Administrative Compensation and Organizational Performance in Texas Nursing Facilities

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ABSTRACT. This study examines the link between compensation and performance by comparing profit-seeking versus nonprofit nursing homes in Texas. Using both cost and profit functions to measure facility performance, that is, resource allocation efficiency by firm management, we find that: (1) the highest paid administrators (profit-seekers) are also the most efficient allocators of firm resources; (2) rural administrators are paid more than their urban counterparts but there is no significant difference in their overall ability to allocate resources; and (3) chain administrators are not compensated more than independent administrators yet are significantly superior in resource allocation. Further, management compensation is strongly influenced by firm size and capacity utilization. These results provide very weak support for the agency theorist's pay/performance paradigm.

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Introduction

Motivation and purpose

Agency-theory issues addressing the separation of ownership and control have engaged both public and financial economists' interest for the last quarter of the 20th century. An issue of primary concern is the link between firm performance and managerial compensation. The fundamental question is whether the marginal cost of managerial talent (compensation) matches the manager's marginal revenue product (performance). If a convincing link between pay and performance cannot be established, the implication is that a failure exists in the market for executive labor (Fama, 1980). Given that managerial inefficiency exists, as is asserted in some of the merger-and-acquisition literature (Jensen, 1989; Gaughan, 1991; Loughran and Vijh, 1997), the failure of the executive labor market implies that overpriced executives placed in charge by owners are making poor use of the firm's resources.

Research and public interest have concentrated for the most part on executive pay levels and firm performance for large, publicly traded corporations. Numerous articles appear regularly in a variety of business publications (for example, the annual April Executive Pay section in the *Wall Street Journal* or a recent *Wall Street* article by Lublin (2000, p. A16) entitled, "CEO Pay of Best Performers Soared, Study Says"). In addition, academic studies of top management compensation have been ongoing for over 70 years and have resulted in over 300 publications (Barkema and Gomez-Meija, 1998). However, less attention has been directed toward compensation and performance in small firms; and it is not clear as to

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whether or not large-firm study findings are applicable (Carr, 1997).

The purpose of this study is to examine the link between the pay of the top administrator and the firm's performance in a sample of approximately 1000 small[1] nursing facilities in Texas. This effort is unique in that performance is measured using traditional cost and profit functions which better reflect the resource-allocation choices by the firm's management. We rank various nursing facility classifications in terms of technical (cost) efficiency, allocation (price) efficiency and overall economic efficiency (that is, a combination of both technical and allocative efficiency). We employ both ordinary least squares and robust least trimmed squares (LTS) regression techniques on 1994 data. Our empirical compensation function examines the impact of organizational form, geographic location, chain affiliation, occupancy rate, case-mix, and firm size on administrative compensation.

We begin with a profile of nursing homes and a discussion of the current operating conditions facing nursing facilities in Texas. This is followed by a brief discussion of various performance measures and a summary of those used in this study. Our compensation model is then presented along with the generated findings and conclusions.

The nursing facility industry: U.S. and Texas profiles

Using data for 1997 and 1998, Giacalone (2001, chapters 1, 4) provides a general quantitative description of nursing facilities in the United States. Some 17,000 nursing homes serve 1.6 million residents, of whom 72 percent are female and 88 percent are white. Finally 92 percent of residents are at least 65 years old, and 46 percent are at least 85 years old. For 43 percent of residents, the length of stay is less than a year; but 36 percent stay for one to three years, and 27 percent stay for more than three years (1995 data). Eighty percent of nursing facilities have between 50 and 200 beds. Over 60 percent are located in urban areas. The Midwest and South each have about one third of the nation's nursing homes; the Northeast and West each have about one sixth.

About two thirds of the facilities are proprietary (profit-seeking), and 56 percent are members of a multifacility organization. Giacalone (2001, p. 63) remarks, "Despite the wave of mergers that the nursing home industry experienced in the 1990s, the industry cannot be said to be highly concentrated. . . . Based on number of facilities, the four-firm and eight-firm concentration ratios for 1998 were 10.3 percent and 16.4 percent respectively. Based on number of beds, the comparable ratios were 11.0 and 19.0 percent. Though industry concentration was slightly higher based on bed capacity, these are low concentration ratios."

Expenditures for nursing home services in the United States were $88 billion in 1998. However, this figure refers to "free-standing" facilities and therefore does not include about $10 billion in outlays for hospital-based nursing facilities. Over 97 percent of nursing homes are certified to serve Medicare or Medicaid beneficiaries.[2] Medicaid outlays, $41 billion in 1998, were the primary funding for two thirds of nursing home residents and paid for almost three fourths of total resident days. Medicare outlays were $10 billion, and private out-of-pocket payments were $29 billion. Private insurance and other unspecified sources provided the remaining funds.

U.S. nursing homes had almost 1.8 million employees in 1998. The average hourly wage was $10.16, and average weekly earnings were $377. Only 10 percent of employees were unionized. Nursing home personnel at all levels, from administrator to nurse assistant, tended to earn less than their counterparts in hospitals. In the tight labor markets of the late 1990s, turnover rates were predictably high.

