent of outsourcing and the types of services outsourced as a function of ownership. In addition, we find different effects on ROA for outsourcing clinical versus non-clinical services. These differences are consistent with differences in objectives and constraints faced by each ownership type.

1. INTRODUCTION

Outsourcing is the contracting of any service or activity to a third party (Drtina 1994; McHugh *et al.* 1995). The last two decades have seen an explosion in outsourcing both in the public and the private sectors (see, e.g., Feenstra 1998 for an overview). While initially restricted to manufacturing operations, outsourcing today encompasses virtually all functions (Chalos 1995). Not surprisingly, this activity has drawn considerable academic interest, with attention focused on factors that motivate a firm to outsource (Grossman and Helpman 2002a, b) and the impact of outsourcing on productivity and profit (Calabrese and Erbetta 2004; Das and Teng 2001; Gorzig and Stephan 2002; Kimura 2002).[1]

Researchers from multiple disciplines have examined the factors that drive firms to outsource, as well the risks and benefits of outsourcing. These factors include production cost advantages, dependability of suppliers, quality, potential for hold-up problems, transaction costs, the impact of outsourcing on the competitive situation of rival-suppliers (Coles and Hesterly 1998; Fürst and Melumad 1999), task complexity (Anderson, Glenn, and Sedatole 2000), and a need to focus on core competencies (e.g. Hamel and Prahalad 1994). We contribute to this literature in the following ways. First, we introduce ownership structure and the consequent variations in managerial incentives as an important factor in explaining the extent of outsourcing in response to external pressures. Second, because organizational characteristics influence ability to coordinate and control the outsourced function, we examine the effect of ownership on financial benefits from outsourcing strategies. Finally, we study outsourcing in an economically important setting: acute-care hospitals.

[1]A distinct branch of the literature (e.g., Deardorff 2001; Kohler 2001; Egger and Egger 2001) examines outsourcing from the perspective of international trade, focusing attention on factors that determine global outsourcing patterns and relative wage levels.

Hospitals provide a natural setting in which to conduct our investigation because of their long history of outsourcing a wide range of business functions, such as information technology, laundry, cafeteria, transcription, janitorial, document storage, and pharmacy. Use of agency nurses, contracted via a third party, is also well established. More recently, hospitals have begun to contract out core and other medical services such as anesthesiology and radiology. In addition, U.S. hospitals file publicly available cost reports, which allow analysis of a time-series of multiple types of outsourcing behavior.

Hospitals outsource for many reasons including cost efficiencies, scope of services expansion, and to focus on core competencies. Environmental pressures likely affect both the cost reduction opportunities offered by outsourcing, and hospitals' abilities to increase scope without committing capital. We explore hospitals' use of outsourcing to respond to two important pressures: the percent of managed care penetration and competitive intensity.

Managed care now accounts for 30% to 70% of hospital revenues (Abbot and Keller 2006). Managed care organizations such as health maintenance organizations (HMOs) and preferred provider organizations (PPOs) employ capitated reimbursement schemes that limit payments received by the hospital and physicians. In addition, managed care plans contract selectively with hospitals, based on prices. This exposes hospitals to the risk of cost over-runs.

As the proportion of patients covered by managed care plans increases, hospitals are likely to reduce costs by relying on external vendors. Entering into fixed fee contracts with vendors enables hospitals to reduce their exposure by shifting some of the cost risk. In addition, when revenues are capitated, outsourcing provides an opportunity for the hospital to provide a service without a capital investment. Thus, the cost structure of the outsourcing hospital has

more variable costs compared to fixed costs, which makes the hospital less vulnerable to demand fluctuations.

Intensifying competition could also spur outsourcing. Greater competition increases the struggle for patient volumes, enhancing hospital incentives to reduce costs relative to competitors. Dranove *et al.* (1993) and Keeler *et al.* (1999) show that hospital markets during the post-1990 period conform to traditional principles of industrial economics (Schmalensee 1989), whereby intensity of competition plays a significant role in reducing costs.

Intensity of competition also encourages hospitals to use outsourcing to expand the breadth of professional services offered. This kind of outsourcing might occur even though the cost per unit of the outsourced service is *higher* than the cost of an in-sourced unit. Real options theory could explain this seemingly paradoxical behavior. This theory predicts that managers increase their decision-making flexibility by considering all options (Philippe 2005), including the option to outsource instead of investing in capital assets. For example, a hospital could offer lithotripsy (a kidney stone removal process using laser technology) without concerns about the size of investment or levels of patient demand.

Our key contribution is to show that ownership structure triggers variation in the nature and extent of outsourcing by hospitals. Relative to for-profit hospitals, managers in government and nonprofit hospitals face fewer short-term penalties for poor financial performance because they have access to subsidies. For these managers, pressures related to maintaining local jobs and providing universal access to high-quality healthcare dominate financial incentives to outsource. This variation in incentives also should affect the kind of services outsourced. For example, managers of government hospitals have greater constraints on terminating employees and hence, they should be less likely to outsource. In addition, county hospitals have soft budget constraints,

whereby any surplus they generate by outsourcing accrues to the county. This reduces their incentives to decrease costs by outsourcing. Similarly, non-profit hospitals typically offer more breadth of services, and hence have a lesser need to outsource to increase breadth.

Finally, ownership could affect the association between outsourcing and financial performance. In some ways, outsourcing imposes a higher level of risk, relative to 'in-house' activities, because cooperation is required with partners who have different objectives. Thus, there is potential for opportunistic exploitation of relationship-specific investments (Klein, Crawford, and Alchian 1978). Because of their greater reliance on bureaucratic controls, government and nonprofit hospitals might be disadvantaged in dealing with such unstructured and novel contracting environments. Poor controls might lead, in turn, to outsourcing not having the desired profit impact.

We analyze a sample of 316 acute care hospitals in California from 2001 until 2003. We measure outsourcing as the proportion of purchased services cost to total cost. We measure profitability as ROA. We find that increased managed care pressure is associated with increases in outsourcing by both nonprofit and for-profit hospitals, but is not associated with outsourcing in government owned hospitals. In contrast, competitive pressures are associated with outsourcing only in for-profit hospitals. Differences in behavior appear to stem from the motivation for outsourcing clinical services. While for-profit hospitals outsource clinical services in response to competitive concerns, nonprofits appear to outsource in response to cost pressure. Finally, consistent with mixed results in the literature, overall, outsourcing does not appear to affect profitability in any hospital type. In for-profit hospitals however, non-clinical outsourcing is associated with an increase in profitability, while clinical outsourcing is associated with a decrease in profitability.

We organize the rest of this paper as follows. In section 2, we develop the theory and hypotheses. Section 3 describes the setting, data and empirical models. In section 4, we report results. Section 5 contains concluding comments.

2. THEORY AND HYPOTHESES

Organizations respond to external pressures that threaten continued viability in a number of different ways. While cost reduction is always an objective, when the risk of failure increases, cost reduction becomes even more critical. In the hospital industry, the change in reimbursement systems from cost-plus to fixed fee for both public and private insurance patients during the 1980s and 1990s increased the risk of failure by imposing the risk of cost overruns on the hospital, while at the same time placing downward pressures on revenues. One of the effects of the change in reimbursement environment was that the basis of competition in the hospital industry shifted from quality to cost (Dranove, Shanley, and White 1995, Krishnan 2006).

Hospitals developed a variety of strategies in response to the increased risk and changes in the basis of competition. One response was to merge hospitals. Mergers benefited the hospitals in several ways. First, they provided an opportunity for the merging hospitals to enjoy lowered costs associated with economies of scale and scope (Dranove 1998). Second, mergers increased the hospital's market power, which allowed these hospitals to negotiate higher prices with insurance companies (Krishnan 1999). Third, the mergers afforded an opportunity for hospitals to reconfigure their product-mix and increase their share of profitable services (Krishnan et al. 2004).

Hospitals also responded to the changed environment by analyzing their operations with the objective to reduce cost and improve cash flow. Prior research shows that hospitals' investments in accounting systems increased after the change to fixed-pay reimbursement

systems (Krishnan 2006). In addition, hospitals re-engineered their processes, albeit with mixed results. For example, a 1994 Hay Hospital Compensation Survey found that 55% of the hospitals surveyed were actively involved in reengineering initiatives, with 8% having completed reengineering (Pierson 1994). Hospitals also focused on making the revenue cycle more efficient. As a result, average days in receivables decreased significantly, from 66.9 to 62.8 days (Jaklevic 2000).

Another improvement strategy explored by hospitals was outsourcing. Hospital spending on outsourcing rose 20% from 1999 to 2000. Healthcare organizations were spending about 22% of their budgets on outsourcing relative to 33% in general industry (Healthcare Financial Management, 2000). Outsourcing has continued to grow in healthcare, with the top 20 outsourcing companies reporting an increase of 12% between 2003 and 2004 for their healthcare clients (Moon 2004). Food-service, housekeeping and laundry contracts increased 17%, in part because these services were packaged together and with others to improve efficiency and cut costs (Moon 2004).

Outsourcing has several advantages for hospitals. First, it offers hospitals an opportunity to save costs, because a specialized vendor may benefit from economies of scale and offer lower prices than the hospital could achieve in-house. Second, hospitals do not have to replenish their investments in infrastructure and technology and thus can reduce committed costs. Third, hospitals do not have to invest in employee training. Finally, the risk of demand and cost fluctuations can be at least partially transferred to the vendor, who pools contracts from a number of hospitals to reduce risk. Indeed, many hospitals experienced an increase quality of these services through outsourcing (Moon 2004).

Hospitals located in markets with greater managed care presence face more intense pressures to reduce costs. For example, Blue Shield, which is one of the largest California managed care insurers (3.3 million enrollment), categorizes hospitals based on cost into several tiers and sets co-payments for hospitals from the organizations' preferred tier (low-cost providers) at lower levels than for hospitals from the other tiers (Robinson, 2003). Another major insurer, Blue Cross uses aggressive negotiations on rates (Robinson, 2003) and has used patient deductibles and co-payments to provide incentives for patients to use preferred (low cost) providers.

