The Influence of Ownership on Accounting Information Expenditures [1]

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Abstract

This paper analyzes the association between ownership, top management incentives, and expenditures on accounting information. We argue that organizations with privately appointed boards of directors such as for-profit and non-governmental nonprofit organizations use incentive pay practices which encourage managers to use accounting information to improve performance. In contrast, government organizations are publicly governed and are constrained in their compensation practices because hospital CEOs are administrators of government provided services. However, these hospitals must prove their efficiency to continue to receive adequate budgetary funding. Therefore government hospitals are more likely to use accounting information to gain legitimacy with stakeholders and regulators. Accordingly, we predict a positive relationship between expenditures on accounting information and contracting intensity in privately governed organizations, whereas we expect no such association for publicly governed organizations. We analyze data from California hospitals to determine differences in these roles across ownership types. We find a positive association between contracting intensity and expenditures on accounting information in privately governed hospitals, but no relation in publicly governed hospitals. Finally, we find differences in the use of accounting information within the privately governed hospitals, based on ownership. While for-profit hospitals expend resources on accounting information that helps improve their revenue positions, nonprofit hospitals expend resources on accounting information that facilitates decision-making related to operating efficiency and cost containment.

Key words: **Governance, accounting information, ownership structure, hospitals**

1. Introduction

This paper examines the relationship between ownership, incentive contracting, and expenditures on accounting information systems. Combining insights from agency and institutional theories, we posit that the relationship between incentive contracting and the demand for specific types of accounting information varies as a function of ownership. While in some types of organizations, incentive contracting is associated with expenditures on accounting information to facilitate decision-making, in other types of organizations, accounting information is used to gain legitimacy with funding agencies and stakeholders. Further, we also demonstrate that when incentive contracting is associated with an increase in expenditures on accounting information, the type of accounting information demanded varies as a function of ownership and the resulting institutional constraints. For example, for-profit hospitals have fewer institutional constraints on their collection policies and are therefore likely to invest in patient billing and collection activities to improve operations. Alternatively, nonprofit hospitals invest in general accounting activities to focus on cost reduction and efficiency improvement strategies because they face institutional constraints prohibiting aggressive collection policies.

We develop arguments about the emphasis that organizations with different ownership place on incentive compensation, and how this influences expenditures on accounting. For example, for-profit and non-governmental nonprofit organizations have appointed boards, private board meetings, and fewer constraints when contracting with managers. Individual stakeholders have limited interest vested in the organization, diminishing incentives to directly monitor managers. Therefore, these "privately

governed" organizations are likely to tie managerial compensation to firm performance to align the interests of managers and owners. When incentive pay is used, an improvement in organizational performance also increases managers' compensation. Consequently, they are more likely to use information generated by the accounting system for better decision-making and operational improvements. Thus, incentive contracting increases the demand for accounting information to facilitate performance improvements.

In contrast, government organizations receive tax subsidization and are part of a bureaucratic reporting system. Because these "publicly governed" organizations are considered government agencies, constraints exist on the use of incentive pay. The highest level managers are generally civil service employees whose compensation is based on a government classification system. In addition, when operations are subsidized, operating performance becomes less important for organizational survival, however maintaining legitimacy with stakeholders becomes crucial. Milgrom (1988) suggests that "influence costs" arise when participants in a centralized organization care about decisions made by the central authority and then spend too much time trying to influence these decisions. According to this argument, hospital managers would want to influence the budget allocation process to ensure adequate funds for their organizations. Part of managers' abilities to influence central authority decisions relies on access to more detailed accounting data. Consequently they invest in elaborate accounting systems to help justify budget requests and to maintain legitimacy with stakeholders. For example, the California Association of Public Hospitals lobbies state and federal governments on issues regarding potential funding cuts. Detailed accounting information from member hospitals is needed to support these lobbying efforts.[1]

We analyze California hospital data which consists of a variety of hospital ownership types that provide essentially similar services. The sample is partitioned into three ownership types: for-profit, non-governmental nonprofit[2] (the privately governed hospitals), and government owned hospitals (the publicly governed hospitals). We examine operations for the year 2003, and use data for the years 1990-2002 for constructing our variables.

For our empirical analysis, we estimate firm-specific regressions using 13 years of data for each hospital, and find that for- and nonprofit hospitals use incentive compensation to a greater extent than government hospitals. We then investigate the sensitivity of incentive compensation to expenditures on accounting information and find a positive association between incentive compensation and expenditures on accounting information in for-profit and nonprofit hospitals, but find no association in government hospitals. However, the type of accounting information that is demanded differs in for-profit versus nonprofit hospitals: incentive compensation in for-profit hospitals is associated with greater expenditures on credit and collection, while in nonprofit hospitals it is associated with expenditures on general accounting to provide information for budgeting, capacity utilization, and cost accounting. In addition, we provide evidence that government hospitals invest relatively more in accounting systems compared to for-profit and nonprofit hospitals.

These results suggest that both for-profit and nonprofit hospitals use accounting information to improve decision making in response to incentive contracting. However, for-profits use accounting information for revenue enhancement decision making, while nonprofits use accounting information to improve operations, budgeting, and capacity

utilization, which is eventually aimed at cutting costs. This difference likely arises because nonprofit institutional norms constrain aggressive revenue-enhancing tactics. No association exists between the demand for accounting information and incentive compensation in government hospitals, probably due to the low power of their incentive contracts. Instead, government organizations invest in elaborate accounting systems to justify and legitimize their financial performance.

This research makes several important contributions to the accounting literature. While considerable research in accounting has examined the role of accounting-based performance measures in compensation contracts (see Indjejikian 1999 and Lambert 2001 for reviews) relatively few studies specifically examine the influence of *ownership* on the use of incentive contracts with senior managers (exceptions include Ke et al. 1999, and Lambert and Larcker 1995). We contribute to this literature by including a broader spectrum of ownership, and more specifically by including government organizations in the analysis.

We also provide empirical evidence that ownership and governance influence the relation between incentive compensation and expenditures on accounting information. Although we find support for the agency notion that the use of incentive contracts with top managers does indeed influence managerial behaviors by increasing the demand for accounting information, we also find variations in the *type* of accounting information demanded. These variations arise because hospital managers use different strategies in response to differences in institutional constraints imposed by ownership. Our results suggest that when examining the role of accounting information in organizations, a combination of agency and institutional theories provides richer insights to researchers.

The remainder of the paper is organized as follows. Section 2 uses both agency and institutional theories to motivate the hypotheses. Section 3 discusses the data. Section 4 discusses the research methodology. Section 5 contains results, and Section 6 discusses conclusions, limitations, and avenues for future research.

2. Theory and Hypotheses

2.1 Role of Accounting Information

Although accounting information serves many functions, we focus on three of its roles: (1) use in managerial performance contracts to align the interests of managers with owners or other stakeholders (*incentive contracting* role), (2) use by managers to improve decision quality (*decision facilitating* role), and (3) use in legitimizing expenditures and conforming to external regulations (*legitimizing* role). The incentive-contracting role of accounting information occurs both *ex-ante* to establish the rules of the game and *ex-post* in the settling up process.

For managerial contracts, the board uses accounting information to choose the types of performance measures and their weights. A large body of agency-based research in accounting, economics, and finance analyzes the importance of accounting information in incentive contracts within for-profit organizations (e.g. Bushman and Smith 2001, Gibbons 1998, Prendergast 1999, Murphy 1985, 1999). Analytical research suggests that accounting-based performance measures are included in managers' contracts when they are informative about agents' actions (Holmstrom 1979). The optimal weight placed on each measure depends on its sensitivity to managers' actions, the precision with which it is measured (Banker and Datar 1989), and its relation to other performance measures (Feltham and Xie 1994). The objective is to design incentive contracts that encourage

managers' efforts to increase organizational performance and maximize stakeholder value.

However, for some types of organizations, financial performance is not critical for survival because consumers may be unable to assess the quality of services provided, or have no alternative providers, for example uninsured patients who use government hospitals. Because private enterprise finds such markets unprofitable, these service providers are likely to be publicly governed and tax subsidized. Additionally, expectations about the objective function and role of public organizations differ across constituencies, so consensus on appropriate performance measures is often lacking (Scott et al 2000); while taxpayers likely expect lower charges for patient services, indigent patients expect consistency of service availability, and government officials desire efficient resource allocations, and also to further their political agendas. With a lack of consensus, incentive contracts are less likely to be used. When performance standards are not informative or clear, the emphasis shifts to legitimacy, and accounting information is used to justify expenditures and to provide information about current services and financial need, rather than to improve organizational financial performance.

The tendency for government organizations to use elaborate accounting information to gain legitimacy with stakeholders is consistent with the tenets of institutional theory. In addition to material resources, organizations also require legitimacy, credibility, and social acceptability to survive and thrive in their social environment (Meyer and Rowan 1977). Krishnan et al. (2004) suggest that the institutional environment constrains firm behavior by defining the boundaries within which firms operate. These constraints take a variety of forms, including: regulative

(rules and laws), normative (codes of conduct, certification, and accreditation), and cultural cognitive (common beliefs, customs and logic of action). Accordingly, success critically hinges on conforming to institutional requirements rather than meeting performance targets, and the focus of the accounting system is on legitimization within this environment. Geiger and Ittner (1996) support this contention and provide empirical evidence that cost accounting systems used by managers in government agencies to compete for funds tend to be more elaborate than cost accounting systems in agencies that use the information primarily for internal purposes.