Although the nursing home industry in Texas conforms to the national pattern in many respects, Texas is a rich source of information and experience because of the state's size, geographic and ethnic diversity and regulatory environment. In 1996, Texas ranked highest in the nation in terms of the total number of available nursing home beds (125,389) and second to California in terms of the total number of nursing facilities (1,151 versus 1,170) (Marion Menell Dow, 1997). Approximately 88 percent are profit-seeking facilities; 12 percent are nonprofit organizations. Slightly over 50 percent of all facilities are located in urban areas and approximately 80 percent are chains. Table I provides a detailed profile summary of the Texas Nursing Facility Industry

TABLE I
1994 Texas nursing facility industry profile summary

Facility & characteristics	Profit seeking π	Nonprofit nπ	Chain		Independent		Urban		Rural	
			π	nπ	π	nπ	π	nπ	π	nπ
Number of facilities (1017)	874	143	631	55	243	88	446	74	428	69
(Avg/SMA)							(16.52)	(2.74)		
(Avg/County)							(9.10)	(1.51)	(2.09)	(0.34)
Number of beds (112,210)	96,551	15,659	72,139	5,836	24,414	9,821	54,862	10,347	41,691	5,310
(Avg/SMA)							(2,032)	(383)		
(Avg/County)							(1,120)	(211)	(203)	(26)
Average number of beds (Combined)	110.47	109.50	114.33 (113.67)	106.11	100.47 (103.44)	111.61	123.01 (125.44)	139.82	97.41 (94.57)	76.97
Occupancy rate (%) (Combined)	73	85	70 (71)	83	79 (81)	85	76 (77)	87	70 (71)	82
Average number of patient days/year (Combined)	29,224	33,656	29,450 (29,649)	31,929	28,636 (30,257)	34,734	33,748 (35,148)	43,586	24,510 (24,301)	23,005
Medicaid patient days (%) (Combined)	74	65	74 (74)	72	74 (71)	61	74 (72)	62	74 (73)	68
Medicaid revenue/total patient revenue (%) (Combined)	70	62	69 (69)	69	72 (69)	58	68 (67)	58	71 (71)	69
Average cost ($):										
Patient care (Combined)	1,161,004	1,553,449	1,173,418 (1,183,016)	1,293,113	1,128,910 (1,285,036)	1,716,159	1,373,271 (1,471,233)	2,061,652	939,891 (949,405)	1,008,420
Administrative (Combined)	239,211	244,690	255,830 (255,518)	251,943	196,058 (207,782)	240,157	288,328 (293,918)	327,609	188,029 (183,549)	155,764
Capital (Combined)	361,950	415,055	375,734 (380,609)	436,544	326,158 (346,222)	401,625	425,061 (444,392)	560,764	296,186 (290,884)	258,787
Average TILE ranking (Combined)	7.65	7.88	7.62 (7.63)	7.73	7.73 (7.79)	7.97	7.50 (7.54)	7.80	7.80 (7.82)	7.96

TABLE I *(Continued)*

Facility & characteristics	Urban				Rural			
	Chain		Independent		Chain		Independent	
	π	nπ	π	nπ	π	nπ	π	nπ
Number of facilities (1017)	322	31	124	43	309	24	119	45
(Avg/SMA)	(11.50)	(1.11)	(4.43)	(1.54)				
(Avg/County)	(6.57)	(0.63)	(2.53)	(0.88)	(1.51)	(0.12)	(0.58)	(0.22)
Number of beds (112,210)	40,951	3,768	13,911	6,578	31,190	2,067	10,502	3,243
(Avg/SMA)	(1,517)	(140)	(515)	(244)				
(Avg/County)	(836)	(77)	(284)	(134)	(152)	(10)	(51)	(16)
Average number of beds	127	122	112	153	101	86	88	72
(Combined)	(127)		(123)		(100)		(84)	
Occupancy rate (%)	74	86	81	87	67	80	77	83
(Combined)	(75)		(82)		(68)		(79)	
Average number of patient days/year	34,107	67,150	32,815	48,226	24,598	25,186	24,281	21,842
(Combined)	(34,374)		(36,783)		(24,640)		(23,612)	
Medicaid patient days (%)	74	68	73	58	74	78	76	63
(Combined)	(73)		(69)		(74)		(72)	
Medicaid revenue/ Total patient revenue (%)	68	63	70	54	70	78	75	62
(Combined)	(67)		(66)		(70)		(71)	
Average cost ($):								
Patient care	1,384,404	1,567,941	1,344,363	2,417,583	953,558	938,125	904,403	1,045,910
(Combined)	(1,400,522)		(1,620,701)		(952,446)		(943,230)	
Administrative	304,586	298,753	246,112	348,412	205,023	191,481	143,801	136,714
(Combined)	(304,073)		(272,453)		(204,047)		(141,928)	
Capital	439,980	499,086	386,320	605,230	308,785	355,760	263,469	207,069
(Combined)	(445,170)		(442,686)		(312,171)		(247,994)	
Average TILE Ranking	7.47	7.56	7.58	7.97	7.77	7.94	7.88	7.96
(Combined)	(7.48)		(7.68)		(7.78)		(7.90)	

for 1994 in terms of various facility classifications and key facility characteristics. The Texas Department of Human Services (TDHS) gathers data through annual cost reports for all facilities receiving Medicaid reimbursement.

Further, approximately 75 percent of all nursing home residents in Texas are Medicaid beneficiaries (Texas Health Care Association, 1997). For the 1994 cost report data, Medicaid revenues were approximately 65–70 percent of total revenue, Medicare revenues were approximately 10 percent, and private-pay revenues were approximately 20–25 percent (see Table I). Private-pay total revenue was approximately 5 percent more in urban areas and 5–10 percent more in nonprofit facilities except for rural-chain-nonprofit facilities.

Operating environment in Texas

In general, the complex policy issues in the nursing facilities industry are accessibility to nursing-home services, level of services, quality of services, and compensation for services provided. According to the Texas Department of Human Services (1990), there are three objectives for the current reimbursement system: (1) to encourage the delivery of quality services, (2) to improve access for patients requiring extra assistance, and (3) to increase payment equity among facilities.

In order to achieve the key objectives of nursing home care, the state of Texas repealed its Certificate of Need (CON) legislation in September, 1986.[3] Moreover, in April, 1989, the reimbursement methodology for compensating facilities for Medicaid patients was changed from a fixed-rate, class-mix system (subject to reimbursement on a reasonable cost-related basis) to a fixed-rate, case-mix system.