There is evidence that hospitals have responded to these pressures: over the period 1983-1994, Robinson (1996) shows that hospital expenditures in locations with high managed care presence grew 44% slower than in other locations. In their literature review, Miller and Luft (1994) document a significantly shorter length of stay for managed care enrollees, as well as a reduction in the use of tests and procedures.

Thus, managed care significantly increases pressures to lower costs. While hospitals could achieve cost containment in several different ways, one response is to outsource. In the following hypothesis, we predict that hospitals with greater managed care pressure outsource to a greater extent (all hypotheses in alternate form).

H1A: The proportion of managed care in the hospital's patient mix is positively associated with the amount of outsourcing by the hospital.

While managed care places pressures on hospitals to reduce costs, competition is another important factor that influences both costs and revenues. Competition places a downward pressure on prices and margins, hence increasing the incentives for companies to cut costs (Schmalensee 1989, Weiss 1989). Consistent with this, prior research has shown that hospitals located in markets with greater competition have lower margins (Dranove, Shanley and White

1993), as well as lower costs, and lower revenues. Using data from California hospitals, Lee, Melnick, and Myrtle (2005) find that the growth rate in total operating expenses and total net revenues was lower for hospitals located in more competitive markets.

Competition among hospitals imposes a downward pressure on prices especially in the presence of selective contracting. Under the cost-plus reimbursement regime, demand for hospital services for insured patients was relatively price inelastic. However, under the selective contracting system used by managed care companies, a hospital with higher prices relative to rivals in the same market faces the risk of losing contracts to these rivals. Thus the demand curve for hospital services is more price-elastic under selective contracting, and the intensity of competition increases the price elasticity of demand for individual hospitals (Zwanziger and Melnick 1988).

For a hospital located in a competitive market, attracting physicians and patients is even more critical to ensure sufficient patient volumes. At the same time, such hospitals may avoid investing in fixed assets because of high risk in achieving break-even volumes. Under such circumstances, hospitals can outsource some of their clinical services to attract physicians and their patients who need a full range of specialized services or newer break-through technology. Hospitals can also use outsourcing when new technology is developed and hospitals want to “test the waters” to determine whether the option is profitable.

Outsourcing thus offers several advantages for hospitals located in more competitive markets. First, contract can be written so that the hospital pays per patient service, resulting in a variable cost that greatly reduces any risk of loss. Second, outsourcing acts as a real option, allowing hospitals to collect information about the profitability of new technology or services without direct investments. Third, outsourcing clinical services helps hospitals expand their

scope of services without commensurate financial investment, thereby increasing competitive advantage.[2] Prior research indicates that physicians prefer hospitals with better clinical and ancillary facilities (Robinson and Luft 1985).

An additional advantage of outsourcing is the ability to increase quality of services offered. Although the hospital industry has moved from competing on quality to competing on the basis of cost, quality continues to be a critical constraint and an important factor in attracting patients in competitive markets. Therefore the quality of patient-related services such as food, laundry, and housekeeping become a competitive factor. Outsourcing of such support services is often used to improve the quality of those services. For example, hospitals contract with vendors to offer patients more choices in diet-appropriate foods and in the times that food is served (Moon 2004).

We hypothesize the following.

H1B: Higher levels of competition are associated with a higher degree of outsourcing.

2.1 Variations in Ownership and Incentives

Prior research has not explored the effect of ownership on hospital outsourcing decisions. We identify three broad ownership groups in our sample: for-profit, nonprofit, and government owned hospitals. For-profit hospitals are owned by investor organizations and other for-profit partnerships. Examples include Quorum and HCA. Nonprofit hospitals include those governed by universities, the community, or religious organizations. Examples include Scripps Healthcare and Catholic Healthcare West. Government hospitals include those owned by counties,

[2] Empirical studies in other industries have found a positive association between competition and the incentives to outsource (Cachon and Harker 2002). For example, Abraham and Taylor (1966) and Helper (1991) characterize outsourcing as an organizational response to cost pressures that could arise from increased competition and /or profit pressures created by costs growing at a faster rate than revenues. Abraham and Taylor (1996) find a positive association between competitive pressures and outsourcing in a number U.S. firms, and Helper (1991) finds a dramatic increase in outsourcing by the U.S. automobile industry in response to competitive pressures.

municipalities, and cities, with Alameda County Hospital and San Francisco General Hospital being prominent examples. Government hospitals also include district hospitals. These organizations have publicly elected governance boards and operations are tax subsidized, although tax subsidies comprise only 5% to 8% of the cost of operations. These hospitals tend to be small, rural hospitals. Examples of district hospitals include Tulare District Hospital located in Tulare, California (population about 50,000), and Mendocino Coast District Hospital in Fort Bragg (population 7,000).

For-profit hospitals correspond well to the traditional economic view of an entity, and their objective functions emphasize increasing shareholder or other owners' value (Gray 1986). Indeed, many for-profit hospitals link top management pay to financial performance (Brickley and Van Horn 2002, Roomkin and Weisbrod 1999). Faced with profit pressure, managers in for-profit organizations are most likely to experiment with alternative profit-creating strategies, making these firms more nimble in their response to changing environmental conditions. In addition, because they have fewer institutional pressures from their communities and government regulatory agencies, for-profits can seek to increase profits via more aggressive and novel outsourcing of clinical and ancillary services. From a theoretical perspective, institutional theory (Meyer and Rowan 1977) classifies organizations in a continuum anchored by technical environments at one end and institutional environments at the other end. Success for organizations in technical environments depends on efficient coordination of resources. In contrast, conformity to externally defined requirements determines success for organizations in institutional environments. Based on their objective functions, governance, and the level of community support, for-profits are more likely to be at the technical end of the continuum. Thus, they likely have the fewest institutional constraints on reconfiguring their services in-house

versus approaching the market for outsourcing. Further, when it comes to patients reimbursed by government programs, these hospitals are able to identify the more profitable patients, leaving the less profitable patients to the other hospital types (Duggan 2000). Thus, these hospitals are more flexible in responding to external stimuli that change operating risk.

Government hospitals lie at the other end of the spectrum. These organizations operate in constrained institutional environments and have a more complex set of objectives than for-profits, such as serving the indigent population, providing community-based health education programs, and outreach. For example, the government hospitals in our sample provide charity care levels that reflect about 27% of their gross charges. (Corresponding numbers are 16% for for-profits and 22% for nonprofit hospitals.) These social objectives, likely shared by managers of these organizations, weaken the power of financial incentives (Tirole 1994). In addition, government hospitals have structural factors such as location (they tend to be located in poorer areas), and governance (e.g., they frequently have elected supervisors) that constrain their acceptable set of responses. Because of the complexity of their objective functions, institutional constraints, and differences in governance, these hospitals rarely use incentive contracting with top managers (Eldenburg and Krishnan 2003). Moreover, government hospitals are subject to soft budget constraints, meaning that a governing agency might bail out a hospital with poor performance but also may appropriate any surplus (Duggan 2000). Government hospitals in our sample receive relatively large subsidies, comprising on average 12.85% of their gross revenues. (Corresponding numbers are 1.33% and 0.68% in for-profit and nonprofit hospitals.) Finally, government-owned hospitals are arguably less responsive to market-driven financial pressures, because both politics and economics affect funding from legislatures and other agencies.

Nonprofit hospitals exhibit characteristics of both for-profit and government-owned hospitals. Their mission statements often articulate social objectives; profit is not the only or perhaps even the primary driver of managerial actions. However, these (or their sponsoring charities) are self-sustaining organizations and can rarely rely on subsidies for operations. Overall, because nonprofits have greater reliance on community support relative to for-profits, but lower access to subsidies relative to government hospitals, they likely fall in the middle of the continuum proposed by institutional theory. Over the last several years, nonprofit hospitals have begun to use compensation contracts that link pay to performance to encourage managers to exert effort on cost reduction and revenue enhancement (Lambert and Larcker 1995; Eldenburg and Krishnan 2006). Empirical research demonstrates that because of increases in incentive contracting, nonprofit managers now act more like managers of for-profit hospitals (Leone and Van Horn 1999). Further, for the most part, they cannot rely on donors to support on-going operations; revenue from operations must fund these costs. Donations to nonprofits in our sample comprise 0.09% of gross revenues, whereas they are 0.89% for government hospitals and 0.04% in for-profits.

Drawing on these arguments, we expect ownership, with its attendant influence on managerial incentives, to be associated with the degree and type of outsourcing. The relations among our hypotheses are shown in Figure 1. We hypothesize that managerial incentives (measured as ownership) affect organizational responses to environmental pressures imposed by managed care. In particular, we expect government hospitals to be less responsive to these operating risks, as these organizations have muted incentives associated with profit. Relative to government hospitals, we expect for-profit hospitals and nonprofit hospitals to exhibit an incrementally positive association.

H2: Compared to government hospitals, the relation between managed care proportion and the decision to outsource will be more positive in for-profit and nonprofit hospitals

We next turn to the interaction between competition and ownership on the decision to outsource. Increased competition intensifies pressure to reduce costs in a manner similar to the pressures imposed by managed care. In addition, hospitals that wish to increase their breadth of services in response to increased competition may choose to outsource rather than purchase costly capital assets and provide the service in-house. The outsourcing strategy provides a real option because it is an opportunity to gain experience in the market and technology without investing in assets.[3] The real option of outsourcing instead of purchasing is unlikely to be attractive to government hospitals because they can ask their supervising agencies or taxpayers (through bonds or tax levies) for funds to purchase new technology. In contrast, for-profit and nonprofit hospitals are likely to view this type of outsourcing as a practical alternative when they consider new services to add to their product lines. Moreover, we expect for-profit and nonprofit hospitals to be more agile than government hospitals in responding to competition with respect to product offerings and pricing strategies. We conjecture:

H3: Compared to government hospitals, the relation between competition and the decision to outsource will be more positive in for-profit and nonprofit hospitals.