2.2 Hospital Industry Background

Changes in the hospital operating environment since the mid 1980s have increased operating risk and consequently the need for better management strategies. In 1983, Medicare changed its reimbursement system from cost-plus to flat-fee. In the mid to late 1980s, managed care organizations, which reimbursed fixed amounts and negotiated for large discounts, began to dominate hospital markets.

In a cost-plus environment, less risk was imposed on managers because inefficiencies could largely be shifted to insurers and other payers. Hence, hospital boards had less need for incentives to motivate management. However, as the operating environment became riskier, the quality of management talent became more important. Lambert and Larcker (1995) used hospital compensation data from 1986 and found that hospitals most adversely affected by Medicare's prospective payment system tended to use bonus-based compensation contracts to a greater extent than other hospitals. They also found that hospitals were less likely to use bonuses when boards of directors and state regulatory bodies closely monitored their activities. In another study, Roomkin and

Weisbrod (1999) use 1992 compensation data to find larger bonuses (both in absolute and relative terms) for top management in for-profit hospitals but higher base salaries in nonprofits. When Brickley and Van Horn (2002) extend the sample period (from 1991 to 1995), they find that both CEO turnover and pay are strongly related to financial performance (return on assets) in nonprofit hospitals. They also find that the threat of turnover due to poor financial performance appears to be stronger in nonprofit hospitals relative to for-profit hospitals. These findings suggest that hiring professional managers and providing them with performance-based incentives is increasingly used by many for-profit and nonprofit hospitals to improve hospital efficiency.

2.3. Use of Incentive Contracting by Ownership Type

Ownership type affects the extent to which incentive contracts are used. For-profit hospitals are investor-owned; therefore their objective is to maximize shareholder value. Accordingly, choices about output, quality, and patient-mix parameters reflect this emphasis on maximizing shareholder value (Picone, Chou, and Sloan 2002). Governing boards of for-profits appoint new board members and board meetings are private. Because of their diffused ownership structures and the tension between the expectations of managers versus stakeholders, incentive contracts are likely to be used more often. For-profit boards are also likely to have fewer restrictions on contracting. Empirical evidence suggests that for-profit hospitals make use of incentive contracts with their senior managers (Brickley and Van Horn 2002).

Non-profit hospitals are owned by religious organizations, physician groups, or the local community. Prior research in economics concludes that in many respects, non-governmental nonprofit and for-profit hospitals exhibit similar behaviors. Glaeser (2001)

suggests that behavior of nonprofit and for-profit hospitals converges when commercialism increases in nonprofits as a response to declining rents and a rise in returns to commercialism. Similarly, Duggan (2000) finds that the presence of for-profit competitors influences the behavior of nonprofit hospitals, but not government hospitals. Thus, nonprofit hospitals in a market with many for-profit hospitals are more likely to "cream-skim" the more profitable patients. One of the factors driving such behavior is that sustained poor performance may result in the community deciding to close the hospital or sell it to another owner. Similarities in CEO compensation practices in nonprofit hospitals and for-profit hospitals have also been empirically documented (Brickley and Van Horn 2002).

Government hospitals in our sample are owned and governed by counties or municipalities. Most county hospitals are governed directly or indirectly by the county board of supervisors. Hospitals in some counties are included in a health services authority; these hospital CEOs report to an agency director who, in turn, reports to the county board of supervisors. In other counties, hospital CEOs report directly to county supervisors. Sometimes an appointed board of trustees provides guidance to hospital management, but budget decisions continue to be made as part of the county or city budgeting process. District hospitals are governed by publicly-elected boards and all board meetings are public. Budgets for all of these government hospitals are published annually and discussed in public meetings and in the media.

County and city hospitals perform much more charity care than do other hospitals and rely heavily on subsidies and grants for operational funds (GAO 1990). These hospitals are considered providers of last resort because they treat a larger proportion of

uninsured patients than other hospital types. For example, the Los Angeles County hospitals provide care to three million uninsured patients, which is nearly half the number of uninsured in the state (Haugh 2002). According to the American Hospital Association, in 2000 hospitals spent $21.6 billion on uncompensated care, an average of 6% of their budgets. However, government hospitals spent a much higher percent on uncompensated care (Haugh 2002). In addition, Duggan (2000) found that California for-profit and nonprofit hospitals skimmed the more profitable Medicaid patients and left the unprofitable cases for the government hospitals.

CEOs in county hospitals are essentially government employees, and their positions are likely considered similar in stature to the heads of other county agencies, such as the head of the parks department, or water department. Hence, government hospitals generally make less intensive use of use incentive contracts compared to for-profit and nonprofit hospitals. Managers do not have the same incentives to increase revenues and profits as those in other hospitals because public subsidies are likely to be reduced as funds from operations increase (Duggan 2000).[3]

Because of the institutional constraints on incentive contracting, government organizations are more likely to use administrative and bureaucratic controls that include mechanisms such as authority structures, rules, policies, standard operating procedures, and socialization strategies. These controls rely on use the use of closer supervision and specify desired actions and targets in advance as a mechanism of controlling behavior and restricting autonomy.

2.4 Predictions Related to the Type of Expenditures on Accounting Information

The contractual incentives to improve financial performance (and thereby managers' pay) provide incentives to invest more heavily in accounting systems to generate information for decision-making and performance improvement. However, we argue that the *type* of accounting information demanded is likely to differ for different ownership types. Organizational performance can be improved in several ways including reducing costs, increasing revenues, and improving product mix, although the flexibility to pursue different cost reduction or revenue enhancing strategies likely varies as a function of ownership.

2.4.1 Revenue Enhancement

Hospitals use a number of strategies for increasing revenues, such as setting competitive prices, shifting the product and payer mix towards more profitable products and payers, and better credit and collection techniques. Of these strategies, hospitals have limited opportunities for increasing prices due to the predominance of fixed-fee pricing contracts with insurers. Hospitals can influence product-mix in the long run by eliminating unprofitable departments, however product-mix changes are difficult to achieve in the short-run.

Given the limited influence on prices and product mix, hospitals have increasingly focused on reducing bad debts. Indeed, the "most watched statistic" in hospitals is bad debt expense (Galloro 2004). Bad debts arise primarily from the inability or unwillingness of uninsured patients to pay for treatment costs. Typically, hospitals recover only about 15% of the bills incurred by self-pay patients. Because 16% (42 million) of all patients are uninsured, these costs can be substantial (Molnar 2004). Identifying uninsured patients who could pay is a difficult task that has important

financial performance consequences.[4] According to the *Wall Street Journal*, hospital administrators claim that collection of even a portion of uninsured patients' bills makes a substantial difference to their bottom lines (Rundle and Davies 2004).

Because of institutional constraints, nonprofit and government hospitals have less flexibility in pursuing aggressive collection practices compared to for-profit hospitals. In 2003 and 2004, 340 class action suits were filed against nonprofit and government hospitals on behalf of the uninsured. These suits mentioned aggressive collection tactics employed by hospitals and argued that because nonprofits have tax-exempt status, they should not be pursuing payment from the uninsured (Betbeze 2004). These arguments are consistent with institutional theory which postulates that nonprofit and government hospitals have more highly institutionalized environments, where conformity to externally defined requirements or regulations is more critical than attention to control and coordination of the use of resources (Scott 2001).

For-profit hospitals have more flexibility in collections because fewer institutional constraints prohibit revenue-enhancing behaviors. To improve collections and reduce bad debt expense, for-profit hospitals employ strategies such as sending financial counselors to talk to patients in their hospital rooms, hiring collection agencies, and providing a discount on patient bills if paid within 30 days of the billing date (Wilson 2004). Some for-profits have pursued even more aggressive strategies. For example, in April 2004, HCA, the largest for-profit hospital chain in the US, required patients to make co-payments before receiving non-emergency care. At Tenet Healthcare, the second largest for-profit chain the US, administrators determine patient co-payment amounts at the time of admission so that the payment can be collected when the service is provided (Rundle

and Davies 2004). For-profit managers with bonuses based on financial performance are likely to expend more effort on credit and collection activities to improve their revenues and margins. In the following hypothesis, we refer to incentive compensation as compensation expense sensitivity because this more closely aligns with the variable used in our tests. Hence our hypothesis is:

H1a: In the for-profit hospital sample, compensation expense sensitivity and accounting expenditures on credit and collection are positively related.

2.4.2 Cost Reduction

In the hospital industry, increasing performance via reducing costs is challenging because, similar to other service industries, a large proportion of hospital costs are capacity related and committed in advance (Cooper and Kaplan 1999). Since the mid-1980s, many cost-reduction strategies have been used by hospitals including re-engineering, outsourcing, consolidation, and closure of high-cost, unprofitable services such as trauma centers. Because nonprofit hospitals are constrained in improving their revenues by reducing bad debts, they are likely to search for other strategies to increase operating efficiency. Such strategies could include outsourcing, utilization reviews, capacity planning, and other cost reduction opportunities. While for-profit and nonprofit hospital managers have similar cost containment incentives, prior research suggests that for-profits were more aggressive in cost reductions in the late 1980s and early to mid-1990s. For example, Li and Rosenman (2001) use Washington State hospital data from 1988 to 1993 and perform a stochastic frontier analysis to show that for-profit hospitals were on average 9% more efficient than the nonprofits during the time period. Becker and Potter (2002) use data from 4,705 short-term general hospitals in 1994 to examine

operating expense per bed and full time employees per bed. The authors find that for-profit hospitals have lower costs and fewer FTEs per bed than nonprofit and government hospitals. Therefore it is likely that for-profits' operations in recent years have been more efficient and these managers have fewer opportunities for further cost reductions without affecting treatment quality.

