Research on Incentives in the Compensation Contracts of Non-profit Hospital CEOs

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Abstract: In this paper, we use the multi-task principal agent model of Holmström and Milgrom [The Journal of Law, Economics and Organization 7 (1991) (Suppl.) 24] to argue that nonprofit hospitals represent an optimal response to information asymmetries between managers and board (government). For a board (government) with multidimensional objectives, the agency problem is getting top executives to distribute their efforts across all dimensions of the hospital’s mission. The nonprofit form is preferred because the absence of high powered incentives such as share ownership reduces executives’ incentives to place undue emphasis on improving financial performance at the expense of important but less observable tasks. Using newly available compensation data we test the model by comparing the conditional distributions of earnings for industrial and nonprofit hospital CEOs in China. Our best estimates are that CEOs in publicly traded firms earn twice as much on average as those in similarly sized nonprofit hospitals but bear roughly eight times the income variance. Estimates of the associated degree of risk aversion are well within conventional bounds and are consistent with the trade-off between insurance and incentives predicted by the theory.

Keywords: Executive compensation; Nonprofit; Hospitals; Principal agent model

1. Introduction

Jensen and Meckling (1976) identified the examination of agency relationships within large organizations as a fundamental step toward shedding light into the “black box” of corporate governance. Separating ownership from control gives rise to an agency problem, requiring the use of incentives to align the objectives of managers and stakeholders. In the absence of perfect monitoring, the second best solution is a contract which links executive compensation to the fortunes of the firm.

Agency problems are endemic to all professionally managed organizations, but nonprofit boards face the particular difficulty of providing incentives in the absence of alienable claims on residual earnings. This observation generated a bifurcation in the nonprofit organizational literature. One strand of research explored the effects of the non-distribution constraint on management behavior and efficiency. Presumably, without stock ownership as a tool to align incentives, the managers of nonprofits would tend to engage in activities that enhanced their own welfare at the expense of the organization. An absence of market discipline would then allow managers to consistently supply sub optimal levels of effort while expanding their pecuniary and non-pecuniary benefits (Fama and Jensen, 1983a,b; Hansmann, 1980; Clarkson,1972). This suggested that nonprofit hospitals would tend to be less technically efficient than proprietary counterparts, so empirical studies attempted to relate hospital costs to ownership status. Sloan (1988) surveys the extensive research and concludes that there is little evidence to support the hypothesis of nonprofit managerial inefficiency. Pauly (1987) further points out that pursuing comparisons based on efficiency, quality, or price will not likely be fruitful in understanding the agency relationship since “despite the anomalous character of the not-for-profit form, theory does not predict wide differences in behavior at the level of the market, nor does empirical evidence suggest that large differences do occur” (p. 267).

A second branch of the literature recognized that nonprofits are the dominant form in particular industries and so are likely to enjoy comparative advantages relative to proprietary competitors. Arrow (1963) had identified the nonprofit hospital as a response to information asymmetries which exist between patients and providers. Hansmann (1980) pursued this direction in a seminal paper which argued that, in general, nonprofit organizations were an optimal solution to contract failures which would otherwise occur in proprietary markets: eliminating the residual financial claims to owners mitigates the moral hazard problem of compromising quality when quality is imperfectly observed.
According to Hansmann, the non-distribution constraint on profits makes organizations vulnerable to agency problems between management and the board, resulting in costs such as excessive managerial salaries and perquisites. However, these costs are outweighed by the benefits from mitigating agency problems between the nonprofit organization and their patrons.

Hirth (1999) developed Hansmann’s conjecture that the nonprofit form is a response to unobserved quality differences in nursing home care. In Hirth’s model, nonprofit status credibly signals quality, and differences in consumer information induce a stable separating equilibrium of high quality nonprofit and for-profit firms. Although, the model is appealing in the context of nursing homes, its predictions hinge on quality disincentives arising from asymmetric information between clients and providers; these disincentives are not likely to be profound in hospitals (Sloan, 1988) and Hansmann himself found the theory “not entirely convincing” (1980, p. 73) when applied to the hospital sector. Arguing that a hospital’s product consists of relatively routine services while more complicated outputs are provided by physicians, Hansmann concluded that not-for-profit hospitals were thinly veiled physician cartels which would eventually be acquired by proprietary firms. However, despite the prediction that the nonprofit hospital would be eclipsed by the proprietary form, the vast majority of hospital care in Canada, the United Kingdom, and the United States continues to be provided by nonprofit organizations.