2.2 Kinds of Services Outsourced

In the previous section, we examined how environmental pressures drive *overall* level of outsourcing by hospitals. In this section, we examine how these pressures affect the *types* of services outsourced. We broadly divide hospital services into clinical (e.g., acute care, radiology, laboratory) and non-clinical services (e.g., janitorial, accounts receivable, laundry). Non-clinical services are obvious candidates for outsourcing in response to cost pressures imposed by

[3] Sick (1995 p. 631) broadly defines a real option as "the flexibility a manager has for making decisions about real assets" and Philippe (2005) suggests that real options include the option to delay an investment or to exchange one kind of input for another.

managed care because they do not constitute a hospital's core competency nor do they support positioning in the product market. Moreover, these services are widely available on a stand-alone basis. Thus, we expect cost-pressure driven outsourcing to be most prominent in non-clinical services. In contrast, we expect that competitive pressures will affect both clinical and non-clinical outsourcing. Facing increased competition, a hospital is likely to be interested in outsourcing non-clinical services to reduce cost by exploiting suppliers' economies of scale. In addition, to attract physicians and contracts from insurance companies, hospitals located in markets with greater competition will use outsourcing of clinical services to expand product offerings, as well as to improve their quality by seeking a reliable supplier. For example, consistent with our earlier discussion pertaining to real options, a hospital could offer advanced imaging or procedures that it does not currently provide.

H4A: The proportion of managed care is positively related to outsourcing of non-clinical services.
H4B: Competition is positively related to outsourcing of non-clinical services.
H4C: Competition is positively related to outsourcing of clinical services.

We next ask if outsourcing of clinical and non-clinical services varies according to ownership. Differences might arise because expanding clinical services is more complex than requesting a bid for non-clinical services such as the cafeteria. Outsourced clinical services must mesh with the hospital's core medical function to provide required care. Contracting arrangements must also consider confidentiality, since the hospital manages patient information and billing. Because of their expertise in the underlying technology outsourced, conflicting financial interests from practicing physicians are also more likely in clinical services. Thus, because of hospital fiduciary responsibilities, we expect these contracting accommodations to be more costly to government hospitals.

H4D: For clinical services, for-profit hospitals and nonprofit hospitals will exhibit a more positive association between outsourcing levels and competitive pressures than will government hospitals.

2.3 Outsourcing and Profitability

Prior research examining the relation between outsourcing and profitability provides mixed results. Lacity, Willcocks, and Feeny (1996) found that as decision-makers analyzed options to outsource, they tended to overestimate cost savings and underestimate transaction costs. Gorzig and Stephan (2002) compared a group of German firms that outsourced with a group that did not outsource and found poorer performance among the organizations that outsourced. Kimura (2002) found that profits in Japanese firms that outsource are no higher than in firms that do not outsource.

Although this prior research does not find large benefits for organizations that outsource, there is evidence that the relation between outsourcing and performance may be moderated by the firm's strategy. Gilley and Rasheed (2000) use data from a survey of 31 manufacturing firms and find that although there is no direct effect of outsourcing on performance, there is an indirect effect via firm strategy: they found a positive relation between outsourcing and performance only for firms that were pursuing a cost leadership strategy.

We believe that our setting provides an opportunity to further investigate the relation between outsourcing and performance. Because hospitals have had many years of prior experience outsourcing resources such as nursing labor, they may be better able to identify and analyze the costs and benefits of outsourcing. In addition, we can partition effects by ownership and conduct separate analysis for clinical and non-clinical services. Although we do not have information on hospital strategy, we expect that for-profit hospitals will have greater emphasis on cost because their objective functions primarily emphasize profits. Hence, consistent with

Gilley and Rasheed (2000), we expect for-profit hospitals to be most successful at outsourcing. We also expect that performance benefits of outsourcing are more likely in outsourcing of non-clinical services, because cost is the primary motivation driving this type of outsourcing.

We also expect nonprofit hospitals to experience greater success with outsourcing relative to government organizations because they have fewer constraints in seeking profitable contracts. However, nonprofit hospitals have more dimensions in their objective functions and outsourcing may not result in the same level of financial success as in for-profits. Similarly because of their public service orientation, we do not expect to find a relation between performance and outsourcing in these hospitals. Because these analyses are exploratory, we do not formally state them in hypothesis form.

We also explore the relation between ROA and the proportion of clinical and non-clinical services outsourced. Our objective here is to examine whether outsourcing of non-clinical services is more profitable for hospitals. These services are not hospitals' core competencies and could be outsourced to low cost suppliers. Alternatively, clinical services, are core competencies and outsourcing them imposes a risk. Therefore hospitals must consider factors other than cost (such as quality). This likely reduces the profitability of outsourcing clinical services. We also explore the interaction between ownership and clinical versus non-clinical services to examine whether ownership has implications for profitability for outsourcing either of these services.

3. DATA AND EMPIRICAL MODELS

We analyze California hospitals because financial and non-financial data are available for a variety of ownership type through the Office of Statewide Health Planning and Development. From the entire set of hospitals, we exclude those belonging to the Kaiser Permanente system because they form part of an integrated HMO system that only admits patients from Kaiser-run

insurance plans. Managed care proportion is, by definition, 100% for these hospitals. We also exclude specialty hospitals such as substance abuse and psychiatric hospitals and those that provide high quantities of long-term nursing care. Production functions and patient mixes for these hospitals are likely quite different from those in acute care general hospitals. We also omit hospital years where the ROA has absolute value greater than 50% because this is likely to be unrepresentative performance.

Our sample period is 2001-2003, which represents the latest years for which data were available when this study was conducted. Prior to 2001, data were not available to measure managed care proportion. Cities, counties, or municipal districts own government hospitals. Nonprofit hospitals include church-owned and community hospitals, registered under IRS 501(c)(3). For-profit hospitals include investor-owned hospitals and those owned by for-profit partnerships and corporations. Overall, our sample consists of 316 hospitals and 872 hospital years.

3.1 Variable Definitions

Outsourcing: We measure this construct as P*ercentage of Total Expenses that are Purchased Services*. Purchased services include the fees paid to outside organizations to provide hospital functions but exclude professional fees such as wages paid to agency nurses. We exclude professional fees because hospitals often employ these resources to augment existing resources when unexpected demand arises.[4] Professional fees comprise only about 1% of total costs. We examine clinical and non-clinical services separately.

Return on Assets: We measure performance as *Return on Assets*, defined as net income divided by total year-end assets.

[4] If professional fees also include fully outsourced services, excluding them would weaken our results.

Cost Pressure: We measure cost pressure as the *Percentage of Revenue from Managed Care*, computed as gross revenue from managed care plans (HMO, PPO, and other managed care plans) divided by hospital gross revenue.

Competition: The Herfindahl-Hirschman Index of competition (*Herfindahl*) is our measure of competitive pressure. We compute *Herfindahl* as the sum of the squared market shares of all firms operating in a particular market, where the market share for an individual hospital is the number of patients it discharges as a percentage of total patients discharged from the market. Based on market definitions from prior studies in health economics (e.g., Frank and Salkever 1991; Lynk 1995) as well as accounting (Krishnan 2006; Lambert and Larcker 1995), we define each county as a separate hospital market.[5] Note that a higher value for the Herfindahl index means lower competition.

Management Firm Dummy: This variable controls for hospitals managed by a management firm. To the extent that these firms manage several hospitals, they may be more likely to outsource services.

Percentage of Revenue from Medicare and MediCal: We control for the proportion of Medicare and MediCal (California Medicaid) patients because these government-sponsored plans pay on a flat-fee or per-diem basis and thus may drive hospital outsourcing decisions. Hofler and Folland (1991) find differences in costs related to proportion of Medicare patients. In addition, Medicare patient proportions have been used in prior hospital performance studies, for example, Zuckerman et al. (1994) and Eldenburg and Krishnan 2003). Robinson and Phibbs

[5] When we use the county as the market definition, we assume that all hospitals in the county experience the same level of competition, regardless of their scope of services. However, our unit of analysis is the hospital and not the service. Our unit of analysis requires a competition measure for an average basket of services that are provided in the market. Additionally, for-profit and nonprofit hospitals consider county hospitals to be major competitors and if we use a market definition that is less aggregated than the county level, competition faced by county hospitals would be understated.

(1989) provide evidence that hospitals with greater proportions of MediCal patients have lower rates of cost inflation.

Average Length of Stay (ALOS): Average length of stay is the average number of days per patient from admission to discharge and is a measure of the average level of resource intensity. This variable also captures severity of illness; a hospital with greater ALOS is likely to have more severely ill patients, which may influence its outsourcing decisions. It also has a significant influence on the operating performance and behavior of hospitals (Lynk 1995).

Bed Size: We control for hospital size by including the number of staffed beds. This variable also controls for the effects of economies of scale, which is likely to influence outsourcing decisions. Prior health care studies have found that hospital size is an important determinant of hospital performance (Robinson and Phibbs 1989; Dranove et al. 1993; Alexander and Lee 1996; Mick and Wise 1996).

Teaching Dummy: We control for teaching status by including a dummy variable that takes the value of 1 if the hospital has an approved residency program and 0 otherwise. Teaching hospitals could be subject to cost pressure because they provide higher levels of charity care. However, they also receive state subsidies for charity care.

Rural Dummy: While rural hospitals face less competitive pressures from the presence of rival hospitals, they tend to include a disproportionately large share of uninsured patients. This influences their performance and decisions. They may also have fewer outsourcing opportunities due to a smaller supply of vendors. We use a dummy variable, *Rural*, to denote hospitals in remote areas. This coding is recorded in the OSHPD data.

Case Mix Index: Case mix index reflects the average complexity of patients treated by the hospital. Every patient who is admitted in a hospital is classified into one of 500 DRGs. Each

DRG has a numeric weight that reflects the average resources consumed for that service relative to the national average resource consumption for all patients. A hospital's average Case Mix Index is computed as the sum of DRG weights divided by the number of patients discharged. Prior research indicates that case mix index influences both revenues and costs (Lee, Melnick, and Myrtle 2005). In addition, case mix index also controls for the average level of complexity of patients treated in the hospital.

Number of Departments: As a further control for scope of operations, we add this variable indicating the number of different departments from which patients are discharged (e.g., coronary, pediatric, neonatal, orthopedic, etc.).