Additional opportunities for cost reduction also arise in nonprofit hospitals because of their greater investment in fixed assets, relative to for-profits.[5] Consequently, nonprofits can improve capacity utilization and asset management to minimize costs. Finally, incentive contracting is relatively more recent in nonprofit hospitals (Lambert and Larcker 1985), and with the constraints on revenue maximization imposed by institutional constraints, nonprofit managers with incentive compensation are more likely to use accounting information to facilitate cost reduction. Hence we hypothesize that incentive compensation will motivate nonprofit managers to demand accounting information that facilitates cost reduction via budgeting, plant and equipment management, and inventory and supplies management. We refer to these expenditures as "general accounting" expenses in the following hypothesis.

H1b: In the nonprofit hospital sample, compensation expense sensitivity and expenditures on general accounting are positively related.

We make no predictions for government hospitals because we expect them to use much less incentive compensation than the other hospital types. However, we report results from the same empirical tests for these hospitals to provide additional evidence about factors that are related to accounting expenditures across ownership types.

2.5 Predictions Related to the Level of Accounting Expenditures

Government hospitals are steeped in a bureaucratic tradition with policies that constrain managers when lay-offs might be needed. These hospitals are likely to have larger accounting departments because workers may be less efficient, but cannot easily be fired. This increases accounting expenditures relative to the other hospital types.

Further, Geiger and Ittner (1996) predict and find that cost accounting systems in government agencies are more elaborate as the extent of competition among agencies for funding increases and as the extent of funding uncertainty increases. In county hospitals, budgets are submitted to county supervisors who disperse funds among all of the county agencies. These hospitals compete with all of the other county agencies for funding. In lean economic times, all departments and agencies suffer budget cuts, including hospitals. As the economy improves, hospital budget requests are more often met. However, because decisions about funds for these hospitals are influenced by local politics, trade-offs are made in expenditures for hospitals, other health care services, sheriff, and jail services, among many others. For example, politically conservative counties sometimes cut back on hospital funding and request that hospitals provide no care for illegal immigrants who are unable to pay.[6] These circumstances increase the uncertainty of funding in government hospitals.

In response to this interagency competition and funding uncertainty, government hospital accounting systems become more elaborate and consequently expenditures on these systems are also likely to increase. Managers invest in these systems to justify cost overruns and funding requests, and also to convince stakeholders that the hospitals control and rationally use resources (Geiger and Ittner 1996). For-profit and nonprofit hospitals do not face interagency competition for funding, or the uncertainty of funding

found in government hospitals, although all hospital ownership types face similar market competition. Accordingly, relative to for-profits and non-profits, government hospitals are likely to spend more on elaborate accounting systems and need more accounting employees to manage these systems.

We expect that these elaborate accounting systems will focus on budgets and reports, as well as utilization management, which we previously referred to in H1b as general accounting expenses. Therefore our hypothesis is:

H2: Government hospitals have higher levels of expenditures on general accounting information compared to for-profit and nonprofit hospitals.

3. Data

We use hospital data from the Office of Statewide Health Planning and Development (OSHPD), a department of the California Health and Human Services Agency. Reporting annual financial data to OSHPD is mandatory for all for-profit, nonprofit, and government hospitals operating in California, with the exception of Kaiser Foundation hospitals and Veterans Health Administration hospitals. These data are used by state regulatory bodies to make decisions on subsidies, tax exemption decisions, and other assessments. The state ensures the reliability of these reports through both desk and on-site audits. A large number of economics and health researchers have used these data (e.g. Duggan 2000, Currie and Fahr 2004), in addition to accounting researchers (e.g. Krishnan 2005, Eldenburg and Krishnan 2003).

To construct the compensation expense sensitivity variables, we use data from 1990-2002, a total of 13 years. Our hypotheses are tested using data from 2003, which was the latest year for which data were available when this portion of the analysis was

conducted.[7] Hospitals operating primarily as skilled nursing facilities (nursing home care) were eliminated because their treatment patterns, reimbursement systems, and operating strategies differ from those of acute care facilities, focusing on residential care rather than medical treatment. We examined lengths of stay and eliminated any hospital with stays greater than 60 days.

4. Research Method

4.1 Incentive Compensation by Ownership Type

Hypotheses 1a and 1b build on the theory that for-profit and nonprofit hospitals make greater use of incentive contracting than government hospitals. To ensure that this pattern holds in our sample, we employ the following empirical model:

$$\begin{aligned} &\textit{Compensation expense sensitivity} = \alpha + \beta_1(\textit{Non-Profit Dummy}) + \beta_2(\textit{For-Profit Dummy}) + \beta_3(\textit{Case-Mix Index}) + \beta_4(\textit{Proportion of Medicare Patients}) + \\ &\beta_5(\textit{Proportion of Medicaid Patients}) + \beta_6(\textit{Proportion of Revenue from Outpatients}) + \beta_7(\textit{LOS}) + \beta_8(\textit{Staffed Beds}) + \beta_9(\textit{Occupancy Rate}) + \\ &\beta_{10}(\textit{Competition Index}) + \beta_{11}(\textit{Psychiatric Beds Dummy}) + \beta_{12}(\textit{Teaching Dummy}) + \beta_{13}(\textit{Rural Dummy}) + \beta_{14}(\textit{System Dummy}) + \varepsilon_i \end{aligned} \quad (1)$$

We use a more restricted combined regression model for this portion of the analysis because our prediction is that *relative* to for-profit and nonprofit hospitals, government hospitals make less intensive use of use incentive contracts.[8] We use the coefficients on the non-profit and for-profit dummies in equation 1 to reflect their pay-for-performance sensitivity relative to government hospitals. The dependent variable in this model, as well as the models to test H1a and H1b, requires a measure of the pay-for-performance sensitivity for each hospital. The OSHPD data does not provide details about CEO and individual manager compensation or bonus weights, hence we infer the

incentive weights on performance measures implicitly by examining the relation between changes in compensation and changes in performance. We estimate separate regressions with log of total compensation expense as the dependent variable and log of operating margin as the independent variable. We use 13 years of data for the period 1990-2002 for these firm-specific regressions. We then use each hospital's beta coefficient on operating margin as the compensation weight for that hospital. We use the same technique to obtain the sensitivity of managerial compensation to net margins. The mean adjusted R^2 for the firm-level operating (net) margin regressions is 22% (20%). This technique has been used in previous studies (e.g., Baber, Daniel, and Roberts [2002], and Krishnan, Yetman, and Yetman [2006]). [9]

The OSHPD database provides details about total pay (salary plus bonus) for the highest-ranking managers of the hospital responsible for overall management and administration. These managers include the CEO, Medical Director, Nursing Director and their assistants for most hospitals. We analyze top management pay because these individuals work together to guide hospital operations. Lambert and Larcker (1995) use proprietary data to examine salaries and bonuses for the top five hospital administrators and find their compensation to be similar to the CEO's pay structure. Therefore we use this variable as our measure of managerial compensation. While this is a noisy measure because it aggregates salaries and bonuses, as long as it is correlated to our variable of interest, our empirical results are meaningful.

We conduct tests for both operating and net margins, because while operating margin captures operating efficiency, net margin also includes non-operating income and non-operating expenditures. Hospital managers also have significant influence over non-

operating income, which includes income from commercial activities unrelated to patient care, tax and other subsidies, grants, and donations. Managers can exert effort to garner additional funds to improve a hospital's bottom-line. Hence net margins are informative about managerial efforts toward cost reduction and revenue enhancement, and also in obtaining additional funding.

4.2 Type of Expenditures on Accounting Information

H1a predicts that for-profit hospitals will exhibit a positive association between compensation expense sensitivity and expenditures on accounting information related to credit and collection. H1b predicts that nonprofit hospitals will exhibit a positive association between compensation expense sensitivity and expenditures on general accounting. To test these hypotheses, we estimate the following regression model separately for each of the three types of hospitals.

$$\begin{aligned} &\textit{Accounting Expenditures per Patient} = \alpha + \beta_1(\textit{Compensation Expense Sensitivity}) + \beta_2(\textit{Case-Mix Index}) + \beta_3(\textit{Proportion of Medicare Patients}) + \\ &\beta_4(\textit{Proportion of Medicaid Patients}) + \beta_5(\textit{Proportion of Revenue from Outpatients}) + \beta_6(\textit{LOS}) + \beta_7(\textit{Staffed Beds}) + \beta_8(\textit{Occupancy Rate}) + \\ &\beta_9(\textit{Competition Index}) + \beta_{10}(\textit{Psychiatric Beds Dummy}) + \beta_{11}(\textit{Rural Dummy}) + \\ &\beta_{12}(\textit{System Dummy}) + \varepsilon_i \end{aligned} \quad (2)$$

We use a less restricted model of separate regressions for each hospital-type because hypothesis H1a (H1b) predicts a positive association between compensation expense sensitivity and accounting expenditures on credit and collection (general accounting) in for-profit (non-profit) hospitals.