Health economists do not have a generally accepted theory of the nonprofit hospital (Pauly, 1987) and despite the progress that has been made in understanding the modern firm, “the inner working of hospitals remains a black box” (Sloan and Becker, 1981, p. 224). Intense analysis of executive contracts in the proprietary sector has afforded considerable insight into corporate governance issues in publicly traded firms. The fact that progress has not been paralleled in understanding nonprofit hospitals is not surprising given that the economics literature contains few published empirical studies of executive compensation in nonprofit organizations.

In this paper we argue that the nonprofit organizational form is a board’s optimal response when some of its objectives are difficult to quantify. In that case, linking pay to performance skews the overall distribution of managerial effort toward observable targets and away from important, but imprecisely observed, tasks. The existence of equity ownership exacerbates the moral hazard problem by allowing a manager to increase the sensitivity of pay to financial performance beyond the board’s desired level by holding shares in the firm.

Our framework for analysis is the multi-task principal agent model of Holmström and Milgrom (1991). We review the theory and then derive its testable implications for the structure of executive compensation in nonprofit hospitals. Newly available compensation data allows us to test the model’s fundamental predictions. We then summarize our results and suggest some implications for hospital environments marked by competitive pressure and financial stress.

2. The Linear Principal-Agent Model

2.1 Description of the Model

Consider a principal-agent makes a one-time choice of a vector of efforts \( t=(t_1, \ldots, t_n) \) at personal cost \( C(t) \). The effort \( t \) leads to expected gross benefits of \( B(t) \), which accrue directly to the principal. We assume that the function \( C \) is strictly convex and that the function \( B \) is strictly concave. The agent’s efforts also generate a vector of information signals,

\[
x = \mu(t) + \epsilon
\]

where we assume that \( \mu : \mathbb{R}^n \to \mathbb{R}^k \) is concave and \( \epsilon \) is normally distributed with mean vector zero and covariance matrix \( \sum \). If the compensation contract specifies a wage of \( w(x) \), then the agent’s expected utility is assumed to take the form

\[
u(CE) = E\{u[w(\mu(t) + \epsilon) - C(t)]\}
\]

where \( u(w) = -e^{-rw} \) and CE denotes the agent’s “certainty equivalent” money payoff. The coefficient \( r \) measures the agent’s risk aversion. The principal is risk neutral.
If the compensation rule were linear of the form $w(x) = \alpha^T x + \beta$, then one could utilize the exponential form to deduce that the agent’s certainty equivalent is

$$CE = \alpha^T \mu(t) + \beta - C(t) - 1/2 \alpha^T \sum \alpha$$

That is, the agent’s certainty equivalent consists of the expected wage minus the private cost of action and minus a risk premium. The term $\alpha^T \sum \alpha$ is the variance of the agent’s income under this linear compensation scheme.

The principal’s expected profit is $B(t) - E\{\mu(t) + \varepsilon\}$, which, under the linear compensation scheme, is $B(t) - \alpha^T \mu(t) - \beta$. Consequently, the total certainty equivalent of the principal and agent (their joint surplus) under the linear compensation plan is $B(t) - C(t) - 1/2 \alpha^T \sum \alpha$. Notice that this expression is independent of the intercept term $\beta$; this concept serves only to allocate the total certainty equivalent between the two parties. This last observation simplifies the principal-agent problem drastically. It implies that, given any technological and incentive constraints on the set of feasible $(\alpha, t)$ a line in $\Re^2$ with slope $-1$. Hence, the incentive-efficient linear contracts are precisely those that maximize the total certainty equivalent subject to the constraints. If $(t, \alpha, \beta)$ is such a contract, then $(t, \alpha)$ must be a solution to

$$\max_{t, \alpha} B(t) - C(t) - \frac{1}{2} r \alpha^T \sum \alpha$$

subject to

$$t \text{ maximizes } \alpha^T \mu(t) - C(t)$$

If the agent’s certainty equivalent is CE, then it follows that the intercept is

$$\beta = CE - \alpha^T \mu(t) + C(t) + \frac{1}{2} r \alpha^T \sum \alpha.$$This intercept is equal to the agent’s certainty equivalent income, minus the expected compensation from the incentive term, plus compensation for the cost that the agent incurs, plus a compensation for risk.