3.2 Empirical Models

Our first tests examine determinants of outsourcing as a function managed care pressures, competitive pressures and ownership. Later analyses examine the types of services outsourced. The final tests examine the association between outsourcing and profitability, by ownership type.

To test H1A and H1B, which examine the total effects of outsourcing, we estimate the following model:

$$\%\ Direct\ Costs\ Outsourced = \alpha + \beta_1(\%\ of\ Revenue\ from\ Managed\ Care) + \beta_2(HHI\ index) + \beta_3(Not\text{-}for\ profit) + \beta_4(For\ profit) + \beta_5(Management\ Firm\ Dummy) + \beta_6(\%\ of\ Revenue\ from\ Medicare) + \beta_7(\%\ of\ Revenue\ from\ MediCal) + \beta_8(Average\ Length\ of\ Stay) + \beta_9(Bedsize) + \beta_{10}(Teaching\ Hospital\ Dummy) + \beta_{11}(Rural\ Dummy) + \beta_{12}(Case\ Mix\ Index) + \beta_{13}(Complexity) + \xi \quad (1)$$

H1A predicts that the total effect of managed care (β_1) will be positive, while H1B predicts that $\beta_2(Herfindahl)$ will be less than 0, because we expect both managed care and competitive pressure to increase outsourcing. We expect the negative sign for competition because a higher index reflects less intense competition.

H2 and H3 require a test of the interactions between managed care and ownership. We use the following model to test these hypotheses:

$$\%\ Direct\ Costs\ Outsourced = \alpha + \beta_1(\%\ of\ Revenue\ from\ Managed\ Care) + \beta_2(HHI\ index) + \beta_3(Not\text{-}for\ profit) + \beta_4(For\ profit) + \beta_5(\%Revenue\ from\ Managed\ Care\ x\ Not\text{-}for\text{-}profit) + \beta_6(\%Revenue\ from\ Managed\ Care\ x\ For\text{-}profit) + \beta_7(HHI\ index\ x\ NP) + \beta_8(HHI\ index\ x\ FP) + Control\ Variables + \xi \quad (2)$$

We expect the interaction terms on ownership and managed care pressure to be positive ($\beta_5, \beta_6 > 0$) because we expect for-profit and nonprofit hospitals to be more responsive to managed care pressures (H2). Similarly, H3 predicts negative coefficients for the interaction terms for competitive pressure ($\beta_7, \beta_8 < 0$).

We next examine the effects of managed care and competitive pressure on the propensity to outsource clinical and non-clinical processes. We estimate the following main effects model:

$$\%\ Non\text{-}Clinical\ Services\ Outsourced = \alpha + \beta_1(\%\ of\ Revenue\ from\ Managed\ Care) + \beta_2(HHI\ index) + \beta_3(Not\text{-}for\ profit) + \beta_4(For\ profit) + Control\ Variables + \xi \quad (3)$$

We use a similar model for examining the effect of clinical services. H4A predicts that $\beta_1 > 0$, while H4B predicts that and $\beta_2 < 0$. H4C predicts that β_2 will continue to be less than *0* when the dependent variable is clinical direct costs.

For testing H4D, we use the following model:

$$Dependent\ variable = \alpha + \beta_1(\%\ of\ Revenue\ from\ Managed\ Care) + \beta_2(HHI\ index) + \beta_3(Not\text{-}for\ profit) + \beta_4(For\ profit) + \beta_5(\%\ of\ Revenue\ from\ Managed\ Care\ x\ NP) + \beta_6(\%\ of\ Revenue\ from\ Managed\ Care\ x\ FP) + \beta_7(HHI\ x\ NP) + \beta_8(HHI\ x\ FP) + Control\ Variables + \xi \quad (4)$$

We expect the interaction terms β_7 and β_8 to be less than 0, i.e., outsourcing in for-profit and nonprofit hospitals in response to competitive pressures will be greater because of the limitations that government hospitals (the base category) face in outsourcing clinical services.

We use the following model to examine the association between outsourcing and profitability (ROA).

$$ROA = \alpha + \beta_1 (\text{not-for profit}) + \beta_2 (\text{For profit}) + \beta_3 (\%\ \text{of Direct Expenses that are Purchased Services}) + \beta_4 (\%\ \text{of Direct Expenses that are Purchased Services x not-for profit}) + \beta_5 (\%\ \text{of Direct Expenses that are Purchased Services x For profit}) + \beta_6 (\%\ \text{of Revenue from Managed Care}) + \beta_7 (\text{HHI index}) + \text{Control Variables} + \xi \quad (5)$$

We expect positive coefficients on the interaction terms, suggesting that the relation between outsourcing and profitability is higher in the case of nonprofit and for-profit hospitals compared to government hospitals.

As mentioned in the previous section, we also explore the relation between ROA and the proportion of clinical and non-clinical services outsourced, for each ownership type. We use the following model:

$$ROA = \alpha + \beta_1 (\text{not-for profit}) + \beta_2 (\text{For profit}) + \beta_3 (\%\ \text{of Clinical Direct Expenses that are Purchased Services}) + \beta_4 (\%\ \text{of Non-Clinical Direct Expenses that are Purchased Services}) + \beta_5 (\%\ \text{of Clinical Direct Expenses that are Purchased Services x NP}) + \beta_6 (\%\ \text{of Non-Clinical Direct Expenses that are Purchased Services x NP}) + \beta_7 (\%\ \text{of Clinical Direct Expenses that are Purchased Services x FP}) + \beta_8 (\%\ \text{of Non-Clinical Direct Expenses that are Purchased Services x FP}) + \beta_9 (\%\ \text{of Revenue from Managed Care}) + \beta_{10} (\text{HHI index}) + \text{Control Variables} + \xi \quad (6)$$

3.3 Tests

Our panel dataset raises concerns regarding heteroscedasticity and sample dependence. We employ Huber-White robust standard errors (Rogers 1993, generalizing White 1980), a maximum-likelihood estimation procedure that assumes and estimates a common component of the variance and co-variance matrix for all observations from the same hospital so that the standard errors are robust to heteroscedasticity and serial correlation (StataCorp 1999, 257).

We also perform diagnostic tests for influential observations and multicollinearity. We estimate all regressions after deleting observations whose values fall below (above) the 1st (99th) percentile of the distribution for the relevant dependent variable. Our inferences are unchanged if

we omit identified influential observations. With regard to multicollinearity, Condition Indices and Variance Inflation Factors are within acceptable limits (Kennedy 1998, 186).

3.4 Descriptive Statistics

Table 1 provides descriptive statistics for hospitals partitioned by ownership type. The majority of the hospitals in our sample are nonprofits (171). Government hospitals are a small, yet significant proportion (57 hospitals). Nonprofit hospitals are larger than the other two types of hospitals and are more likely to be teaching hospitals ($p < 0.10$).

On average, for the entire sample of hospitals, purchased services (excluding professional fees) account for 9.54 percent of costs.[6] The mean proportion of purchased services is significantly lower in government hospitals compared to for-profit and nonprofit hospitals ($p < 0.01$).[7] This pattern seems driven by the outsourcing of non-clinical services; in aggregate, our sample hospitals outsource about 3.10% of clinical services versus 13.48% of non-clinical services. For profit hospitals, in particular, appear to be aggressive in outsourcing non-clinical services (15.9% compared to 13.4% for nonprofits and 10.4% for government hospitals).

The percentage of revenue from managed care is lower in government hospitals compared to the other two hospital types ($p < 0.01$). Because of soft budget constraints, revenue generation appears to be less important in these hospitals (Duggan, 2000). For-profits are located in more competitive markets than are government hospitals ($p < 0.001$). District hospitals, which we categorize as government hospitals because local property taxes subsidize part of their operations, largely serve rural areas of California. As expected, government hospitals have the lowest return on assets. Several factors discussed earlier may contribute to this finding. First,

[6] For all of the dependent variables used in regressions, we report descriptive statistics after trimming observations above the 99th percentile and below the 1st percentile. We do this for conformity with the data used in the regression estimates.

[7] The *p*-values reflect the results of t-tests, performed using three combinations of two hospital types each.

government hospitals perform the majority of charity care in a given area. Second, government hospitals lack performance based compensation. Lastly, any surpluses experienced by government hospitals revert to their governing agencies, while subsidies cover losses. This soft budget constraint dampens any incentives to improve financial performance.

Government hospitals have lower proportions of Medicare patients ($p< 0.01$), but have higher proportions of MediCal patients ($p<0.02$). For-profit hospitals have higher proportions of MediCal patients compared to nonprofit hospitals ($p< 0.01$).[8] Average length of stay is highest in government hospitals ($p< 0.0001$). These hospitals include large urban organizations (city or county owned) that provide trauma and other complex care that requires longer stays. Moreover, rural government hospitals are likely to keep elderly patients longer when no one is available at home to provide care, or when local nursing homes are at capacity. The longer LOS may also result from lower incentives to control costs by managing LOS. Case mix index and the number of departments from which patients are discharged is higher in the case of nonprofits

Table 2 reports correlations among key variables. While many of the correlations are significant, none appears to be high enough to cause concern.

4.0 Multivariate Results

Table 3 panel A reports results from our primary analysis while Table 3 panel B reports appropriate t-statistics for tests that consider the sum of coefficients in the same regression. For example, the coefficient of 0.061 for *% Managed care* – total under Model 1 of Table B is the total effect of managed care from Panel A, Model 1, before partitioning the effects of ownership. In Model 2 of Panel 2, the coefficient of 0.032 for *% Managed care – Government* is the

[8] Duggan (2000) found that after a 1990 change in state regulation to increase financial incentives for treating indigent patients, both for-profit and nonprofit hospitals cream-skimmed the most profitable MediCal patients while avoiding the less profitable ones. He also found that government owned hospitals did not respond to the new incentives. The result was that government hospitals treated the least profitable MediCal patients, while any increases in revenues from the new program were matched dollar-to-dollar by a reduction in subsidies.

coefficient from Model 2 for *% Managed care*. Since the government dummy is the omitted variable, the coefficient for *% Managed care* is the effect of managed care on outsourcing for government hospitals. The coefficient of 0.082 for the *% Managed care – Not For Profit* in Model 2, Panel B is calculated by adding the coefficient on *% of Revenue from Managed Care* of 0.032 (reflecting the main effect of managed care) to the coefficient on *% of Revenue from Managed Care x NP*, which is 0.050. Other coefficients on Table 3, Panel B are calculated similarly.