When the dependent variable is credit and collection expenditures in equation 2, β_1 should be positive in for-profit hospitals (H1a) and when the dependent variable is general accounting, β_1 should be positive in nonprofit hospitals (H1b). Although we

make no predictions for government hospitals, we estimate equation 2 for this group and expect β_1 to be insignificant.

The OSHPD database partitions accounting expenditures into three categories: general accounting, patient accounting, and credit and collection. *General accounting* expenditures include those related to activities such as the preparation of ledgers, budgets and financial reports, payroll accounting, accounts payable accounting, plant and equipment accounting, inventory accounting, non-patient accounts receivable accounting, etc. This cost center includes direct expenses such as salaries and wages, benefits, professional fees, supplies, purchased services, etc. *Patient accounting* expenses relate to processing patient charges, claims, and bills, and patient-level accounting activities. *Credit and collection* expenditures include activities such as interviewing patients about credit, checking references, and using outside collection agencies. For completeness, we analyze these three groups of accounting expenditures individually, although we have no hypotheses related to patient accounting. For ease of interpretation and to control for size, accounting expenditures are scaled by the number of patients discharged.[10]

4.3 Level of Accounting Expenditures

H2 predicts that government hospitals will spend more on general accounting than for-profit and nonprofits. To test this hypothesis, we estimate the following regression equation using general accounting expenditure per patient as the dependent variable:

$$\begin{aligned} &\textit{General Accounting Expenditures per Patient} = \alpha + \beta_1(\textit{For-profit Dummy}) \\ &+\beta_2(\textit{Nonprofit Dummy}) + \beta_3(\textit{Case-Mix Index}) + \beta_4(\textit{Proportion of Medicare Patients}) + \beta_5(\textit{Proportion of Medicaid Patients}) + \beta_6(\textit{Proportion of Revenue from Outpatients}) + \beta_7(\textit{LOS}) + \beta_8(\textit{Staffed Beds}) + \beta_9(\textit{Occupancy Rate}) + \\ &\beta_{10}(\textit{Competition Index}) + \beta_{11}(\textit{Psychiatric Beds Dummy}) + \beta_{12}(\textit{Rural Dummy}) \\ &+\beta_{13}(\textit{Teaching Dummy}) + \beta_{14}(\textit{System Dummy}) + \varepsilon_i \end{aligned} \quad (3)$$

In this analysis, we use a combined regression because H2 predicts that *relative* to for-profit and non-profit hospitals, government hospitals will have higher expenditures on general accounting. Using the coefficients from these regressions, we test the significance of the differences between government and for-profit hospitals, and government and nonprofit hospitals. In addition, for a comprehensive picture, we estimate equation (3) for the other two categories of accounting expenditures, i.e., credit and collection, and patient accounting for government hospitals.

4.4 Control variables

Case mix measures the severity of illness of an average patient and controls for differences in accounting expenditures related to increased complexity of care. Medicare patient days as a proportion of total patient days is a control variable because prior research finds differences in costs related to proportion of Medicare patients (Hofler and Folland 1991), and these patients reflect a sizeable portion of revenues (for example, Zuckerman et al. 1994, Eldenburg and Krishnan 2003).

In 1990, the state of California established a program that offered financial incentives to hospitals providing a disproportionate share of care to the poor. For-profit and non-profit hospitals increased their shares of profitable Medicaid patients, but continued to avoid unprofitable Medicaid patients, while government hospitals were unresponsive to the incentives (Duggan 2000). Therefore we include the proportion of Medicaid patient days to the total patient days as a control. The proportion of outpatients is a control because hospitals are required by Medicare to treat patients in their emergency rooms regardless of ability to pay and this group can include a large number of indigent patients with little ability to pay for services. Length of stay (LOS) is included

because of its significant influence on resource utilization, operating performance, and the behavior of hospitals (Lynk 1995).

Prior research indicates that firm size influences performance and behavior in for-profit organizations (e.g. Jensen and Murphy 1990), as well as in nonprofit hospitals (Robinson and Phibbs 1989, Dranove et al. 1993, Alexander and Lee 1996, French 1996, Mick and Wise 1996, Pink and Leatt 1991, Santerre and Thomas 1993). Therefore the average number of staffed beds is a control. Consistent with prior literature on hospital efficiency, we include occupancy rates (number of patient days scaled by staffed beds times 365) (Zuckerman et al. 1994).

The competitive environment in which a firm operates is likely to influence contract design (Aggarwal and Samwick 1999, Bushman and Smith 2001, DeFond and Park 1999). Aggarwal and Samwick (1996) find that firms located in less competitive markets have higher CEO compensation and also that compensation is positively related to both own-firm and rival-firm performance. Hence, we include a measure of competition defined as 1/Herfindahl Hirschman Index. We define each county as a hospital market, consistent with prior studies (e.g. Lambert and Larcker 1995), and compute the market share of each hospital as the number of patients discharged by that hospital as a proportion of total patients discharged in the market. The Herfindahl Hirschman Index (HHI) is the sum of the squared market shares (expressed as proportions) of all the firms operating in the market, and provides a good measure of competitive intensity (Martin 1993). The higher the competition, the lower is the HHI.[11] We also perform sensitivity analysis by computing each hospital's proportion of revenue

to total revenues earned in the hospital market as a whole, with substantially the same results.

In addition, we include dummy variables for the presence of psychiatric beds because psychiatric patients require a different type of care with longer stays than regular patients. We include a dummy for teaching hospitals (in equations 1 and 3), because they tend to attract more complex cases and provide more charity care than other hospitals.[12] A rural hospital dummy is included because these hospitals tend to offer less complex care and have less access to managerial labor markets. Further, a control is added for membership in a hospital system because hospitals in specific systems may face similar types of constraints.

5. Results

5.1 Descriptive Statistics

Table 1 presents descriptive statistics for our sample hospitals.[13] Notice from the means that government hospitals spend the most on accounting information per patient across all expenditure categories. For-profit hospitals have greater compensation expense sensitivity (based on net margins) compared to nonprofit and government hospitals. Government hospitals have fewer Medicare patients who tend to be relatively profitable, but more Medicaid patients and outpatients who are typically quite unprofitable. Nonprofit hospitals have lower length of stay compared to for-profit and government hospitals. For-profit hospitals are smaller with fewer beds (115 on average) whereas nonprofit and government hospitals are approximately the same size (means of 203 and 204 beds respectively). Government hospitals have higher occupancy rates and are more

likely to be located in markets with lower competition, whereas for-profit hospitals are located in markets with higher competition.

5.2 Compensation Expense Sensitivity by Ownership Type

Table 2 presents the results of estimating equation 1, which examines the relative extent of compensation expense sensitivity in hospitals by ownership. Column 1 reports the results of compensation expense sensitivity to net margin, while column 2 reports the results of compensation expense sensitivity to operating margin. The coefficients on the for- and nonprofit dummies are significantly positive in both columns, indicating that for-profit and nonprofit hospitals have greater incentive compensation than government hospitals.

Hospitals with greater proportions of Medicare patients have lower compensation expense sensitivity. Because Medicare patients are reimbursed based on fixed-fee, hospital managers have limited flexibility to influence these revenues, and prior research finds that, on average, Medicare patients are profitable (Eldenburg and Krishnan 2003, Friedman et al 2004). In contrast, hospitals with greater proportions of Medicaid patients tend to use more incentive contracting because this patient pool tends to be unprofitable; state reimbursement levels are low relative to treatment costs. Greater effort on the part of hospital managers to contain costs is likely to result in substantial payoffs when proportions of Medicaid patients are larger. Competition is the other significant control variable. Hospitals located in areas with greater competition have lower compensation expense sensitivity, consistent with the results of Aggarwal and Samwick (1999), who find that firms in more competitive industries place greater weight on rival firm performance relative to own firm performance. However, the coefficients for the competition variable

are very low (-0.0002 for net margin and -0.0004 for operating margin), suggesting that the effect is not economically significant. The R-squares are low in these regressions, probably because our measure of compensation is noisy.

5.3 Relation between Incentive Compensation and Expenditures on Accounting Information

In Tables 3, 4, and 5, we examine the relation between incentive compensation as the independent variable, and expenditures on each of the three components of accounting (general accounting, patient accounting, and credit and collection) as the dependent variable for each ownership type. We report the results using compensation expense sensitivity to operating margins, however we find similar results when we use compensation expense sensitivity to net margins. Table 3 provides the results of estimating equation 2 in for-profit hospitals. In column 1, the dependent variable is expenditures on general accounting per patient, column 2 reflects patient accounting costs, and column 3 shows the credit and collection expenditure results. The coefficient on *Compensation Expense Sensitivity* is positive and statistically significant for credit and collection expenditures. These results are consistent with H1a and suggest that for-profit managers respond to incentives to improve performance by investing in credit and collection, which helps facilitate decisions that increase revenue performance.

Table 4 contains the results of estimating equation 2 in nonprofit hospitals. Recall that H1b predicts a positive association between compensation expense sensitivity and expenditures on general accounting. The results in column 1 support H1b - the coefficient on compensation expense sensitivity is positive and statistically significant and suggests that nonprofit hospitals with greater incentive compensation are more likely to spend

more on general accounting. Table 5 contains the results of estimating equation 2 in government hospitals. As expected, the compensation expense sensitivity variable is not significant for any accounting expenditures.