As previous CON legislation supposedly restricted nursing facility expansion, the repeal of CON has encouraged facilities to maintain excess bed supplies; however, excess beds increase facility costs which, in turn, are built into Medicaid reimbursement payments. Since the average occupancy rate in Texas is about 80 percent, this legislation has apparently produced an oversupply of services statewide and excess capacity for many facilities.

Analytical framework

Historically, two fairly broad perspectives have been used to examine managerial compensation: the financial economist's approach of moral hazard/agency theory and the human-resource model proposed by management theorists. Much of the recent academic interest in executive pay is couched in the theory of agency. In fact, given public perceptions that top executive compensation is grossly inappropriate, financial economists argue that the human-resource-compensation models must be replaced by the agency performance/pay paradigms (Zajac and Westphal, 1995). However, the latter theories yield ambiguous results in empirical tests. Tosi et al. (1998) find that less than five percent of compensation is explained by performance factors.

Jensen and Meckling (1976) indicate that the firm is a nexus of contracts among the firm's participants. Principals make explicit or implicit contracts with agents and delegate decision-making authority to these agents, who in turn are supposed to act in the best interest of principals. The principals face the problem of controlling agent behavior because (1) the agents rationally pursue their own self-interest, (2) they are assumed to be risk and work averse and (3) information asymmetry exists. Control is achieved through monitoring, bonding, threats of firing or takeover, providing appropriately structured compensation incentives or making the agents principals.

Human-resource models have evolved from early theories of organizations where teamwork and cooperation are paramount (Zajac and Westphal, 1995). Management compensation is based on highly competitive labor markets within and among industries. Hence, this approach stresses the need to satisfy and retain valuable personnel through incentive compensation. The differences between owner's and manager's goals are deemphasized in the human-resource approach.

Barkema and Gomez-Mejia (1998, p. 13) assert that "adding more empirical studies on the statistical relationship between executive pay and firm performance to the vast literature that already exists on this issue leads researchers into a blind alley." They base their conclusions on typically

weak pay-performance correlations; however, they acknowledge wide variations in previous studies. The results of two key studies by agency proponents are representative. Murphy (1985) finds that executive pay is positively and significantly correlated with shareholder returns; Jensen and Murphy (1990b) concur. However, by changing the focus of the investigation to concentrate on the dollar change in CEO compensation for every $1,000 change in total shareholder wealth, Jensen and Murphy conclude that CEOs receive only $2.59 for every $1,000 change in the firm's equity, which is insufficient to provide a strong link between pay and performance.

Studies of the link between pay and performance have wrestled with the appropriateness of various performance measures capturing both the incentives provided for and risk-taking in the investing and financial decision-making by management. Jarrell (1993) provides an insightful summary of the performance/pay paradigm and calls for research to establish a stronger linkage between pay and performance which would justify higher executive compensation. Additionally, Jerrell emphasizes the appropriateness of various performance measures as predictors of management compensation: sales growth, return on investment, return on equity, earnings growth, stock price returns, and economic value added.

Jensen and Murphy (1990a) point out that measures which do not correlate with changes in shareholder wealth would be inappropriate predictors in profit-seeking firms. However, some variation in stock prices and hence shareholder returns cannot be attributed to managerial decision-making and the fundamental operations of the firm. Of course, this makes the accounting perspective important as well (for example, see Jarrell (1993) and Watts (1993)). Bennett Stewart (1994) asserts that the best firm performance measure is EVA™ (economic value added) because it includes the cost of equity capital and over 164 additional adjustments for measuring performance. Dillon and Owens (1997) and Kramer and Pushner (1997) are not convinced by EVA™. Bacidore et al. (1997) assert that REVA (refined economic value added) is even better than EVA™ as it is based on the firm's market value rather than its net asset value. Ferguson and Leistikow (1998) show, however, that REVA is inconsistent with finance theory and shareholder wealth maximization.

Barkema and Gomez-Mejia (1998) argue that a more general framework, inclusive of agency theory, is needed to advance research on executive pay. In addition to performance measures, firm governance and contingency factors should also be included. Proposed explanatory variables include firm size (Carr, 1997), market forces, sales levels (Ciscel and Carroll, 1980), peer compensation, CEO behavior and characteristics, and CEO role or position issues (Gomez-Mejia and Wiseman, 1997). Governance issues such as ownership structure, board of directors structure and remuneration committees should also be included (Conyon and Peck, 1998); Zajac and Westphal, 1995 and Werner and Tosi, 1995). Finally, internal and external contingencies including a firm's strategy, risk taking, market growth, industry concentration, regulation, globalization, etc. need to be addressed as well (Sanders and Carpenter, 1998; and Finkelstein and Boyd, 1998).

The above discussion provides a general analytical framework for management compensation; however, we are specifically interested in the small firm nursing facility and industry in Texas. In a review of nursing-home incentives, Ullmann (1987) argues that profit-seeking facilities try to maximize profits while maintaining the level of quality required for operating certification. The economic theory of competition shows that a profit-maximizing firm must produce its output or service at the least possible cost per unit. Other kinds of administrative behavior that affect quality and resident mix presumably enter the owners' objective function only if they are consistent with profit maximization.

For the nonprofit nursing home, Ullmann (1987) identifies a different set of objectives: enhancing the facility's prestige by increasing quality and quantity of service. The goals are capital enhancement, an outstanding medical staff, and a more heterogeneous mix of residents. Since it is unclear how quantity maximization (a large market share) affects quality of service, Ullmann assumes that a nonprofit administrator tries to maximize the facility's prestige subject to a limit on the deficit which the nursing home can incur. The deficit, which is recovered from private charitable contributions or public subsidies,

weakens the incentive for administrative control of costs.