As noted in the Panel B, Model 1, on average, managed care is associated with higher levels of outsourcing (0.061, $p < 0.01$). This is consistent with H1A. The coefficient on the Herfindahl Index in Panel B, Model 1 is not significant, and thus H1B is not supported. Finally, results in column 1 (Panel A, model 1) show that both non- and for-profit hospitals outsource to a greater degree than do government hospitals.

Next, we turn to the variation in response to managed care due to ownership. As reported in panel B, model 2, nonprofit hospitals (0.082, $p<0.01$) and for-profit hospitals (0.043, $p<0.05$) are more responsive to managed care pressure compared to government hospitals. These results indicate support for H2.

Results are mixed for H3. The aggregate non-response to competitive pressure appears to be the sum of two counter-veiling forces. With higher levels of competition, for-profit hospitals outsource to a greater extent than government hospitals (-0.107, $p<0.001$, Table 3, Panel B). These findings are consistent with H3. However, the association between competition and outsourcing for nonprofit or government hospitals does not differ from zero at conventional levels.

Results for control variables show that hospitals with greater proportion of MediCal patients outsource more, as do patients with greater LOS. A large proportion of MediCal patients are unprofitable, and hospitals probably experience increased cost pressure as the number of MediCal patients increases. These results provide further evidence in support of our predictions about outsourcing in response to cost pressures. Rural hospitals outsource less, potentially because their location does not offer a broad cross-section of vendors. Other control variables are not significant at conventional levels.

Taken together the results in Table 3 suggest that for for-profits and nonprofits, higher levels of managed care pressures are associated with outsourcing more of their functions, while government hospitals do not have a similar association. However, while nonprofits' outsourcing is primarily associated with managed care pressures, for-profit hospitals also have an association between competitive pressures and outsourcing. One potential reason for this is that for-profits are smaller in size compared to nonprofits and hence use outsourcing as a way to expand capacity, rather than commit to capacity up-front. Further, for-profit hospitals may find it easier to increase quality of non-clinical services such as food and laundry by outsourcing to high quality vendors.

4.1 Clinical versus non-clinical services

Table 4 provides the results for the outsourcing of clinical versus non-clinical services. Consider the model 1 in panel B, relating to non-clinical services. We find that managed care is associated with outsourcing of non-clinical services ($p < 0.001$), as predicted by H4B. In addition, we also find that managed care pressures are associated with outsourcing of clinical services. The coefficients on *% managed care – total* in model 1 (non-clinical) is however, significantly ($p<0.05$) higher than the coefficient on *% managed care – total* in model 1

(clinical). Thus, although hospitals outsource both clinical and non-clinical services in association with managed care pressures, outsourcing of non-clinical services occurs to a greater extent. This is consistent with the notion that hospitals are more likely to outsource non-clinical services because they are not a part of their core mission and core competency.

When we examine the variations in outsourcing of clinical and non-clinical services for hospitals of different ownership types, we observe an interesting pattern of results. First, both nonprofit and for-profit hospitals outsource their non-clinical expenses to a greater extent than do government hospitals (Table 4, Panel A, Model 1, non-clinical). This is consistent with our argument that institutional and political constrains inhibit the ability of government hospitals to lay off employees. Further, cost containment is not as important to government hospitals because of their soft budget constraints.

Second, the results for outsourcing of clinical expenses reveal that in response to managed care pressures, non-profit hospitals outsource clinical expenses to a greater extent than do the for-profits or the government hospital (Table 4, Model 2, Clinical). Thus, non-profit hospitals are most likely to use outsourcing as a way to reduce clinical costs, as managed care pressures increase. In addition, these hospitals tend to be larger and serve more complex patients, and may therefoe require a broader array of services for these patients that could be offered through outsourcing without incurring additional fixed costs in new assets or technology.

Third, we examine the effects of competition on outsourcing. The coefficient on *Herfindhal Index – Total* in Model 1 is not significant for either clinical or non-clinical services. Thus, H4B and H4C are not supported. However, we observe variations based on ownership types. In association with competitive pressures, for-profit hospitals, are more aggressive in seeking out additional scope opportunities by outsourcing clinical services, and cost-reduction

opportunities by outsourcing non-clinical services (Table 4, Panel A, Clinical, Model 2). Thus H4D is partially supported.

Overall, the results in table 4 indicate that managed care pressures are a more dominant factor in outsourcing both clinical and non-clinical services, compared to competitive pressures. Moreover, we find more positive associations for nonprofit and for-profit hospitals in non-clinical services.

4.2 Financial Performance

Table 5 explores the effects of outsourcing on financial performance (H5). The results suggest that outsourcing in the form of purchased services has no implications for ROA for any ownership type (no significant coefficients on the slope or interaction variables). The results in Table 5 show that hospitals located in more competitive markets (lower *Herfindahl*) have lower ROA, suggesting that as predicted by economic theory, competition reduces margins (Schmalensee 1989). Hospitals with higher case mix index have higher ROA, perhaps stemming from better reimbursements for more complex ailments. Hospitals that are managed by a management firm have lower ROA. These results suggest that hospitals in a poor financial condition are more likely to use a management firm. Overall, our weak results for the effects of outsourcing on ROA are consistent with prior research in manufacturing (Gorzig and Stephan 2002 and Kimura 2002 for example).

In Table 6, we partition the effects of clinical and non-clinical outsourcing as a function of ownership. In Model 1 of Table 6, we examine a model with only the main effects, and in Model 2, we include the ownership interactions. An interesting pattern of results emerges in this analysis. For non-profit hospitals, outsourcing clinical or non-clinical services is not associated with ROA. However, in for-profit hospitals outsourcing of clinical services is negatively

associated with ROA, whereas outsourcing of non-clinical services is positively associated with ROA. Thus the reticence of for-profits to outsource clinical services in response to managed care that we observed in the earlier set of results (Table 4, Panel B) is likely to arise from their accurate assessment of the effect of such outsourcing on profit performance.

5. CONCLUSION

In this study, we use panel data from three years and 316 hospitals to analyze the influence of ownership and operating risk on outsourcing behavior. We measure operating risk by analyzing each hospital's levels of managed care and competition. Due to differences in objective functions, funding opportunities, and soft-budget constraints, we expect for-profit and nonprofit hospitals to respond to both types of operating risks by outsourcing more of their operations than government hospitals. Empirical analyses reveal that outsourcing in for-profit and nonprofit hospitals is positively associated with managed care pressures, whereas for-profits also have a positive association between outsourcing and competition. Government hospitals do not have an association between outsourcing and these pressures.

Our sample hospitals are located in a single state, California. This strengthens our analysis because these hospitals are subject to the same state and federal regulations. However it may also limit our ability to generalize the results to hospitals in other states. While for-profit and nonprofit governance objectives and constraints should be similar across states, government hospital ownership forms and consequent constraints might vary. The government hospitals in our sample are owned by counties, cities, or municipal districts. In some states there are few or no county hospitals governed by county supervisors or related agencies, but more district hospitals with elected boards. In other states there are few or no district hospitals.[9] We eliminate state-owned hospitals from our sample because they are residential facilities,

[9] Fifteen states have no district hospitals.

comprised primarily of institutions for mentally and physically disabled. However, some states own hospitals, for example the University of Iowa hospitals are state owned. In California, hospitals associated with universities are either nonprofit or county hospitals; for example the University of San Francisco is associated with several nonprofit hospitals including Mount Zion and San Francisco General, and a Veterans' Administration hospital. Although the governmental entities that operate public hospitals may differ across states, governance constraints are likely to be similar, with little, if any, performance based compensation for top management. Additionally, government hospitals in other states are also likely to operate under soft budget constraints. To the extent these two factors are in place, our results should generalize to those hospitals.[10]

Our findings likely generalize to other organizations that include the diverse ownership types, for example educational institutions and fitness facilities. Higher education has a number of institutions operated by nonprofit and government entities, although fewer for-profit organizations. Incentives across ownership types in these organizations should be similar to those in our sample hospitals; hence the factors that affect outsourcing decisions in these organizations are likely to be similar to those found in our sample.

Prior research on outsourcing has examined factors that influence the decision to outsource, the risks and benefits of outsourcing (Grossman and Helpman 2002a, b), and the impact of outsourcing on productivity and profit (Calabrese and Erbetta 2004; Das and Teng 2001; Gorzig and Stephan 2002; Kimura 2002). None of these studies incorporated ownership

[10] To remedy the problem of few performance incentives in government hospitals, at least one California hospital is considering changes in oversight. Martin Luther King/Drew Medical Center, owned by Los Angeles County, is considering a change to its governance board from a panel of county supervisors to an independent board with budgeting authority separate from the county's budgeting process. A consulting firm recommended this change to improve inefficient operations and to correct problems that have arisen (Health Care Strategic Management 2005). As governance structures change, government hospital incentives will also change, leading to potential changes in outsourcing behavior.

as an influencing factor. We add to this stream of research by analyzing differences in outsourcing behavior among for-profit, nonprofit, and government hospitals. Future research could focus on the outsourcing behavior of government hospitals and compare the influence of various governing mechanisms within these publicly owned organizations.

We also add to management accounting research by examining the differential effects of governance and incentives on outsourcing as a response to financial and competitive pressures. While accounting textbooks routinely emphasize the outsourcing decision as a function of the marginal costs incurred by the firm versus the outside supplier, and the risks of depending on an external supplier (e.g. Horngren, Datar, and Foster 2005; Maher, Stickney, and Weil 2006; Eldenburg and Wolcott, 2004), our results show that there is diversity in the use of outsourcing as a strategy by firms as they manage competitive and cost risks. Future research can explore this issue more thoroughly.