The control variables reflect factors that influence accounting expenditures across hospital types. Case mix index reflects severity of illness and is positively related to credit and collection costs for all the three hospital types. As severity increases, patients incur more costs and may have difficulty paying or are no longer covered by insurance, and hospitals need to work harder to collect receivables. Case mix in nonprofit and government hospitals is also positively related to general accounting. These hospitals tend to be larger than the for-profits and treat more complex patients, requiring more complex accounting systems to better manage operations. In government hospitals, as proportion of Medicare business increases, credit and collection costs decrease, probably because Medicare pays for bad debts incurred by their patients and government hospitals can expend fewer resources collecting receivables from those patients.

In nonprofit and government hospitals, as the proportions of outpatients increase, expenditures on general and patient accounting tend to increase. Hospitals are required to serve all patients who use their emergency departments, regardless of ability to pay. Emergency departments usually have a higher portion of uninsured patients. Therefore hospitals use accounting resources to improve operations as charity care levels increase, and to identify whether patients can pay. For government hospitals, outpatient increases are unrelated to credit and collections, whereas a positive relation arises in nonprofits. This difference could be attributed to government hospitals' soft budget constraints, that is, any efforts in increasing collections is unrewarded because funding is reduced as

operations improve. In for-profit hospitals, proportion of outpatients is negatively associated with general accounting expenditures. Recall that these hospitals are smaller and tend to be located in more affluent neighborhoods. Therefore outpatients tend to require less complicated treatment and also tend to be insured, reducing the need to expend resources on accounting to cut costs.

Length of stay (LOS) is positively related to accounting expenditures for all hospital types. Costs increase as length of stay increases, requiring increased cost monitoring, increased patient billing services, and increased attention to receivables as patient bills accumulate. Size (staffed beds) is negatively related to general accounting for all hospital types, suggesting that a proportion of accounting costs are fixed, resulting in economies of scale. However, notice that the coefficients on LOS and size are small, indicating that although they are statistically significant, they do not have a major influence on the dependent variable. Competition does not appear to affect for-profit hospital accounting expenditures, but is positively related to credit and collection accounting expenditures for nonprofit and government hospitals. Nonprofit and government hospitals in more competitive areas have to compete for resources and hence invest in accounting to improve decision making. However, prior research has shown that in competitive markets, for-profits tend to "cream skim" by attracting more profitable insured patients (Norton and Staiger 1994), reducing their need to improve decision making by investing in accounting. Hospitals that belong to for-profit systems invest more in their patient accounting and collections systems while nonprofit system members are able to reduce these accounting expenditures. For-profit systems are often large, such as HCA, and system reporting requirements are likely to be more onerous, whereas the

nonprofit systems, such as Catholic Healthcare West, are loosely knit systems developed to help hospitals benefit by sharing expenses and purchasing power. Government hospitals are rarely part of hospital systems, and when they are members of a system, these systems also tend to be loose-knit.

The separate (by ownership) regressions in tables 3-5 provide the benefit of controlling for hospital environmental features specific to each hospital type that influence the relation between the control variables and accounting expenditures. However, a limitation of the separate regressions is the loss of efficiency caused by smaller sample sizes. We also estimate combined regressions to improve our efficiency and report the results in Table 6A. The interaction between for-profit and incentive compensation is statistically significant when the dependent variable is credit and collection (Column 3 of Table 6A), which is consistent with H1a. Thus, in for-profit hospitals there is a positive relation between incentive compensation and accounting expenditures on credit and collection. In Column 1 of Table 6A, the interaction between nonprofit and incentive compensation is statically significant when the dependent variable is general accounting. These results indicate that in nonprofit hospitals, there is a positive relation between incentive compensation and expenditures on general accounting, consistent with H1b.

5.4 Accounting Expenditures in Government Hospitals versus Nonprofit and For-Profit Hospitals

H2 predicts that government hospitals will spend more on general accounting compared to the other two hospital types. To test this, we use the regression model in

equation 3. Because the government dummy is the omitted dummy in equation 3, β_1 provides the estimate of the difference between government hospitals and for-profit hospitals, and β_2 reflects an estimate of the difference between government hospitals and nonprofit hospitals.

The results in Table 6B are consistent with H3.[14] Government hospitals spend more on general accounting compared to nonprofits and for-profits. For the other two categories of accounting expenditures, government hospitals spend more on credit and collection and patient accounting compared to nonprofit hospitals, and spend more on patient accounting compared to for-profit hospitals. The difference in expenditures on credit and collection between government and for-profit hospitals is not significant. This result arises from differences in patient populations treated. Recall that government hospitals provide large amounts of charity care and treat a larger proportion of indigent patients than either for-profit or nonprofit hospitals. Therefore bad debts are likely to be a larger proportion of receivables, and consequently require more effort in determining ability to pay and in collecting payments. In addition, government hospitals have lower incentive to outsource collections, but more incentive to hire a larger staff to manage this function. Hence their expenditures on credit and collections are not significantly different than those in for-profit hospitals.[15]

5.5 Estimation Issues

Endogeneity issues are likely to arise in testing H1a and H1b using equation 2 because hospitals with higher quality accounting systems or that invest more in accounting, may have greater incentive pay for managers. In addition, if expenditures on more refined accounting systems reduce the noise in performance measures, these

measures are more useful for incentive contracting. To test whether endogeneity bias influences our results, we use a two-stage estimation procedure and conduct the Hausman omitted variable test. We carry out the procedure outlined by Berndt (1991, chapter 9) and Greene (2000, chapter 16), as described in the following paragraphs.

In equation 2, in the first stage, we regress the likely endogenous variable (incentive compensation) as a function of other exogenous variables. We use the exogenous variables from equation 2 in the first stage regression and in addition, use net assets per patient and number of services offered as additional predictors.[16] We then use the omitted variable version of the Hausman test to test for endogeneity (Kennedy, 1998, page 150-151). That is, we use the fitted values of the incentive compensation from the first stage in addition to all the other variables in the regression models in Tables 3, 4, and 5. We find (untabulated) that the fitted values are not statistically significant in any of the three regressions in tables 3, 4, and 5, while the original variable (incentive compensation) continues to be significant. The addition of the fitted values to the regressions in tables 3, 4, and 5 does not significantly change the overall fit or the explanatory power of the regressions (F-test denotes that all p's > 0.50). Thus, we can reject the hypothesis that endogeneity is influencing our results and conclude that to the extent that there are no other correlated omitted variables our coefficient estimates in Tables 3, 4, and 5 are unbiased.

To test for multicollinearity, we examined the Variance Inflation Factors for each of the regression models. The VIFs range from from 1.18 to 3.71 in Table 2, from 1.15 to 5.37 in Table 3, from 1.13 to 4.24 in Table 4, from 1.27 to 4.11 in Table 5, and from 1.15

to 3.77 in Table 6. Because all the VIF scores were well below 10, multicollinearity is not a serious concern (Kennedy 1998).

Because our incentive compensation measure is derived implicitly, we performed two additional sensitivity tests. We use a one-year change in managerial compensation expense as the dependent variable and the change in net margin (or operating margin) as the dependent variable. The interactions between for-profit and change in net margin (or operating margin), and nonprofit and change in net margin (or operating margin) are significant, suggesting that for-profits and nonprofits have higher pay-performance sensitivity than government hospitals. In addition, we define compensation expense sensitivity as log (change in compensation expense in year 2003 to 2002) /Log (Change in operating margin [or net margin] year 2002 to 2001), which is regressed using nonprofit and for-profit dummies and other controls as predictors. The results are very similar to the 13-year firm-specific regressions reported in Table 2 and indicate that for-profit and nonprofit hospitals have higher incentive compensation sensitivity than do government hospitals.

Our estimations in Tables 2-5 and 6A use cross-sectional data for 2003 for the control variables. A limitation of our analysis is that we were unable to use average values of the control variables for the period 1990-2003 because we do not have a consistent balanced data set of all the control variables over this period. However, the dummy variables such as ownership, psychiatric beds, teaching hospital, and rural remain unchanged over the years, as does the number of staffed beds. Based on our knowledge of the hospital industry, the variables such as patient mix are based on hospital location, and hence are unlikely to change significantly over the years.

Because some of our variables are measured indirectly, and to provide further insight into differences in compensation practices and accounting expenditures across ownership types, we mailed a survey to 379 sample hospitals. Respondents were asked to rate on a 1 to 5 scale how data from the accounting system were used, where 1 was not used at all, and 5 was used to a greater extent. The uses we included were: to plan for and manage activities and programs, to request funds from the governing board or government supervisory agency, to determine managerial compensation, to report about costs and policies for regulatory requirements, to perform variance analysis and monitor operations, and to determine prices. We also asked the respondents to estimate the proportions of total accounting expenditures used for the following activities: budgeting and monitoring, reports for fulfilling legislative requirements, analysis to improve productivity or to cut costs, analysis to improve quality, perform strategic planning, financial statement preparation, daily operations such as payroll, accounts payable, and determining salaries and compensation.

We received responses from a total of 47 hospitals, including 11 for-profit hospitals, 23 nonprofit hospitals, and 13 government hospitals (including 3 county hospitals and 10 district hospitals). We used multinomial logistic regressions to discern differences in the use of accounting information, for each of the uses of accounting information listed in the survey. A summary of our findings is presented in Table 7.