Many researchers have emphasized the divergent objectives of profit-seeking and nonprofit enterprises: Dahlman (1979), De Alessi (1974, 1983), Demsetz (1966, 1967, 1968), and Furerbotn and Pejovich (1972). Ownership rights may be poorly defined or hard to transfer in nonprofit firms. This creates a disincentive to risk bearing and planning for further contingencies since there is virtually no process for capitalizing further benefits into the current value of the firm. Furthermore, religious, fraternal, and governmental nursing facilities try to maximize economic benefit for their residents, who may participate or lobby to obtain lower costs and more or better service. Consequently, nonprofit enterprises may undertake the least remunerative activities in the market for long-term care.

Although the moral hazard/agency theory seems seriously deficient in explaining management compensation, it does provide a solid foundation for analyzing divergent behavior between organizational structures (for example, profit-seeking versus nonprofit organizations). Numerous empirical cost- and profit-function studies have verified significant performance differences between profit-seeking and nonprofit firms (for example, Knox et al., 1999; Claggett et al., 1995; Stutzman and Stansell, 1992; Hollas and Stansell, 1988). Demsetz (1967) notes that property rights arise when those affected by externalities find it worthwhile to internalize their cost and benefits. Compared with nonprofit ownership, profit-seeking ownership is often an effective way to take account of these "spillovers." In addition, Alchian and Demsetz (1972) note that shirking is more likely to occur in nonprofit firms than in profit-seeking firms. Finally, Jensen and Meckling (1976) highlight the cost of monitoring and bonding in an organization. They find that nonprofit organizations have reduced incentives to enforce contracts and develop internal controls.

For this study, we use standard cost- and profit-function performance measures for both profit-seeking and nonprofit firms. We assume that all performance measures reflect management's attempt to allocate the firm's resources efficiently. The cost- and profit-function models adequately reflect management's decisions about resource allocation. Stigler (1976) points out that the imposition of any arbitrary set of goals upon firms which in fact have other goals leads to the fallacious conclusion that the firms are inefficient. Using both cost and profit functions as our resource allocation models for this study, we recognize that profit-maximization represents a restricted view of the objective functions of diverse firms. Making no a priori assumptions regarding a firm's objectives, we simply test for exhibited differences in objective functions reflecting profit maximization. We are able to rank various nursing facility classifications in terms of technical (cost) efficiency, allocative (price) efficiency, and relative overall economic efficiency. As expected, nonprofit nursing facilities are more costly and less profitable than profit-seeking facilities; however, our findings do not imply, for example, that nonprofit nursing facilities are inefficient using other definitions of efficiency.

Data

All data are from the 1994 Texas Medicaid Nursing Facility Cost Report (Texas Department of Human Services, 1994). Table I provides a detailed profile summary of the Texas Nursing Facility Industry for 1994 in terms of various facility classifications and key facility characteristics. The Texas Department of Human Services (TDHS) gathers data through annual cost reports for all facilities receiving Medicaid reimbursement. Table II provides an industry profile summary of top administrator compensation in terms of mean, standard deviation, and range. We note that: (1) about 11 percent of Texas nursing facilities are excluded from Tables I and II; (2) although the data reflect information for both private-pay and Medicaid residents, it is impossible to allocate costs and profits between the two groups; and (3) nonprofit facilities include government, fraternal, and church affiliated entities. Despite these data limitations, we believe that our analyses of a sample of over 1000 facilities adequately reflects the nursing facility industry in Texas.

Most of the variables in Tables I and II are self-explanatory. However, the TILE, Texas Index

TABLE II
1994 Texas nursing facility compensation profile summary

Facility & characteristics	Profit seeking π	Nonprofit nπ	Chain		Independent		Urban		Rural	
			π	nπ	π	nπ	π	nπ	π	nπ
Top administrator only ($):										
Mean salary & benefits	43,124	44,039	42,474	44,089	44,812	44,008	45,524	50,187	40,624	37,445
(Combined)			(42,604)		(44,598)		(46,188)		(40,182)	
Range	0–127,570	0–124,831	1,816–110,190	17,790–79,930	0–124,831	0–127,570	0–127,570	3,800–124,831	0–80,542	0–74,060
(Combined)			(1,816–110,190)		(0–127,570)		(0–127,570)		(0–80,542)	
Standard deviation	16,627	18,005	16,500	12,334	20,850	16,868	17,702	19,899	15,045	12,909
(Combined)			(16,205)		(17,983)		(18,084)		(14,796)	

	Urban				Rural			
	Chain		Independent		Chain		Independent	
	π	nπ	π	nπ	π	nπ	π	nπ
Top administrator only ($):								
Salary & benefits	45,326	45,779	46,039	53,365	34,503	41,905	43,533	35,067
(Combined)	(45,366)		(47,925)		(39,676)		(41,210)	
Range	4,499–110,190	19,967–79,950	0–127,570	3,800–124,831	1,816–99,965	20,846–86,949	0–131,056	0–112,458
(Combined)	(4,499–110,190)		(0–127,570)		(1,816–99,965)		(0–131,056)	
Standard deviation	17,082	13,262	19,283	23,194	15,343	10,907	13,884	13,368
(Combined)	(16,766)		(20,541)		(15,068)		(14,218)	

for Level of Effort, requires explanation. This procedure uses an inflation-adjusted, prospective, per-diem reimbursement rate having 11 payment categories based on activities-of-daily-living criteria (the lower the TILE value, the higher the level of services provided). Accordingly, the reimbursement amount for a resident in a given payment category is the same for all facilities statewide. The uniform rates are based on the average costs of all participating facilities and reflect three cost centers: patient care, general and administrative overhead, and capital costs. For 1996, the average TILE reimbursement rate was $66.52 per patient day compared with the $90.18 national average (Texas Health Care Association, 1997). "Texas has relatively low Medicaid rates for nursing home care; in fact, Texas was ranked 45th among all states in 1999" (Morgan et al., 2000, p. 10). We experiment with TILE as a price variable in the profit function and as a case-mix variable in the cost and compensation functions.