Our analysis is performed at the hospital level, although we separate clinical and non-clinical services. Future research could examine outsourcing at a more micro level, such as by department. This level of analysis could provide empirical further evidence on the influence of transaction costs and asset specificity on outsourcing behavior. Prior research has relied on survey responses to examine this issue (e.g., Cole and Hesterly 1998) rather than actual decisions by managers. In addition, other types of outsourcing could be explored. For example, hospitals outsource labor, using temporary labor agencies to augment nursing and physician resources. Factors related to this type of outsourcing are likely to differ from the factors we discussed related to direct services. The following factors are likely to influence outsourcing of hospital labor: the need for flexibility in staffing to accommodate volatile volume patterns and local competition for nursing labor.

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Table 1
Descriptive Statistics

	Government Hospitals (N = 57 hospitals, 165 hospital-years)				Nonprofit Hospitals (N = 171 hospitals, 472 hospital-years)				For-Profit Hospitals (N = 88 hospitals, 235 hospital-years)			
***Variable*[1]**	***Mean***	***Median***	***Min***	***Max***	***Mean***	***Median***	***Min***	***Max***	***Mean***	***Median***	***Min***	***Max***
% of Direct Expenses outsourced	7.3%	6.2%	2.3%	22.7%	9.6%	8.6%	2.7%	30.3%	10.8%	10.9%	10.3%	25.2%
% of clinical expenses outsourced	2.5%	0.8%	0.0%	27.9%	3.8%	1.2%	0.0%	33.2%	1.8%	0.8%	0.0%	21.8%
% of non-clinical expenses outsourced	10.4%	9.6%	3.6%	20.3%	13.4%	12.7%	3.9%	29.7%	15.9%	16.2%	4.1%	29.8%
Ratio of clinical/non-clinical outsourcing	0.22	0.10	0.01	1.39	0.24	0.11	0.0	1.48	0.12	0.05	0.00	1.13
Return on Assets	1.9%	1.4%	-31.9%	37.6%	2.1%	2.6%	-36.3%	33.2%	4.5%	6.9%	-36.7%	35.6%
Operating expenses per adjusted patient day '000	1.58	1.41	0.39	4.48	1.79	1.72	0.41	5.08	1.58	1.50	0.72	3.68
Revenue per adjusted patient day	2.59	2.58	0.44	7.47	4.69	4.32	0.46	13.31	6.38	5.75	1.08	15.47
% of Revenue from Managed Care	19.9%	14.4%	0.0%	62.0%	34.6%	38.0%	0.0%	86.5%	34.6%	32.6%	0.0%	73.4%
Herfindahl Index	0.285	0.198	0.016	1.000	0.211	0.156	0.016	1.000	0.081	0.051	0.016	0.475
% of Revenue from Medicare	33.2%	35.6%	3.4%	77.9%	42.3%	43.1%	1.24%	65.2%	40.6%	40.1%	6.8%	78.4%
% of Revenue from MediCal	29.8%	28.3%	3.3%	66.9%	16.9%	12.8%	0.46%	60.5%	25.2%	23.2%	0.0%	68.4%
Average Length of Stay	12.06	5.62	2.23	87.47	6.56	4.89	2.33	266.31	5.59	5.11	1.98	27.26
Bedsize	141.76	100.00	15.00	755.00	218.82	181.00	12.00	875.00	146.15	130.00	10.00	434.00
Teaching Status	0.21	0.00	0.00	1.00	0.23	0.00	0.00	1.00	0.18	0.00	0.00	1.00
Rural Status	0.50	0.00	0.00	1.00	0.18	0.00	0.00	1.00	0.06	0.00	0.00	1.00
Management Firm	0.25	0.00	0.00	1.00	0.04	0.00	0.00	1.00	0.03	0.00	0.00	1.00
Case Mix Index	0.95	0.94	0.59	1.31	1.10	1.06	0.62	1.86	1.04	1.01	0.52	2.20
Number of Departments	25.95	27.00	10.00	46.00	31.21	31.00	10.00	51.00	27.94	29.00	6.00	41.00

[1]Descriptive statistics for the variables used as dependent variables in the analyses (the first seven variables) are based on the trimmed sample (at 1% and 99%) used for the regression with that dependent variable. All other statistics are based on the full sample

Table 2
Correlations among Study Variables

	PCT_EX	PCT_C	PCT_NC	RATIO	ROA	EXP DAY	REV DAY	MC%	HHI	MR	MC	LOS	BEDS	TCH	RUR	MGT	CMI	DEPT
PCT_EX		0.50***	0.97***	0.25***	0.06	0.03	0.25***	0.31***	-0.31***	0.00	-0.01	0.01	0.24***	0.08*	-0.34***	-0.10**	0.03	0.15***
PCT_C	0.78***		0.34***	0.95***	-0.05	-0.03	-0.16***	0.01	-0.06	-0.05	0.11**	0.11**	0.14***	0.13***	-0.10**	-0.06	-0.03	0.09**
PCT_NC	0.92***	0.48***		0.06	0.07*	0.04	0.31***	0.32***	-0.29***	0.03	-0.03	-0.02	0.22***	0.05	-0.33***	-0.10**	0.05	0.14***
RATIO	0.61***	0.91***	0.28***		-0.09*	-0.04	-0.27***	-0.07*	0.03	-0.06	0.11**	0.13***	0.07*	0.12**	-0.01	-0.03	0.05	0.04
ROA	0.02	-0.05	0.06	-0.05		0.18***	0.35***	0.04	-0.00	-0.03	-0.01	-0.04	0.15***	0.02	-0.06	-0.14***	0.11**	0.15***
EXPDAY	0.07*	0.10**	0.04	0.04	0.10**		0.64***	0.15***	0.22***	-0.01	-0.35***	-0.59***	0.09**	0.19***	-0.17***	-0.15***	0.31***	0.21***
REVDAY	0.19***	-0.05	0.30***	-0.15***	0.33***	0.45***		0.38***	-0.10**	0.14***	-0.36***	-0.42***	0.26***	0.06	-0.36***	-0.23***	0.37***	0.35***
MC%	0.32***	0.18***	0.33***	0.10**	0.02	0.06	-0.33***		-0.29***	0.09**	-0.43***	-0.16***	0.37***	0.01	-0.42***	-0.10**	0.25***	0.38***
HHI	-0.20***	-0.05	-0.23***	-0.03	-0.01	0.24***	-0.09**	-0.39***		0.01	-0.18***	-0.20***	-0.38***	-0.23***	0.47***	0.11**	-0.07*	-0.22***
MR	0.04	0.04	0.04	-0.02	-0.08*	-0.12**	0.13***	0.14***	0.05		-0.50***	-0.05	0.07*	-0.20***	-0.02	-0.08*	0.44***	0.12**
MC	-0.03	-0.08*	-0.01	-0.01	0.05	-0.24***	-0.27***	-0.41***	-0.15***	-0.56***		0.33***	-0.04	0.21***	0.07*	0.10**	-0.49***	-0.16***
LOS	-0.13**	-0.03	-0.16***	0.04	-0.01	-0.29***	-0.25***	-0.21***	0.09**	-0.16***	0.27***		0.21***	0.11**	0.02	0.01	0.11**	0.04
BEDS	0.11**	0.06	0.11**	0.07*	0.17***	0.08*	0.19***	0.31***	-0.33***	-0.00	-0.04	-0.11**		0.30***	-0.56***	-0.24***	0.41***	0.78***
TCH	0.06	0.05	0.04	0.07*	0.05	0.14***	0.04	0.01	-0.22***	-0.23***	0.21***	-0.06	0.36***		-0.25***	-0.10**	0.14***	0.25***
RUR	-0.29***	-0.11	-0.32***	-0.07	-0.07*	-0.06	-0.31***	-0.42***	0.54***	-0.02	0.14	0.27***	-0.43***	-0.25***		0.21***	-0.29***	-0.50***
MGT	-0.10**	-0.04	-0.11**	-0.02	-0.10*	-0.10**	-.19***	-0.11**	0.05	-0.04	0.08*	0.06	-0.16***	-0.10**	0.21***		-0.13***	-0.17***
CMI	0.05	0.03	0.06	-0.01	0.12**	0.24***	0.37***	0.24***	-0.12**	0.36***	-0.47***	-0.11**	0.38***	0.17***	-0.27***	-0.11**		0.38***
DEPT	0.11**	0.04	0.14***	0.04	0.18***	0.11**	0.30***	0.38***	-0.27***	0.14***	-0.18***	-0.28***	0.71***	0.27***	-0.50***	-0.17***	0.35***	

Notes

1. *** p < .0001; ** p < .01; * p < .05
2. Pearson (Spearman) correlations in lower (upper) diagonal.
3. Correlations are based on the full sample; PCT_EX=% of total expenses outsourced; PCT_C=% of clinical expenses outsourced; PCT_NC=% of non-clinical expenses outsourced; RATIO=PCT_C/PCT_NC; ROA=return on assets; EXPDAY=expenses per adjusted patient day; REVDAY=revenue per adjusted patient day; MC%=% of revenues from managed care; HHI=Herfindahl Index; MR=% of revenue from Medicare; MC=% of revenue from MediCal; LOS=average length of stay; BEDS=bedsize; TCH=teaching status dummy; RUR=rural dummy; MGT=managed by management firm dummy; CMI=case mix index; and DEPT=number of clinical departments.