The results of the multinomial logistic regressions, where the dependent variable was the response to each survey question, and the independent variables were ownership types, indicate the following. First, for-profit hospitals make greater use of accounting information for planning and managing activities, compared to nonprofit and government

hospitals. Second, for-profit and nonprofit hospitals make greater use of accounting information for determining managerial compensation, compared to government hospitals. Third, no differences arise among ownership types in using accounting information to report about costs and policies for regulatory requirements, for variance analysis and monitoring, or to determine prices.

The survey results also indicate no differences between ownership types in their use of accounting information to request funds from the governing board or government supervisory agency. However, when we excluded the district hospitals from the government hospitals sample and only examined the responses of the county hospitals, we found differences between county hospitals and other hospitals on this question. Results show that the county hospitals made greater use of accounting information to request funds from their governing boards or government supervisory agencies compared to non-profit and for-profit hospitals (mean for the county hospitals = 5.00, difference between county and for-profit and county and non-profit hospitals was significant at $p<0.01$). For the other parts of this survey question, the county and the district hospitals' responses were similar.[17]

Consistent with the results from our econometric analysis, the survey results indicate that for-profit hospitals make greater use of accounting information for determining managerial compensation and operating decisions, whereas government hospitals use accounting information for legitimization.

6. Conclusions

In this study we find that the prevalence of incentive contracting and the relation between incentive contracting and expenditures on accounting information varies among

hospitals of different ownership types. We provide evidence that for-profit and nonprofit hospitals are more likely to use incentive contracts compared to government hospitals. We speculate that these differences are driven by governance differences in these hospitals. Non-profit and for-profit hospitals have appointed boards, private meetings, and more business professionals on their boards, whereas government hospitals are overseen by county boards of supervisors or agency directors who report to the supervisors. Further, compensation for the head of a county hospital is unlikely to differ from the head of any other county agency, so the use of incentive contracting is less prevalent.

The emphasis of for-profit and non-profit boards is to increase overall performance, and their diffused ownership places fewer constraints regarding the methods used to achieve these goals. Hence for-profit and nonprofit boards are likely to use incentive contracts that tie managerial compensation to accounting performance to align managers' and owners' interests. In addition, it is likely that for-profit and non-profit hospitals also use non-financial measures such as quality to evaluate managers, although we do not have data to examine such measures. It would be worthwhile for future research to examine the use of non-financial performance measures by various types of hospitals.

A limitation of our study is that we use an implicit measure (compensation expense sensitivity) instead of actual compensation contracts because we lack data on the details of managerial contracts. However, our models are similar to other researchers who have used implicit estimation of incentive weights (e.g. Brickley and Van Horn 2002,

Jensen and Murphy 1990). In addition, we use a richer set of firm-level and market-level control variables.

Future research in industries with firms of various ownership types, such as education and health care, could also explore differences that arise in compensation practices and accounting investments. The finding that ownership influences expenditures on the different types of accounting information suggests that the objective function of a firm, as well as its goals, influence incentive contracting, which subsequently influences the type of accounting information demanded by managers.

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Footnotes

[1] See the California Association of Public Hospitals web site at http://caph.org/.
[2] In this paper, we refer to non-governmental nonprofits as "nonprofits."
[3] The government hospitals in our sample obtain mean (median) subsidies of 27.64% (30.19%) of revenue.
[4] In 2004, three-quarters of uninsured patients were above the poverty line (http://covertheuninsuredweek.org/factsheets/display.php?FactSheetID=108).
[5] The average nonprofit hospital in our sample had $13,160 per patient invested in property, plant, and equipment assets, while the average for-profit hospital had $7,194, and the average government hospital had $13,136.
[6] This information was provided through our conversations with officials from the California Association of Public Hospitals (CAPH).
[7] We re-ran our empirical analysis using data for the period 1998 through 2002, both on a year-by-year basis and using the pooled data, with substantively the same results. We report the results for 2003, because we want to test the hypotheses using a different year from the ones which were used to construct the variables.
[8] A combined regression assumes that the error variances are the same across hospital types.
[9] As a sensitivity check, we also used a logarithmic difference specification to obtain the compensation weights. Change in managerial compensation expense was defined as log (Managerial compensation expense in year t+1 – Managerial compensation expense in year t/Managerial compensation expense in year t) and change in net margin was defined as log (Net Margin in year t+1 – Net Margin in year t / Net Margin in year t). The results were very similar to the results reported in the tables. We also ran the specifications using operating margins and found similar results.
[10] To examine sensitivity of our results, we scaled the accounting expenses by the ratio of the proportion of revenues from inpatients to total revenue, and obtained consistent results.
[11] We use 1/Herfindahl Hirschman Index for ease of interpretation. Thus, a monopoly market will have a competition index of 1, while a market with two firms with 40% and 60% share respectively, will have a competition index of 1.92.
[12] We do not include a teaching hospital dummy in equation 2 (Tables 3-5) because there are no for-profit teaching hospitals in our sample.
[13] We winsorized all observations at the 1st and 99th percentile to control for outliers. In addition, we also removed observations which had a studentized residual greater than two or less than negative two.
[14] The adjusted R^2 of this regression was 0.52.
[15] We also estimated a regression for government hospitals with total accounting expenditures per patient as dependent variable and subsidy received per patient as independent variable, in addition to the controls listed in Table 5. The coefficient on the subsidy per patient was positive and significant (0.10, t=2.02, p<0.05), with an R^2 of 57%. These results that government hospitals receiving greater subsidies spend more on accounting per patient suggest that these hospitals use accounting information for legitimization purposes. The subsidy variable did not have a significant association with accounting expenditures for the for-profit and non-profit hospitals.
[16] For two-stage estimation, the first stage has to include at least one variable that is not included in the second stage. The best candidate is a variable that is correlated with the likely endogenous variable and uncorrelated with the dependent variable in the second stage.
[17] For this particular use of accounting information, we believe that the differences between district and county hospitals arise from the funding models for these two ownership types. While both district and county hospitals are publicly governed and have similar incentives for top

managers, county hospitals can lobby for increasing funding from the county supervisors, whereas district hospitals are subsidized by a percentage of property tax revenues. Increasing property taxes requires voter approval at a general election, and is rarely undertaken because it is difficult to get voters to increase their taxes.

TABLE 1
Descriptive statistics

Variable	For-Profit Hospitals			Non-Profit Hospitals			Government Hospitals		
	Mean	Median	Std Dev	Mean	Median	Std Dev	Mean	Median	Std Dev
Compensation Expense Sensitivity (based on Net Margin)	0.036	0.003	0.073	0.021	0	0.044	0.012	0	0.03
Compensation Expense Sensitivity (based on Operating Margin)	0.032	0.002	0.063	0.030	0	0.108	0.009	0	0.020
General Accounting Expenditures Per Patient ($)	169	80	369	147	99	196	334	208	365
Patient Accounting Expenditures Per Patient ($)	228	154	326	242	169	329	499	296	621
Credit and Collection Expenditures Per Patient ($)	106	77	115	75	48	102	122	78	141
Case Mix Index	1.07	0.97	0.43	1.08	1.05	0.26	0.95	0.93	0.16
Proportion of Medicare	0.40	0.38	0.23	0.39	0.39	0.17	0.29	0.29	0.22
Proportion of Medicaid	0.41	0.39	0.21	0.33	0.36	0.18	0.31	0.31	0.20
Proportion of Outpatients	0.23	0.21	0.19	0.31	0.29	0.14	0.32	0.32	0.24
LOS	8.29	5.99	7.46	6.12	4.99	4.04	9.10	5.49	7.27
Staffed Beds	115	101	85	203	172	157	204	100	275
Occupancy rate	0.58	0.60	0.20	0.63	0.66	0.16	0.69	0.70	0.25
Competition Index	25.54	11.49	26.71	15.98	5.27	23.06	9.29	3.01	16.67

Notes:
Data are for the year 2003, except for compensation expense sensitivity which is based on the weights from firm-specific regressions for each hospital using13 years of data from 1990-2002. The sample sizes are: non-profit 249, for-profit 141, and government hospitals 87.

TABLE 2
Ownership and compensation expense sensitivity (t-values in parentheses)

$$\textit{Compensation Expense Sensitivity} = \alpha + \beta_1(\textit{Non-Profit Dummy}) + \beta_2(\textit{For-Profit Dummy}) + \beta_3(\textit{Case-Mix Index}) + \beta_4(\textit{Proportion of Medicare Patients}) + \beta_5(\textit{Proportion of Medicaid Patients}) + \beta_6(\textit{Proportion of Revenue from Outpatients}) + \beta_7(\textit{LOS}) + \beta_8(\textit{Staffed Beds}) + \beta_9(\textit{Occupancy Rate}) + \beta_{10}(\textit{Competition Index}) + \beta_{11}(\textit{Psychiatric Beds Dummy}) + \beta_{12}(\textit{Teaching Dummy}) + \beta_{13}(\textit{Rural Dummy}) + \beta_{14}(\textit{System Dummy}) + \varepsilon_i$$