Methodology

In this study, we use a two-step procedure to examine the relationship between the pay of the top administrator and the nursing facility's performance. First, we develop performance ranking measures for nursing facility organizational structure (profit-seeking versus nonprofit), classification (chain versus independent) and location (urban versus rural) using both cost- and profit-function models. Second, we regress these performance measures on the dependent variable, administrative compensation, adjusting for firm size (span of control), case mix (risk taking), and occupancy rate (capacity utilization).

Performance rankings

A firm is technically efficient if it allocates resources to minimize the average cost of its product or service. Technical efficiency is independent of the product's marginal revenue and does not determine the most profitable rate of production. Yotopoulos and Lau (1973) note that the relative technical efficiency of two firms may be measured by a firm-specific efficiency parameter that reflects neutral differences in the production function using a firm-specific efficiency parameter to represent differences in managerial ability and the non-measurable fixed factors of production.

Further, Yotopoulos and Lau (1973) note that price efficiency (that is, allocation efficiency) can be categorized into relative price efficiency and absolute price efficiency. A firm achieves absolute allocation efficiency by equating the marginal revenue product of each variable resource to its marginal factor cost; in other words, the firm maximizes its profit. While a firm may in practice fail to achieve absolute allocation efficiency, it is useful to compare the relative allocation efficiencies of groups of firms. In some groups, the average gap between marginal revenue product and marginal factor cost will be smaller than in other groups.

Lau and Yotopoulos (1971) also point out that technical efficiency and price efficiency are functionally related. Technical efficiency is a necessary condition for profit maximization. Allocation efficiency is a necessary and sufficient condition for profit maximization. Firms may exhibit equivalent levels of overall economic efficiency, yet differ in terms of either price or technical efficiency. If two classes of firms have different degrees of technical and price efficiency and face similar prices in both input and output markets, the firm class with higher profits is considered to be more economically efficient. A more rigorous development is provided in Lau and Yotopoulos (1971).

An important model for the cost function was developed by Nerlove (1963) in his examination of the U.S. electric power industry. Assuming a Cobb-Douglas production function, Nerlove obtained a log-linear expression for total cost in terms of output and resource prices. He estimated the regression by OLS, arguing that the electric utilities were price takers in resource markets and that their output was also exogenous because customers and regulators expect electricity to be produced on demand. In our view, the same reasoning applies, at least approximately, to the nursing facility industry in Texas.

Table III displays our total cost model, a description of the variables, and the results of both OLS and LTS regressions.[4] Profit-seeking facilities are less costly than nonprofits, urban facilities

TABLE III
The total cost function with 1994 data (ln total cost is the dependent variable)

Independent variables	OLS		LTS	
	Coefficient	T-statistic	Coefficient	T-statistic-
Location	0.027	2.557	0.024	3.224
Profit-seeker	–0.121	–8.239	–0.096	–9.149
Chain	0.029	2.646	0.046	5.946
ln *LVN*	0.157	3.220	0.163	4.853
ln *Aide*	0.487	8.476	0.373	9.299
ln *CSMX*	0.379	7.683	0.399	11.616
ln *Occu*	–0.179	–11.093	–0.129	–11.099
ln *Days*	1.003	79.014	1.013	112.966
Constant	3.655	18.998	3.739	27.773
Std. error of est.	0.155		0.099	
R-squared.	0.938		0.997	
F-stat	1902.573		41333.957	
	(8, 1008)		(8, 995)	
Sample size.	1017		1004	

Note: ln *Cost* = β_0 + β_1 *Location* + β_2 *Profit-seeker* + β_3 *Chain* + β_4 ln *LVN* + β_5 ln *Aide* + β_6 ln *CSMX* + β_7 ln *Occu* + β_8 *ln Days* + *U*

where *Cost* includes employees' wages and benefits, compensation of contract personnel, purchases of materials and equipment, administrative outlays, utilities, maintenance, depreciation, taxes, interest, and insurance. The dummy variables are: *Location* (1 = urban, 0 = rural), *Profit-seeker* (1 = profit-seeker, 0 = nonprofit), and *Chain* (1 = member of a chain of nursing homes, 0 = independent). *LVN* is an estimate of each nursing facility's average hourly wage for licensed vocational nurses, while *Aide* is the average hourly wage for aides, including assistants to nurses and therapists as well as other employees providing general care for residents. *CSMX* measures each nursing facility's average case mix, an index of the level of medical care and supervision provided to residents. *Occu* is the occupancy rate (average resident days per bed/365 days), while *Days* is a facility's total resident days in 1994. ln is the natural logarithmic transformation. Finally, *U* is an unobserved gaussian error which we assume to have zero expectation and a constant variance. This random component of each facility's total cost is supposed to be uncorrelated among nursing homes.

are more costly than rural facilities and chains are more costly than independent facilities.[5]

The profit function (measuring relative overall efficiency) both supports and enhances the findings of the cost function. By definition, the profit function represents the maximized profit for a firm as a function of prices of output, prices of variable input factors and quantities of the fixed factors of production. Mullineaux (1978) points out that additional variables may be necessary to explain profit levels. The function is non-negative, convex, increasing in output prices, decreasing in input prices and continuously differentiable. Thus, the profit function expresses the value of the maximized profit for a profit-maximizing firm that is a price taker in its resource markets and its product markets. Lau (1978) develops the general translog form of the normalized profit function. Lau and Yotopoulos (1971) and Yotopoulos and Lau (1973) formulate the Cobb-Douglas case of the normalized profit function and estimating equations.