A central feature of our model is the general way in which we may allow observables to enter. We can study situations in which different activities can be measured with varying degrees of precision, including the important special case in which performance measures can be influenced by activities other manipulation of accounting figures. We can study cases in which the number of observables is much smaller than the number of activities in $t$, forcing the contract to be based on aggregate information about the agent’s activities. A special case of this, discussed in Holmstrom and Milgrom (1987), occurs when the agent acts on private information (to avoid adverse selection, one assumes that the information is observed after contracting). We can bring in contingent action explicitly by taking the model as follows. Let $\lambda^T = (\lambda_1, \ldots, \lambda_m)$ be a vector of probabilities of $m$ possible states. Let $t_i$ be the agent’s contingent action in states $i$ and let $B_i(t_i), C_i(t_i), \mu_i(t_i)$, and $\varepsilon_i$ represent state-contingent profits, costs, signal function, and memory errors, respectively. The analysis of that contingent-action model is equivalent to the analysis of our model with the specifications:

$$B(t) = \sum \lambda_i B_i(t_i) \quad C(t) = \sum \lambda_i C_i(t_i)$$

$$\mu(t) = \sum \lambda_i \mu_i(t_i) \quad \varepsilon = \sum \lambda_i \varepsilon_i$$

Another important feature of the model is that $B$ need not be part of $x$ (i.e., the returns to the principal may not be observed). This puts $B$ and $C$ in a symmetric role. Indeed if $B = -C$, the principal and the agent share the same objective and first best can be achieved in
Max_{t,\alpha}^{B(t) - C(t) - \frac{1}{2} r\alpha^2 \sum \alpha} \quad (1) \tag{1}

by setting \( \alpha = 0 \). On the other hand, if \( B \) is different from \(-C\), (1) may lead to a nontrivial agency problem even without the agent being risk averse. This occurs when the standard solution of making the agent a residual claimant is rendered infeasible because \( B \) is insufficiently well observed—a point made in Banker using a model with stats-contingent actions of the type described above. Thus, risk aversion is not essential for the analysis to follow. The cost of measurement error, as expressed in (1), could alternatively arise out of a risk-neutral formulation.

The model described above involves two seemingly ad hoc assumptions. The more obvious one is a linear function of measured performance. The second assumption is more conventional and therefore less likely to be noticed, but it is no less troubling. It is the assumption that the agent is required to make a relationship without regard to the arrival of performance information over time.

In view of its underlying assumption, the model seems especially well suited for representing compensation paid over a short period, like a month, a quarter or perhaps a year, in environments where profits are the cumulative result of persistent efforts over time. As such, the model seems most appropriate for analyzing the use of piece rates or commission systems; however, because the model is so tractable, we shall not avoid the temptation to stretch its use somewhat further in this article.

3. Empirical analysis and Results

3.1. Data

The hospital data relating to characteristics and CEO compensation were obtained from Bureau of Finance and Bureau of Health sources in 2006 following disclosure. Industrial firm data for 2006 are available from corporate financial reports and were obtained in electronic form from proprietary databases.

To be included in the sample, we required that there be all of the year 2006 of compensation data for each CEO in order to ensure that the reported amount represented an annual flow. We were also concerned that comparisons between the hospital and corporate sector would be biased if geographic variation in compensation was not controlled. To obtain the real data is very difficult in Hubei. The manager in hospital must be in an assignment of the Bureau of Health. Some manager’s compensation included the wage lawful and the compensation unlawful. Unlawful compensation is nearly unable to be measured. The data in this paper is only the lawful compensation. We choose the 30 publicly hospitals in Hubei were all normative and modern.

For the purposes of this comparative analysis, we selected publicly traded corporations with characteristics similar to those of our sample hospitals. The vast literature on executive compensation finds that organization size, typically measured by revenues, assets, or employees, is a fundamental covariate in the determination of earnings. However, the corporations are much more complex than the hospitals both in financial condition and compensation condition. The ownership of most corporations that assets are less than 50,000,000 has been changed from public to personal. Therefore, the data of the corporations are almost unable to avoid some mistakes.

Measures of executive performance offer a choice between accounting and market based approaches. Both types of indicators may be important in determining bonuses in executive contracts, however, market based measures are conceptually difficult when applied to the nonprofit sector.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospitals (2005-2006, N=30)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compensation (¥)</td>
<td>58719.67</td>
<td>11267.30</td>
<td>40610.00</td>
<td>73860.00</td>
</tr>
<tr>
<td>Revenues (¥ 000)</td>
<td>23431.45</td>
<td>9209.12</td>
<td>4314.00</td>
<td>87139.00</td>
</tr>
<tr>
<td>Assets (¥ 000)</td>
<td>30615.53</td>
<td>34206.95</td>
<td>3778.00</td>
<td>108446.00</td>
</tr>
</tbody>
</table>
3.2. Specification

The compensation regressions for hospitals and corporations take the form

\[ \ln(COMP) = \alpha + \alpha_H \text{HOSPITAL} + \beta_1 \ln(\text{ASSETS}) + \beta_2 \ln(\text{INT}) + \beta_3 \text{PERF} + \beta_4 \text{PERF} \times \text{HOSPITAL} + \epsilon \]  

(5)

where \( i \) denotes the CEO, \( \text{HOSPITAL} \) is an indicator variable identifying CEOs managing hospitals and \( \epsilon \sim N(0, \sigma^2) \). In the specified regression, \( \alpha_H \) is a levels effect which roughly relates to the percent difference in earnings between hospital and corporate CEOs.