	Dependent Variable: Compensation Expense Sensitivity to	
Predictors	Net Margin	Operating Margin
Non Profit Dummy	0.015 (2.03)**	0.024 (1.93)*
For Profit Dummy	0.031 (3.58)***	0.024 (1.70)*
Case Mix Index	0.005 (0.54)	-0.002 (-0.14)
Proportion of Medicare	-0.050 (-2.23)**	-0.026 (-0.69)
Proportion of Medicaid	0.053 (2.32)**	0.076 (2.02)**
Proportion of Outpatients	0.007 (0.36)	-0.014 (-0.41)
LOS	0.000(-0.43)	0.000 (-0.10)
Staffed Beds	0.000 (-0.06)	0.000 (-0.04)
Occupancy Rate	0.017 (1.17)	0.006 (0.25)
Competition Index	0.000 (-2.22)**	0.000 (-2.13)**
Psychiatric Beds Dummy	0.005 (0.55)	-0.003 (-0.18)
Teaching Dummy	0.006 (0.49)	0.026 (1.40)
Rural hospital Dummy	0.000 (-0.01)	0.000 (-0.77)
System Dummy	-0.004 (-0.69)	-0.007 (-0.82)
Intercept	-0.007 (0.38)	0.003 (0.09)
N	477	477
Adjusted R^2 (F-Value)	0.03 (F=2.12)***	0.01 (F=1.86)**

Notes:
*, **, ***: Significant at $p<0.10$, $p< 0.05$, and $p< 0.01$ (two-tailed) respectively.
Data for all variables except compensation expense sensitivity are for the year 2003. *Compensation Expense Sensitivity* is computed using firm-specific regressions using data from 1990 to 2002. *Non Profit Dummy* (*For Profit Dummy*) is 1 if the hospital is non-profit (for-profit) and 0 otherwise. *Government Dummy* is the omitted dummy. *Case Mix Index* reflects the average severity of illness. *Proportion of Medicare* (*Medicaid*) is Medicare (Medicaid) patient days to total patient days. *Proportion of Outpatients* is outpatient revenue to total revenue. *LOS* is length of stay from admittance to discharge. *Occupancy Rate* is patient days scaled by staffed beds times 365. *Competition Index* is defined as 1/Herfindahl Hirschman Index. *Psychiatric Beds* dummy is 1 if the hospital also treats psychiatric patients and 0 otherwise. *Teaching*, *Rural*, and *System* dummy variables are 1 if the hospital is a teaching hospital, rural hospital, or belongs to a multi-hospital system respectively.

TABLE 3
Compensation expense sensitivity and expenditures in accounting in for-profit hospitals (t-values in parentheses)

$$\textit{Accounting Expenditures per Patient} = \alpha + \beta_1(\textit{Compensation Expense Sensitivity}) + \beta_2(\textit{Case-Mix Index}) + \beta_3(\textit{Proportion of Medicare Patients}) + \beta_4(\textit{Proportion of Medicaid Patients}) + \beta_5(\textit{Proportion of Revenue from Outpatients}) + \beta_6(\textit{LOS}) + \beta_7(\textit{Staffed Beds}) + \beta_8(\textit{Occupancy Rate}) + \beta_9(\textit{Competition Index}) + \beta_{10}(\textit{Psychiatric Beds Dummy}) + \beta_{11}(\textit{Rural Dummy}) + \beta_{12}(\textit{System Dummy}) + \varepsilon_i$$

Predictors	Dependent Variable: Per patient expenditures on		
	General Accounting	Patient Accounting	Credit and Collection
Compensation Expense Sensitivity	-77.64 (-0.32)	86.84 (0.34)	346.13 (2.26)**
Case Mix Index	-54.98 (-1.00)	57.19 (1.00)	64.43 (1.79)*
Proportion of Medicare	152.02 (0.79)	303.68 (1.55)	167.05 (1.52)
Proportion of Medicaid	-335.10 (-1.65)	1.20 (0.01)	-81.81 (-0.69)
Proportion of Outpatients	-322.30 (-1.90)*	-46.57 (-0.26)	-17.34 (-0.16)
LOS	6.82 (14.85)***	5.85 (12.48)***	0.11 (0.42)
Staffed Beds	-0.69 (-2.50)**	-0.13 (-0.44)	-0.02 (-0.11)
Occupancy rate	-237.81 (-2.13)**	-553.16 (-4.71)***	-303.49 (-4.60)***
Competition Index	-0.13 (-0.19)	57.19 (1.00)	-0.09 (-0.22)
Psychiatric Beds Dummy	-20.37 (-0.30)	276.12 (3.84)***	91.09 (2.17)**
Rural hospital Dummy	-31.59 (-0.30)	177.11 (1.68)*	-32.62 (-0.51)
System Dummy	25.07 (0.54)	123.67 (2.61)**	93.38 (3.41)***
Intercept	500.76 (3.95)***	184.36 (1.36)	122.77 (1.54)
N	135	129	108
Adjusted R^2 (F-Value)	0.72 (F=30.47)***	0.64 (F=19.94)***	0.20 (F=3.16)***

Notes:
*, **, ***: Significant at $p<0.10$, $p< 0.05$, and $p< 0.01$ (two-tailed) respectively.
Data for all variables except compensation expense sensitivity are for the year 2003. Accounting Expenditure per Patient is expenditures on general accounting, patient accounting, and credit and collection respectively, scaled by the number of patients discharged. *Compensation Expense Sensitivity* is computed using firm-specific regressions using data from 1990 to 2002. *Case Mix Index* reflects the average severity of illness. *Proportion of Medicare* (*Medicaid*) is Medicare (Medicaid) patient days to total patient days. *Proportion of Outpatients* is outpatient revenue to total revenue. *LOS* is length of stay from admittance to discharge. *Occupancy Rate* is patient days scaled by staffed beds times 365. *Competition Index* is defined as 1/Herfindahl Hirschman Index. *Psychiatric Beds* dummy is 1 if the hospital also treats psychiatric patients and 0 otherwise. *Rural* and *System* dummy variables are 1 if the hospital is a rural hospital, or belongs to a multi-hospital system respectively.

TABLE 4
Compensation expense sensitivity and expenditures in accounting in non-profit hospitals (t-values in parentheses)

Accounting Expenditures per Patient = $\alpha + \beta_1$*(Compensation Expense Sensitivity)* + β_2*(Case-Mix Index)* + β_3*(Proportion of Medicare Patients)* + β_4*(Proportion of Medicaid Patients)* + β_5*(Proportion of Revenue from Outpatients)* + β_6*(LOS)* + β_7*(Staffed Beds)* + β_8*(Occupancy Rate)* + β_9*(Competition Index)* + β_{10}*(Psychiatric Beds Dummy)* + β_{11}*(Rural Dummy)* + β_{12}*(System Dummy)* + ε_i

Predictors	Dependent Variable: Per patient expenditures on		
	General Accounting	Patient Accounting	Credit and Collection
Compensation Expense Sensitivity	272.52 (2.59)**	144.68 (0.34)	18.22 (0.15)
Case Mix Index	115.69 (2.26)**	159.16 (1.66)*	112.51 (4.85)***
Proportion of Medicare	-124.40 (-1.13)	-141.03 (-0.69)	-45.98 (0.98)
Proportion of Medicaid	188 (1.48)	290.06 (1.23)	-2.31 (-0.04)
Proportion of Outpatients	233.60 (2.26)**	676.08 (3.59)***	108.55 (2.22)**
LOS	2.17 (7.52)***	5.33 (10.03)***	3.50 (19.52)***
Staffed Beds	-0.19 (-2.20)**	-0.01 (-0.08)	-0.04 (-1.01)
Occupancy Rate	-29.83 (-0.42)	-102.24 (-0.77)	0.48 (0.01)
Competition Index	1.05 (2.35)**	0.20 (0.25)	0.55 (2.86)***
Psychiatric Beds Dummy	129.91 (2.30)	56.65 (0.56)	-8.25 (-0.24)
Rural hospital Dummy	-6.73 (0.18)	-18.65 (-0.28)	-30.62 (-1.92)*
System Dummy	-36.08 (-1.79)*	-67.37 (-1.81)*	-20.52 (-2.29)**
Intercept	-132.82 (1.71*)	-215.65 (-1.46)	-75.96 (2.15)**
N	201	204	163
Adjusted R^2(F-Value)	0.34 (F=10.32)***	0.44 (F=13.47)***	0.73 (F=36.49)***

Notes:
*, **, ***: Significant at $p<0.10$, $p< 0.05$, and $p< 0.01$ (two-tailed) respectively.
Data for all variables except compensation expense sensitivity are for the year 2003. Accounting Expenditure per Patient is expenditures on general accounting, patient accounting, and credit and collection respectively, scaled by the number of patients discharged. *Compensation Expense Sensitivity* is computed using firm-specific regressions using data from 1990 to 2002. *Case Mix Index* reflects the average severity of illness. *Proportion of Medicare* (*Medicaid*) is Medicare (Medicaid) patient days to total patient days. *Proportion of Outpatients* is outpatient revenue divided by total revenue. *LOS* is length of stay from admittance to discharge. *Occupancy Rate* is the number of patient days scaled by staffed beds times 365. *Competition Index* is defined as 1/Herfindahl Hirschman Index. *Psychiatric Beds* dummy is 1 if the hospital also treats psychiatric patients and 0 otherwise. *Rural* and *System* dummy variables are 1 if the hospital is a rural hospital, or belongs to a multi-hospital system respectively.