Table IV displays regression results for the profit function. Profit-seekers clearly achieve higher overall efficiency than do nonprofits and, reversing the result of the total cost function, chain members appear to be significantly more efficient than independent facilities. Additionally, the profit function indicates that urban facilities are more efficient overall than rural facilities (LTS only). This conclusion, while not OLS statistically significant, also reverses the findings of the total cost model. Table V provides a more detailed report of relative economic efficiency between the various groups of facilities. F-tests of urban-rural comparisons of overall efficiency for all facilities and profit-seeking facilities are mixed for OLS and LTS regressions. There appears to be no

TABLE IV
The profit function (ln *Profit* is the dependent variable)

Independent variables	OLS		LTS	
	Coefficient	T-statistic	Coefficient	T-statistic
Constant	–5.460	–3.44	–4.838	–4.08
ln *Wage*	–0.638	–3.03	–0.439	–2.81
ln *Price*	2.468	6.63	2.118	7.58
ln *Occu*	1.038	21.16	0.961	26.07
ln *Capital*	0.837	17.85	0.955	25.86
Location	0.079	1.71	0.101	2.94
Profit-seeking	0.547	7.80	0.249	4.35
Chain	0.337	7.11	0.286	8.12
Standard error of estimate	0.638		0.454	
R^2	0.523		0.671	
F-statistic	142.981		245.063	
	(7,913)		(7,842)	
Sample size	921		850	

Note: $\ln(Profit) = a_0 + b_1 \ln Wage + b_2 \ln Price + b_3 \ln Occu + b_4 \ln Capital + d_1 Location + d_2 Profit\text{-}seeking + d_3 Chain + e$

where the dependent variable, *Profit*, is defined to be operating profit (i.e., earnings before tax plus interest, depreciation, and property tax). The independent variables fore the profit function include the dummies: *Location, profit-seeking*, and *chain. Location* (1 = urban; 0 = rural) reflects facilities in the 28 SMAs in Texas as being urban and all other facilities in counties outside the SMAs as rural. *Chain* (1 = chain; 0 = independent) indicates whether or not the facility is a member of either a profit-seeking or nonprofit chain. *Profit-seeking* (1 = profit-seeking; 0 = nonprofit) is the key ownership form variable.

The remaining variables, in natural logs, are: hourly wage rate, occupancy rate, price index, and capital. The hourly wage rate (*Wage*) is the weighted average of the wage rates for LVNs and for aides. This variable represents the price of variable inputs. The occupancy rate (*Occu*) measures bed utilization and indicates facility capacity. The price variable (*Price*) is the TILE ranking index. The ranking is determined by classifying patients into 11 categories of care and calculating a weighted average of those categories. Texas Medicaid payments are unique for each of the categories of care in which the patients are classified. The capital (*Capital*) variable is the total square footage in each nursing facility. This is our proxy for the quantity of fixed inputs.

difference in the economic efficiency of urban and rural nonprofit facilities.

In order to address allocation efficiency, we use both the profit function and a labor-demand model. We employ Zellner's (1962) "seemingly unrelated regression" technique. Using an index of price efficiency as suggested by Lau and Yotopoulos (1971), both relative and absolute price efficiency may be examined.

As shown in Table VI, all facility classifications fail the absolute price efficiency hypothesis because they use too much labor in relation to their fixed inputs. Hence, labor's marginal revenue product is less than its wage rate. However, we conclude that profit-seekers are relatively better profit-maximizers than nonprofits, chain members are somewhat more price efficient than independents, and rural facilities outperform their urban counterparts. However, we cannot perform a rigorous statistical test on the difference between the observed efficiency (k) and a null value (e.g., 1) because the sampling distribution of ($k - 1$) is unknown.

Based on the results (Tables III–VI) of the cost and profit functions, Table VII provides a facility-classification performance ranking for technical efficiency, allocation efficiency, and combined cost and price efficiency for the nursing facility industry in Texas.

By enhancing the concept of economic efficiency, the profit function reinforces the cost function findings that profit-seeking firms have superior economic efficiency when compared with nonprofit nursing facilities. Further, the profit function implies that the allocation efficiency of both chains and urban facilities is strong enough to offset the technical efficiency disadvantage found by the cost function. That is, chain and

TABLE V
Tests of relative economic efficiency

Facility Group tested		OLS F-Statistic	LTS F-Statistic
(1)	All facilities: Urban vs. Rural	2.931* (1,913)	8.632 (1,842)
(2)	All facilities: Chain vs. Independent	50.581 (1,913)	65.999 (1,842)
(3)	All facilities: Profit vs. Nonprofit	60.883 (1,913)	18.188 (1,842)
(4)	Profit-seeking facilities: Urban vs. Rural	3.398* (1,816)	9.678 (1,761)
(5)	Profit-seeking facilities: Chain vs. Independent	31.826 (1,816)	79.854 (1,761)
(6)	Nonprofit facilities: Urban vs. Rural	0.003* (1,91)	0.209* (1,88)
(7)	Nonprofit facilities Chain vs. Independent	14.832 (1,91)	15.445 (1,88)
(8)	Rural facilities: Profit vs. Nonprofit	27.573 (1,437)	37.252 (1,402)
(9)	Urban facilities: Profit vs. Nonprofit	32.131 (1,470)	65.141 (1,447)

Note: *Unable to reject the null hypothesis at the 95 percent confidence level.

TABLE VI
Absolute and relative price efficiency

Facility classification and *k*-values	
π	0.849
Chain	0.841
Rural	0.833
Urban	0.799
Independent	0.764
$n\pi$	0.648
Rural – Chain – π	0.638
Urban – Chain – π	0.621
Rural – Independent – π	0.605
Urban – Independent – π	0.592
Rural – Chain – $n\pi$	0.527
Urban – Chain – $n\pi$	0.521
Rural – Independent – $n\pi$	0.516
Urban – Independent – $n\pi$	0.513

Notes: (1) *k*-values < 1 indicate absolute price inefficiency; (2) significant differences between classification *k*-values and 1 are indeterminable; (3) facilities are ranked based on their ability to match their marginal revenue product for labor with the wage rate. (4) In order to conduct hypothesis tests for absolute and relative price efficiency, we also must estimate a labor-demand equation using Zellner's (1962) "seemingly unrelated regression" (ZSUR) technique. The labor-demand equation is:

$$-(Total\ Wage/Profit) = c_0 + c_i\ Dummy$$

The dependent variable in the labor-demand equation is the ratio of [(total wages for LVNs and aides)/2]/*Profit*. *Total Wage* is an arithmetic average of the total wage bill for licensed vocational nurses (LVNs) and aides. *Dummy* is the dummy variable for either urban/rural, profit-seeking/nonprofit or chain/independent comparison analyses. Because of the profit identity, only the profit and input-demand equations need to be estimated.

urban facilities appear to be better at matching the wages paid with employee productivity. However, these differences are numerically small and, for urban-rural comparisons, statistically mixed.