Table 3
Determinants of Total Direct Expenses That Are Outsourced

Panel A: Regression Estimates

Percent of direct costs that are outsourced = $\alpha + \beta_1$(% of Revenue from Managed Care) + β_2(HHI index) + β_3(Not-for profit) + β_4(For profit) + β_5(%Revenue from Managed Care x Not-for-profit) + β_6(%Revenue from Managed Care x For-profit) + β_7(HHI index x NP)+ β_8(HHI index x FP) + β_9(Management Firm Dummy) + β_{10}(% of Revenue from Medicare) + β_{11}(% of Revenue from MediCal) + β_{12}(Average Length of Stay) + β_{13}(Bedsize) + β_{14}(Teaching Hospital Dummy) + β_{15}(Rural Dummy)+β_{16}(Case Mix Index) + β_{17}(Complexity) + ξ

Item	Model 1	Model 2
Intercept	0.069	0.078
	*(3.21)***	*(3.51)****
% of Revenue from Managed Care	0.061	0.032
	*(5.15)****	*(1.25)*
Herfindahl Index	0.003	-0.002
	(0.30)	*(-0.11)*
Not-for-profit hospitals	0.017	-0.002
	*(2.88)***	*(-0.25)*
For profit hospitals	0.022	0.030
	*(3.39)****	*(2.36)**
% Revenue from Managed Care x NP		0.050
		(1.71)
% Revenue from Managed Care x FP		0.011
		(0.36)
Herfindahl Index x NP		0.025
		(1.27)
Herfindahl Index x FP		-0.105
		*(-3.00)***
Management Firm Dummy	0.001	0.001
	(0.15)	*(0.16)*
% Revenue from Medicare	-0.003	-0.008
	(-0.16)	*(-0.354)*
% Revenue from MediCal	0.050	0.039
	*(2.40)**	*(1.85*)*
Average Length of Stay	-0.000	-0.000
	*(-2.27)**	*(-2.09)**
Bedsize	0.000	0.000
	(0.86)	*(0.83)*
Teaching Hospital Dummy	-0.002	-0.002
	(-0.29)	*(-0.42)*
Rural Dummy	-0.015	-0.016
	*(-2.32)**	*(-2.43)**
Case Mix Index	-0.002	-0.003
	(-0.16)	*(-0.21)*
Complexity (number of departments)	-0.000	-0.000
	(-1.15)	*(-0.87)*

Panel B: Tests of significance for total effects[3]

Item	***Model 1***	***Model 2***
% Managed care - Total	0.061 (5.15)***	
% Managed Care - Government		0.032 (1.25)
% Managed care – Not for profit		0.082 (5.05)***
% Managed care – For profit		0.043 (2.31)**
Herfindahl Index – Total	0.003 (0.30)	
Herfindahl Index – Government		-0.002 (-0.14)
Herfindahl Index – Not for profit		0.023 (1.70)
Herfindahl Index – For profit		-0.107 (-3.53)***
N	852	852
Adjusted R^2	16.3%	18.2%
F	12.05***	12.12***

Notes
1. Each cell contains the relevant t-statistic computed using Huber-White robust standard errors.
2. Significance levels: * < 0.05, ** < 0.01, ***<0.001.
3. t-statistics for tests of whether sum of coefficients differs from zero.

Table 4
Determinants of Clinical and Non-Clinical Expenses That Are Outsourced

Panel A: Regression Estimates

Dependent variable = α + β_1(% of Revenue from Managed Care) + β_2(HHI index) + β_3(Not-for profit) + β_4(For profit) + β_5(% of Revenue from Managed Care x NP)+ β_6(% of Revenue from Managed Care x FP)+ β_7(HHI x NP) + β_8(HHI x FP) + β_9(Management Firm Dummy) + β_{10}(% of Revenue from Medicare) + β_{11}(% of Revenue from MediCal) + β_{12}(Average Length of Stay) + β_{13}(Bedsize) + β_{14}(Teaching Hospital Dummy) + β_{15}(Rural Dummy) + β_{16}(Case Mix Index) + β_{17}(Complexity) + ξ

Item	***Non-Clinical Expenses***		***Clinical Expenses***	
	Model 1	***Model 2***	***Model 1***	***Model 2***
Intercept	0.079	0.093	0.03	0.041
	(2.92)***	*(3.28)***	(1.35)	*(1.65)*
% Revenue from Managed Care	0.078	0.047	0.044	0.009
	(5.26)***	*(1.48)*	(2.65)***	*(0.31)*
Herfindahl Index (HHI)	0.009	0.001	0.010	-0.000
	(0.65)	*(0.03)*	(0.73)	*(-0.00)*
Not-for-profit hospitals (NP)	0.022	0.004	0.009	-0.021
	(2.90)***	*(0.28)*	(1.40)	*(-1.50)*
For profit hospitals (FP)	0.039	0.036	-0.013	0.006
	(4.53)***	*(2.18)**	(-1.82)*	*(0.47)*
% Revenue from Managed Care x NP		0.041		0.076
		(1.15)		*(2.07)**
% Revenue from Managed Care x FP		0.043		-0.032
		(1.11)		*(-0.96)*
Herfindahl Index x NP		0.029		0.031
		(1.08)		*(1.30)*
Herfindahl Index x FP		-0.123		-0.046
		*(-2.55)**		*(-2.14)**
Management Firm Dummy	0.002	0.004	-0.002	-0.003
	(0.26)	*(0.32)*	(-0.19)	*(-0.31)*
% Revenue from Medicare	0.010	0.008	-0.016	-0.020
	(0.40)	*(0.29)*	(-0.70)	*(-0.82)*
% Revenue from MediCal	0.073	0.066	0.016	-0.000
	(2.75)***	*(2.53)**	(0.69)	*(-0.02)*
Average Length of Stay	-0.000	-0.000	0.00	0.000
	(-3.37)***	*(-3.44)****	(0.09)	*(0.89)*
Bedsize	0.000	0.000	0.00	0.000
	(0.71)	*(0.84)*	(0.50)	*(0.023)*
Teaching Hospital Dummy	-0.004	-0.004	0.00	-0.000
	(-0.50)	*(-0.62)*	(0.08)	*(-0.01)*
Rural Dummy	-0.017	-0.02	-0.01	-0.009
	(-2.15)**	*(-2.50)**	(-1.47)	*(-1.11)*
Case Mix Index	0.006	0.006	-0.01	-0.010
	(0.34)	*(0.35)*	(-0.42)	*(-0.63)*
Complexity (Number of Departments)	-0.001	-0.001	0.00	0.000
	(-1.01)	*(-1.10)*	(-0.84)	*(0.06)*

Panel B: Tests of significance for total effects[3]

	Non-Clinical Expenses		***Clinical Expenses***	
Item	***Model 1***	***Model 2***	***Model 1***	***Model 2***
% Managed care - Total	0.078 (5.26)***		0.044 (2.65)***	
% Managed Care - Government		0.047 *(1.48)*		0.009 *(0.31)*
% Managed care – Not for profit		0.088 *(4.64)***		0.085 *(3.46)****
% Managed care – For profit		0.090 *(3.61)****		-0.023 *(-1.02)*
Herfindahl Index – Total	0.009 (0.65)		0.010 (0.73)	
Herfindahl Index – Government		0.001 *(0.03)*		-0.000 *(-0.00)*
Herfindahl Index – Not for profit		0.029 *(1.90)**		0.031 *(1.44)*
Herfindahl Index – For profit		-0.124 *(-2.94)****		-0.046 *(-2.77)****
N	852	852	852	852
Adjusted R^2	20.60%	22.4%	5.06%	7.8%
F	17.99***	15.43***	4.49***	5.25***

Notes
1. Each cell contains the relevant t-statistic computed using Huber-White robust standard errors.
2. Significance levels: * < 0.05, ** < 0.01, ***<.001.
3. t-statistics for tests of whether sum of coefficients differs from zero.

Table 5
Determinants of ROA

$ROA = \alpha + \beta_1$ *(not-for profit)* $+\beta_2$ *(For profit)*$+ \beta_3$ *(% of Direct Expenses that are Purchased Services)* $+ \beta_4$ *(% of Direct Expenses that are Purchased Services x not-for profit)* $+ \beta_5$ *(% of Direct Expenses that are Purchased Services x For profit)*$+ \beta_6$*(% of Revenue from Managed Care)*$+ \beta_7$*(HHI index)* $+ \beta_8$*(Management Firm Dummy)* $+ \beta_9$*(% of Revenue from Medicare)* $+\beta_{10}$*(% of Revenue from MediCal)* $+ \beta_{11}$*(Average Length of Stay)* $+ \beta_{12}$*(Bedsize)* $+ \beta_{13}$*(Teaching Hospital Dummy)* $+ \beta_{14}$*(Rural Dummy)* $+\beta_{15}$*(Case Mix Index)* $+\beta_{16}$*(Complexity)* $+ \xi$

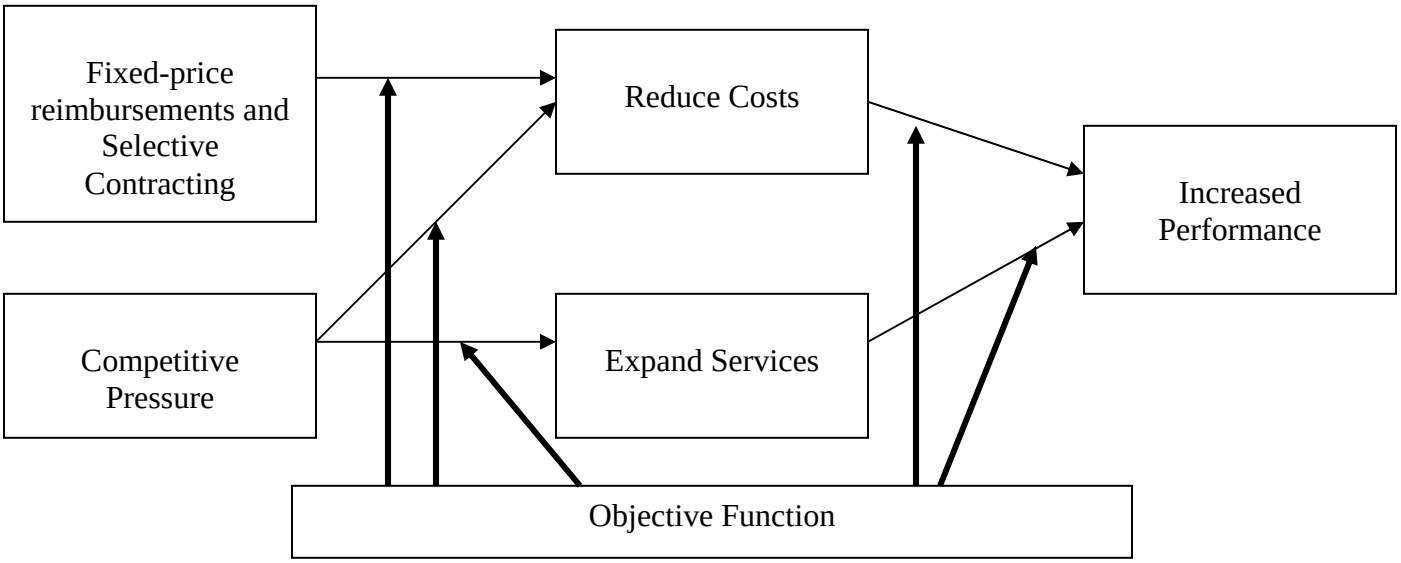
Item	***ROA***
Intercept	-0.126
	(1.96)
Not-for-profit hospitals (NP)	-0.022
	(-0.91)
For profit hospitals (FP)	-0.019
	(-0.48)
% Direct Expenses that are Purchased Services	-0.088
	(-0.31)
% Direct Expenses that are Purchased Services x NP	0.079
	(0.25)
% Direct Expenses that are Purchased Services x FP	0.478
	(1.14)
% Revenue from Managed Care	0.035
	(0.99)
Herfindahl Index	0.082
	*(2.67)***
Management Firm Dummy	-0.040
	*(-2.14)**
% Revenue from Medicare	-0.066
	(-1.19)
% Revenue from MediCal	0.051
	(0.86)
Average Length of Stay	0.000
	(0.33)
Bedsize	0.000
	(0.99)
Teaching Hospital Dummy	-0.012
	(-0.73)
Rural Dummy	0.015
	(0.88)
Case Mix Index	0.079
	*(2.51)**
Complexity (Number of Departments)	0.002
	(*1.71)*