TABLE 5
Compensation expense sensitivity and expenditures in accounting in government hospitals (t-values in parentheses)

$$\textit{Accounting Expenditures per Patient} = \alpha + \beta_1(\textit{Compensation Expense Sensitivity}) + \beta_2(\textit{Case-Mix Index}) + \beta_3(\textit{Proportion of Medicare Patients}) + \beta_4(\textit{Proportion of Medicaid Patients}) + \beta_5(\textit{Proportion of Revenue from Outpatients}) + \beta_6(\textit{LOS}) + \beta_7(\textit{Staffed Beds}) + \beta_8(\textit{Occupancy Rate}) + \beta_9(\textit{Competition Index}) + \beta_{10}(\textit{Psychiatric Beds Dummy}) + \beta_{11}(\textit{Rural Dummy}) + \beta_{12}(\textit{System Dummy}) + \varepsilon_i$$

Predictors	Dependent Variable: Per patient expenditures on		
	General Accounting	Patient Accounting	Credit and Collection
Compensation Expense Sensitivity	-1,309.34 (-1.02)	-689.32 (-0.28)	-4.39 (-0.01)
Case Mix Index	637.84 (2.49)**	699.95 (1.41)	403.14 (3.14)***
Proportion of Medicare	-30.06 (-0.11)	88.56 (0.16)	-398.58 (-3.19)***
Proportion of Medicaid	-541.20 (-1.65)	-230.42 (-0.36)	9.18 (0.06)
Proportion of Outpatients	1,194.47 (4.40)***	1,650.06 (3.15)***	116.96 (0.94)
LOS	6.54 (7.11)***	8.62 (4.86)***	2.03 (5.12)***
Staffed Beds	-0.86 (-3.26)***	-1.77 (-3.50)***	-0.302 (-2.66)***
Occupancy Rate	159.62 (0.86)	501.71 (1.40)	-90.64 (-1.08)
Competition Index	2.61 (0.89)	2.21 (0.39)	403.14 (3.14)***
Psychiatric Beds Dummy	302.97 (1.82)*	80.67 (0.25)	-30.59 (-0.35)
Rural hospital Dummy	-31.14 (-0.32)	-4.48 (-0.02)	-22.07 (-0.51)
System Dummy	-111.40 (-0.63)	-129.06 (-0.38)	58.68 (0.82)
Intercept	-683.85 (-2.13)**	-1,077.52 (-1.74)*	-125.32
N	71	71	59
Adjusted R^2 (F-Value)	0.58 (F=8.31)***	0.46 (F=5.66)***	0.55 (F=6.58)***

Notes:
*, **, ***: Significant at $p<0.10$, $p< 0.05$, and $p< 0.01$ (two-tailed) respectively.
Data for all variables except compensation expense sensitivity are for the year 2003. Accounting Expenditure per Patient is expenditures on general accounting, patient accounting, and credit and collection respectively, scaled by the number of patients discharged. *Compensation Expense Sensitivity* is computed using firm-specific regressions using data from 1990 to 2002. *Case Mix Index* reflects the average severity of illness. *Proportion of Medicare* (*Medicaid*) is Medicare (Medicaid) patient days to total patient days. *Proportion of Outpatients* is outpatient revenue to total revenue. *LOS* is length of stay from admittance to discharge. *Occupancy Rate* is the number of patient days scaled by staffed beds times 365. *Competition Index* is defined as 1/Herfindahl Hirschman Index. *Psychiatric Beds* dummy is 1 if the hospital also treats psychiatric patients and 0 otherwise. *Rural* and *System* dummy variables are 1 if the hospital is a rural hospital, or belongs to a multi-hospital system respectively.

TABLE 6A
Combined Regressions of compensation expense sensitivity and expenditures in accounting (t-values in parentheses)

*Accounting Expenditures per Patient = $\alpha + \beta_1$(Compensation expense sensitivity) + β_2(For-Profit) + β_3(Non-Profit) + β_4(Incentive Compensation*For-Profit) + β_5(Incentive Compensation*Non-Profit) + β_6(Case-Mix Index) + β_7(Proportion of Medicare Patients) + β_8(Proportion of Medicaid Patients) + β_9(Proportion of Revenue from Outpatients) + β_{10}(LOS) + β_{11}(Staffed Beds) + β_{12}(Occupancy Rate) + β_{13}(Competition Index) + β_{14}(Psychiatric Beds Dummy) + β_{15}(Rural Dummy) + β_{16}(System Dummy) + ε_i*

Predictors	Dependent Variable: Per patient expenditures on		
	1 General Accounting	2 Patient Accounting	3 Credit and Collection
Compensation Expense Sensitivity	-1,074.20 (-0.92)	-486.61(-0.27)	-304.64 (-0.47)
For-Profit	-123.99 (-2.98)***	-135.35 (-2.07)**	-32.94 (-1.38)
Non-Profit	-124.04 (-3.52)***	-157.88 (-2.89)***	-56.69 (-2.86)***
Incentive Comp*For-Profit	1,115.89 (0.93)	172.22 (0.09)	513.23 (2.76)***
Incentive Comp*Non-Profit	1,285.74 (3.09)***	617.37 (0.34)	268.95 (0.41)
Case Mix Index	138.15 (3.42)***	202.16 (3.20)***	72.30 (2.79)***
Proportion of Medicare	-58.07(-0.52)	-139.86 (-0.81)	-61.25 (-0.99)
Proportion of Medicaid	--146.91 (-1.18)	308.18 (1.58)	13.39 (0.19)
Proportion of Outpatients	-266.90(2.72)***	650.34 (4.23)***	71.60 (1.21)
LOS	4.55(18.42)***	4.10 (10.71)***	0.83 (5.78)***
Staffed Beds	-0.24 (-2.69)**	-0.10 (-0.76)	-0.0003 (-0.01)
Occupancy rate	-104.41 (-1.48)	-32.67 (-0.30)	-62.00 (-1.54)
Competition Index	0.81(1.75)*	1.52 (2.14)**	0.36 (1.39)
Psychiatric Beds Dummy	116.10 (2.56)***	197.23 (2.71)***	20.57 (0.77)
Rural hospital Dummy	21.34 (0.53)	164.14 (2.64)*	-12.23 (-0.84)
System Dummy	-31.66 (-1.35)	-32.67 (-0.30)	19.30 (1.47)
Intercept	251 (2.98)***	-165(-1.20)	64.58 (1.26)
N	407	404	330
Adjusted R^2 (F-Value)	0.53 (F=28.29)***	0.38 (F=14.96)***	0.16 (F=3.74)***

Notes:
*, **, ***: Significant at $p<0.10$, $p< 0.05$, and $p< 0.01$ (two-tailed) respectively.
Data for all variables except compensation expense sensitivity are for the year 2003. Accounting Expenditure per Patient is expenditures on general accounting, patient accounting, and credit and collection respectively, scaled by the number of patients discharged. *Compensation expense sensitivity* is computed using firm-specific regressions using data from 1990 to 2002. *Case Mix Index* reflects the average severity of illness. *Proportion of Medicare* (*Medicaid*) is Medicare (Medicaid) patient days to total patient days. *Proportion of Outpatients* is outpatient revenue to total revenue. *LOS* is length of stay from admittance to discharge. *Occupancy Rate* is the number of patient days scaled by staffed beds times 365. *Competition Index* is defined as 1/Herfindahl Hirschman Index. *Psychiatric Beds* dummy is 1 if the hospital also treats psychiatric patients and 0 otherwise. *Rural* and *System* dummy variables are 1 if the hospital is a rural hospital, or belongs to a multi-hospital system respectively. Government is the dropped dummy.

TABLE 6B
Differences in accounting expenditures by ownership types (coefficients, *t*, and *p* values of contrasts)

	Expenditures Per Patient on		
	General Accounting	Patient Accounting	Credit & Collection
For-profit versus Government	**-99.46** **t=2.61 (*p*<0.009)**	**-106.62** **t=1.82 (*p*<0.07)**	13.92 t=0.65 (*p*<0.52)
Nonprofit versus Government	**-96.83** **t=2.93 (*p*<0.004)**	**-121.37** **t=2.45 (*p*<0.02)**	**-47.34** **t=2.63 (*p*<0.009)**

Notes:
Significant contrasts are in bold.
p-values are two-tailed.
Data are for the year 2003. Results are based on regression analyses where the relevant accounting expenditure per patient is the dependent variable. The regressions include ownership dummies, and other control variables as shown in Table 2.

Table 7
Regression results of survey responses

Panel A: Accounting information uses - scaled from 1 (not used at all) to 5 (always used)
Results of multinomial logistic regressions

Uses of accounting	**Results**
To plan for and manage activities and programs	For-profit > (Nonprofit, Government)
To request funds from your governing board or your government supervisory agency	County > (For-profit, Nonprofit)
To determine managerial compensation	(For-profit, Nonprofit) > Government
To report about costs and policies for regulatory requirements	No difference
To perform variance analysis and monitor operations	No difference
To determine prices	No difference

Panel B: Percentage of total accounting expenditures used for various activities
Results of OLS regressions

Accounting activity	**Results**
Budgeting and monitoring	For-profit > (Nonprofit, Government)
Reports for fulfilling legislative requirements	No Difference
Analysis to improve productivity or to cut costs	No Difference
Analysis to improve quality, perform strategic planning	(For-profit, Nonprofit) > Government
Financial statement preparation	No Difference
Daily operations such as payroll, accounts payable, etc.	No Difference
Determining salaries and compensation	(For-Profit, Nonprofit) > County

Notes:

Results are based on responses from a total of 47 hospitals, including 11 for-profit hospitals, 23 nonprofit hospitals, and 13 government hospitals. All p values are less than 0.01 or better.