Finally, although the comparative efficiency results of profit-seeking firms and nonprofit facilities are fairly well known, the question remains whether the finding reflects differences in managerial efficiency or differences in the quality of care provided. Past studies either assumed that quality is homogeneous for all facilities (Knox et al., 2001; Anderson et al., 1999), or used ad hoc proxies such as the number of bedsores reported, number of unsolicited complaints, number of observed violations, number of nurses per resident, etc. A decade ago, Davis (1991, p. 135) indicated that the "literature on nursing home quality consists of a morass of findings that are largely inconsistent due to disparate methods of defining and measuring quality." Clearly, this is a most interesting issue that requires further examination in future research efforts.

Based on the results of the cost and profit functions and our performance rankings, the second phase of our procedure is to examine the link between performance and compensation using an empirical "compensation function."

Compensation function results

Beyond the neoclassical economic model (marginal revenue product equals marginal cost of managerial talent as in Bodvarsson and Brastow (1998)), we are not aware of a specific, generally accepted quantitative theory that specifies the relationship between pay and performance. Of course, conceptual qualitative links are found in

TABLE VII
Facility performance rankings summary

Rank	Technical efficiency (cost function)			Price efficiency** (profit function with ZSUR)			Relative economic efficiency (profit function)		
1	π	Independent	Rural*	π	Chain	Rural	π	Chain	Urban*
2	nπ	Chain	Urban*	nπ	Independent	Urban	nπ	Independent	Rural*

Notes: * Location significant differences are found for *all facilities* in cost (OLS and LTS) function and profit (LTS) function regressions.
** Facility ranking is based on *k*-values where significant differences are indeterminable.

numerous management texts (for example, Gibson, Ivancevich and Donnelly, 1991).

Although the theory of agency is given significant credit for explaining performance differences in firms of different organizational structure (as found in this study), the theory does not appear to explain convincingly the level or changes in the level of management remuneration. We therefore consider the following issues to be essentially empirical: (1) Do relatively higher levels of performance lead to relatively higher levels of compensation? (2) Does the employment market recognize key responsibilities of the manager and compensate accordingly? Our empirical compensation function is:

$$\ln COMP = \beta_0 + \beta_1 LOCATION + \beta_2 PROFIT\text{-}SEEKING + \beta_3 CHAIN + \beta_4 OCCU + \beta_5 \ln CSMX + \beta_6 \ln BEDS + e.$$

This regression model attempts to explain the compensation of Texas nursing facility administrators. The dependent variable, ln *COMP*, is the natural log for salary and benefits paid to each facility's top administrator.[6]

The dummy variables are used to reflect performance rankings: *LOCATION* (1 = urban, 0 = rural), *PROFIT-SEEKING* (1 = profit-seeking, 0 = nonprofit) and *CHAIN* (1 = chain member, 0 = independent). Simultaneously, *LOCATION* reflects competitive markets for both inputs and output (Gomez-Mejia and Wiseman, 1997); *PROFIT-SEEKING* reflects ownership structure (Conyon and Peck, 1998), and *CHAIN* reflects governance (Zajac and Westphal, 1995). The remaining variables are used to adjust compensation for facility size (*BEDS* is the number of resident beds in each facility), occupancy levels (*OCCU* is the occupancy rate (average resident days per bed/365 days)), and the type of resident care provided (*CSMX* is the TILE variable in Table I). Based on the suggested generalized framework, *BEDS* reflects firm size (Gomez-Mejia and Wiseman, 1997; and Carr, 1997) and management's span of control; *OCCU* reflects sales levels (Ciscel and Carroll, 1980) and capacity utilization; and *CSMX* reflects management risk-taking decisions (Carr, 1997).

Table VIII presents the estimates of the compensation function. If the coefficients of the higher-performing facility classifications in Table VII are significantly different from zero, we may conclude that a link has been established between pay and performance. Additionally, by controlling for facility size, level of resident care, and the number of residents, we obtain (1) a more appropriate comparison among facility classifications and (2) insight into the labor market's recognition and compensation for the manager's ability to handle the responsibilities of supervision, risk taking, resource utilization, and sales. As each of these functional responsibilities increases, we expect compensation to increase as well.

According to Table VIII, the links between compensation and performance are not as strong as agency theorists would expect. The link between organizational structure and pay is statistically significant for OLS. Profit-seeking facilities pay 4.4–10.9 percent more in salary and benefits than nonprofit facilities. This is an important finding as Table VII suggests that profit-seeking facilities are more efficient performers. The evidence supports the conventional wisdom that managers are rewarded for efficiency as measured by lower average costs or higher profits (Ullmann, 1987).

TABLE VIII
Compensation function estimates (ln COMP is the dependent variable)

Independent variables	OLS		LTS	
	Coefficient	T-statistic	Coefficient	T-statistic
LOCATION	–0.083	–3.086	–0.049	–2.982
PROFIT-SEEKING	0.109	2.906	0.044	1.901
CHAIN	0.017	0.613	–0.029	–1.701
OCCU	1.771	29.084	0.769	15.585
ln *CSMX*	0.426	3.389	0.462	5.957
ln *BEDS*	0.416	13.168	0.288	14.593
Constant	8.129	25.838	9.708	48.745
Std. error of est.	0.395		0.233	
R-squared	0.512		0.349	
F-stat	176.921		82.514	
	(6, 1010)		(6, 920)	
Sample size	1017		927	

Compensation differences between chains and independent facilities are not statistically significant in both OLS and LTS regressions. We repeat that, in Table VII, chains are statistically more inefficient in cost-function analyses and statistically more efficient in profit-function analyses.