Table 6
ROA as a function of Clinical and Non-Clinical Outsourcing

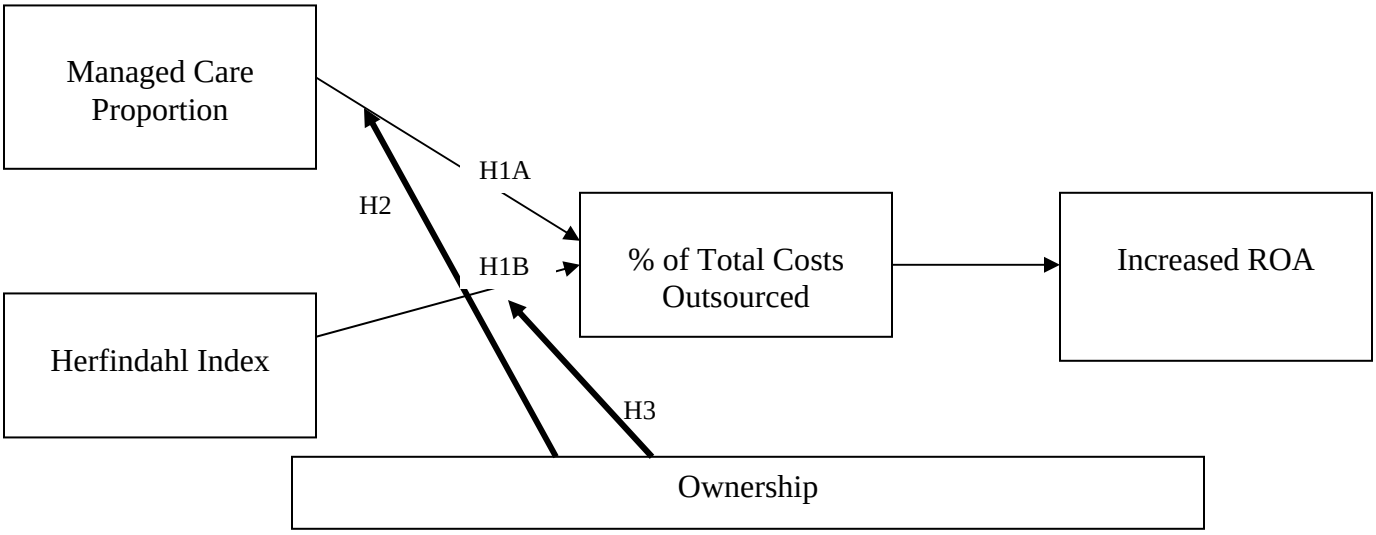
Item	***Model 1***	***Model 2***
Intercept	-0.157	*-0.098*
	(-2.49)**	*(1.52)*
Not-for-profit hospitals (NP)	-0.019	*-0.027*
	(-1.34)	*(-.85)*
For profit hospitals (FP)	0.018	*-0.063*
	(0.89)	*(-1.49)*
% Clinical Direct Expenses that are Purchased Services	-0.134	*0.152*
	(-1.27)	*(0.48)*
% Non-Clinical Direct Expenses that are Purchased Services	0.204	*-0.217*
	(1.64)	*(-0.81)*
% Clinical Direct Expenses that are Purchased Services*Not-for-profit		*-0.137*
		(0.41)
% Non-Clinical Direct Expenses that are Purchased Services *Not-for-profit		*0.179*
		(0.58)
% Clinical Direct Expenses that are Purchased Services*For-profit		*-1.59*
		*(-2.75)***
% Non-Clinical Direct Expenses that are Purchased Services*For-Profit		*0.841*
		*(2.55)**
% Revenue from Managed Care	0.035	*0.027*
	(0.88)	*(0.82)*
Herfindahl Index	0.082	*0.079*
	(2.64)***	*(2.57)**
Management Firm Dummy	-0.043	*-0.04*
	(-2.41)**	*(-1.86)**
% Revenue from Medicare	-0.063	*-0.065*
	(-1.12)	*(-1.17)*
% Revenue from MediCal	0.059	*0.065*
	(0.99)	*(1.12)*
Average Length of Stay	0.000	*0.000*
	(0.54)	*(0.00)*
Bedsize	0.000	*0.000*
	(0.90)	*(0.89)*
Teaching Hospital Dummy	-0.012	*-0.007*
	(-0.75)	*(-0.44)*
Rural Dummy	0.019	*0.008*
	(1.12)	*(0.45)*
Case Mix Index	0.078	*0.079*
	(2.48)	*(2.70)****
Complexity (Number of Departments)	0.002	*0.001*
	(1.94)*	*(1.23)*
N	852	852
Adjusted R^2	6.73%	10.13%
F	5.09***	6.05***

Figure 1
Relation between risk, ownership, and outsourcing

Panel A: Theoretical Framework



Panel B: Empirical Framework – Overall Outsourcing



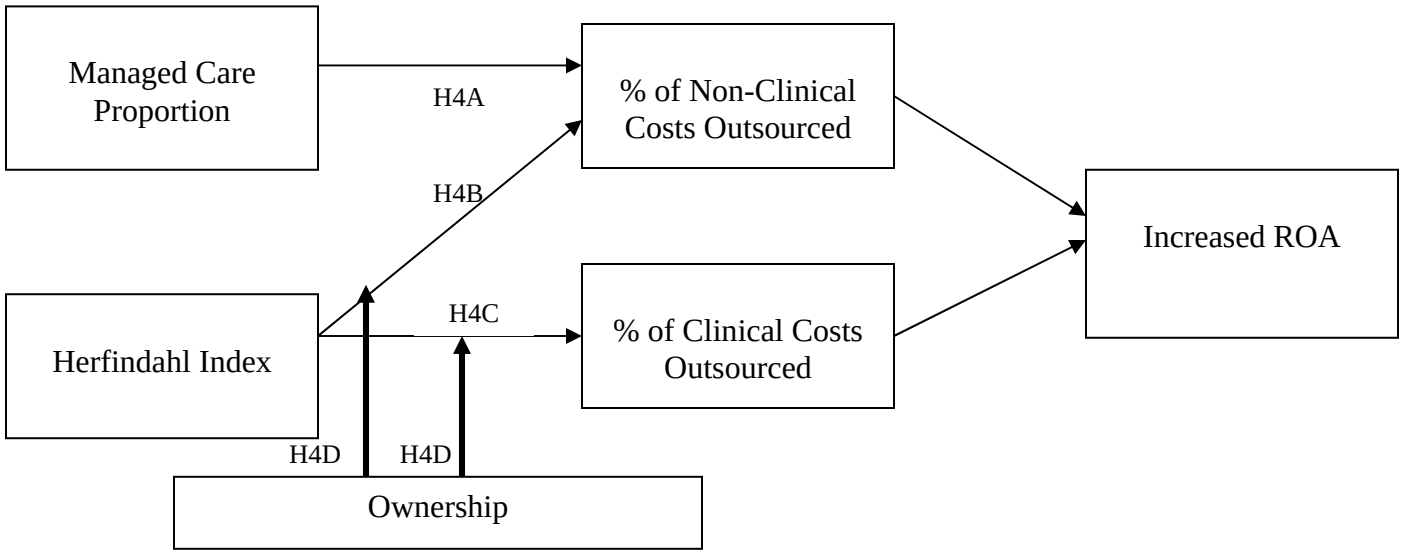
H1A: The proportion of managed care in the hospital's patient mix positively influences the amount of outsourcing by the hospital.

H1B: Greater competitive intensity motivates a hospital to undertake a greater amount of outsourcing.

H2: Compared to government hospitals, the relation between managed care proportion and the decision to outsource will be more positive in for-profit and nonprofit hospitals

H3: Compared to government hospitals, the relation between competition and the decision to outsource will be more positive in for-profit and nonprofit hospitals.

Panel C: Empirical Framework – Clinical versus Non-Clinical Outsourcing



H4A: The proportion of managed care is positively related to outsourcing of non-clinical services.

H4B: Competition is positively related to outsourcing of non-clinical services.

H4C: Competition is positively related to outsourcing of clinical services.

H4D: Compared to government hospitals, for-profit hospitals and not-for-profit hospitals will exhibit a stronger preference for outsourcing of clinical services in response to increases in competitive pressures.