Rosen (1982) suggests that a positive relationship between firm size and compensation arises through a ‘chain letter’ effect, by which managerial effort enhances the productivity of all subordinates in the firm hierarchy. Since the CEOs of large firms command high levels of labor and capital, their compensation levels will be accordingly higher. A puzzling recurrence in the executive compensation literature is the uniformity of estimates of \( \beta_1 \), the elasticity of compensation with respect to firm size. In international studies across markedly different data sets, the elasticity generally lies in the range from 0.2 to 0.3, with 0.25 being the most common estimate (Rosen, 1992). Estimates for nonprofit organizations are scarce, but Joskow et al. (1993) expanded the breadth of the result by replicating the elasticity of 0.25 across a 20 years sample of regulated and unregulated American firms. A satisfactory explanation behind the consistency of these findings has not yet been provided, but we predict that market forces will imply a similar pattern for our data.

We expect that top executives will be rewarded for superior financial performance so \( \beta_3 \), which represents the relative bonus for an increase in margin of one standard deviation from the mean, should be substantively different from zero. Variable \( \beta_4 \) is affected by both differences in reward systems, and in the productivity of effort in generating surpluses. Given the importance of residual earnings for nonprofit hospitals in increasingly competitive environments, we anticipate that hospital managers will be rewarded for achieving high levels of financial performance relative to their peers.

The standard principal agent model suggests that executive compensation will be sensitive to performance, while the multi-task theory further predicts that the conditional variance of CEO earnings (which relates to executive risk) should be higher for industrial firms. Contracting on performance when some outcomes are difficult to measure would distort the distribution of managerial effort toward observable, so the solution is to contract based on a structure in which pay is less dependent on variable factors. Since this implies less risk bearing on the part of hospital managers, the expected value of their contracts can be reduced while still providing the same expected utility as their corporate counterparts. Therefore, theory implies that, conditional on firm characteristics; executive contracts in nonprofit hospitals will have a lower variance and lower expected value than those in a proprietary setting.
3.3. Results

Table 2 presents the parameter estimates of the model using COMP as the dependent variables.

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
<th>95% Confidence Interval For B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
<td>Lower Bound</td>
</tr>
<tr>
<td>(Constant)</td>
<td>6.117</td>
<td>2.046</td>
<td>2.989</td>
<td>0.004</td>
<td>2.014</td>
</tr>
<tr>
<td>Hospital</td>
<td>-0.0713</td>
<td>0.372</td>
<td>-0.047</td>
<td>-0.192</td>
<td>0.849</td>
</tr>
<tr>
<td>ln Assets</td>
<td>0.574</td>
<td>0.186</td>
<td>0.824</td>
<td>3.081</td>
<td>0.003</td>
</tr>
<tr>
<td>Intensity</td>
<td>-0.0284</td>
<td>0.019</td>
<td>-0.165</td>
<td>-1.484</td>
<td>0.144</td>
</tr>
<tr>
<td>Performance</td>
<td>0.345</td>
<td>0.136</td>
<td>0.439</td>
<td>2.537</td>
<td>0.014</td>
</tr>
<tr>
<td>Assets*Performance</td>
<td>-9.001</td>
<td>4.449</td>
<td>-0.429</td>
<td>-2.010</td>
<td>0.049</td>
</tr>
</tbody>
</table>

Our estimates of the elasticity of compensation with respect to size are 0.574. Our results indicate that CEOs are rewarded for financial performance. Given the organizational form, an increase in margin of one standard deviation from the mean is associated with a 34.5% increase in the cash portion of compensation. Residual earnings conditional on firm characteristics are greater for industrial CEOs than for hospital CEOs, as evidenced by the negative estimated coefficient of the hospital indicator. Since the base levels of compensation for industrial firms are higher in the corporate sector, a 34.5% increase in pay translates to a larger incentive payment than in the hospital sector, so that proprietary CEOs likely experience higher powered incentives for financial performance.

That hospital managers are rewarded for profitability is to be expected given the importance of surpluses in carrying out the hospital’s mission in a decade marked by fiscal stress. Government funding in Hubei has, in part, been reallocated across hospitals on an efficiency basis. In past years, hospitals have been responsible for covering deficits, and have required surpluses in order to fund the development of special programs and capital expenditures.

References


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