Urban facilities pay their top administrator 4.9–8.3 percent less than do rural facilities. Further, the total cost function model indicates (Table III) that urban facilities are less cost efficient in both OLS and LTS regression results. However, our profit function OLS results (Table V) do not support urban/rural performance differences for profit-seeking, nonprofit, or all facilities combined. LTS results do significantly support stronger urban facility relative economic performance for profit-seeking and all facilities combined, but not for nonprofit firms.

Table IX provides a comparison summary of the above discussion. Finally, as shown in Table VIII, occupancy rates, case-mix, and facility size are important determinants of managers' compensation. As expected, their compensation is higher when there are fewer empty beds, the case mix is riskier, and the facility is larger.

Conclusion

According to the performance rankings obtained from the OLS cost and profit functions and our compensation function regressions, it is clear that the highest paid administrators (profit-seeking) are also the most efficient allocators of facility resources. Robust LTS regressions support this conclusion as well, except in the compensation function. On the other hand, we have not found

TABLE IX
Compensation and performance comparison summary

Facility comparison groups	Relative compensation difference (%)*		Relative cost difference (%)**		Relative profit difference (%)**	
	OLS	LTS	OLS	LTS	OLS	LTS
Profit-seeking vs. Nonprofit	10.9	4.4*	–12.1	–9.6	54.7	24.9
Chain vs. Independent	1.7*	–2.9*	2.9	4.6	33.7	28.6
Urban vs. Rural	–8.3	–4.9	2.7	2.4	7.9*	10.1

Notes: * Values are not significant at the 5% level.
** Cost and profit values obtained from Tables III and IV, respectively.

convincing or statistically reliable relationships between management compensation and chain membership or urban location. Although the profile data in Table II indicate higher compensation in urban facilities, with adjustments for facility size, occupancy rate, and case-mix (see Table I), our model implies that rural administrators are paid more for less. We simply do not know if top administrative positions in rural facilities in Texas are considered hardship posts.

Inclusion of other variables as suggested by Barkema and Gomez-Mejia (1998) to broaden the general framework for analyses indicates that the managerial labor market recognizes and rewards administrators in Texas nursing facilities for facility operating size, risk-taking decisions, and capacity resource utilization. We conclude that there is a direct link between management compensation and organizational performance. However, the link is weak as has been found in previous research (Tosi et al., 1998; and Jensen and Murphy, 1990b). Further, given the mixed performance results of the regression models, it is not clear if chain facility managers or urban facility managers are adequately compensated on a relative basis. Finally, management compensation appears to be better explained by the human-resource-market model than the agency theorist's pay/performance paradigm.

Notes

[1] Texas nursing facilities are small (averaging approximately $2.5 million in annual cost per home) compared with firms usually studied in the management compensation literature (e.g., Fortune 500). However, with reference to the nursing home industry, Texas facilities would cover the range from a few beds to several hundred.

[2] Medicare and Medicaid are public insurance programs designed to provide specific groups with access to the U.S. health care system. Begun in the mid 1960s, both programs are government financed and administered, but rely on the private sector for the delivery of health care services. Medicare provides coverage for the elderly, disabled, and individuals with end-stage renal disease. The source of funding for Medicare is a payroll tax paid jointly by employers and employees. Administration is through the Centers for Medicare and Medicaid Services (formerly the Health Care Financing Administration). Medicaid is a program of the U.S. federal government and the states. Beneficiaries are principally low income individuals who have satisfied a financial needs test. The source of funding for Medicaid is through general tax revenues at both the federal and state levels.

[3] Certificate of Need (CON) legislation is designed to limit costly capital expenditures that increase the cost of healthcare. Originally put into law in 1974 through the National Health Planning and Resources Development Act, health care suppliers are required to receive approval through a government planning board prior to new plant additions. In the 1980s, CON was repealed at the national level leaving only a few states today that continue to impose moratoriums on capacity expansion.

[4] Least trimmed squares is a robust method designed to withstand outliers in either dependent or independent variables. This version uses a Tukey biweight function to downweight or exclude observations with large, robust residuals. The LTS results provide a useful sensitivity analysis that highlights the existence of atypical firms in the industry (Rousseeuw and Leroy, 1987).

[5] The surprising chain results have been found previously by Anderson, Lewis and Webb (1999) and Knox et al. (2000). However, by using resident costs (that is, compensation of LVNs and aides, medical equipment and supplies, laundry and housekeeping food preparation and utilities) only rather than total costs, Knox et al. (2001) find that chains are more cost efficient. These results are not included.

[6] A noted concern here is the separation of ownership and management in small, privately held firms. The owner or a close relative may in fact be the administrator of the nursing facility. In such cases, the allocation of revenues between profit and the administrator's salary may be rather arbitrary. It could be affected by tax incentives and other factors not included in our model, leading to a biased measurement of the dependent variable. By concentrating on independent, profit-seeking facilities (the most likely classification of firms reflecting this issue), we used our compensation model to examine (1) the independent, profit-seeking facilities by themselves, (2) the independent, profit-seeking facilities below the median size of this group, and (3) all facilities except the independent, profit-seeking facilities for consistency of results. Our findings indicate that, although the coefficient magnitudes are different, the qualitative results are similar except for minor significance differences. Thus, if the revenue-allocation issue produces a bias in the dependent variable, it is apparently too small to alter our conclusions about the compensation function. Results are not included for brevity.

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