Organizational Structure, Performance, Quality and Administrative Compensation in Texas Nursing Facilities

Kris Joseph Knox
Texas A&M University at Galveston

Eric C. Blankmeyer
Southwest Texas State University

J. R. Stutzman
Southwest Texas State University

This study examines the link between pay of the top administrator and the firm's performance by comparing profit-seeking versus nonprofit nursing facilities in Texas. Using both cost and profit functions to measure resource allocation by management, we rank various nursing facility classifications in terms of cost efficiency and overall economic efficiency (that is, both cost and price efficiency). Our empirical compensation function reflects both agency performance measures and variables suggested by the human-resource market model—firm size, degree of risk taking, sales and capacity utilization, and quality. Although we find that the administrators of more efficient profit-seeking firms are better paid than their nonprofit counterparts, the statistical evidence is not as convincing as financial economic-agency theorists would assert. While quality of care has no systematic impact on administrative compensation in Texas nursing facilities, we believe that the compensation market model is more viable than the pay-performance paradigm.

Introduction

Agency-theory issues addressing the separation of ownership and management have engaged public and financial economists' interest for more than 25 years. An issue of primary concern is the link between firm performance and managerial compensation. The fundamental question is whether the marginal cost of managerial

0747-5535/01/1600/0045/$2.00

talent (compensation) matches the manager's marginal revenue product (performance). More generally, does the firm's managerial compensation provide adequate incentives to maximize firm 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; and 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 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 *Wall Street Journal*'s annual April Executive Pay section or a recent article by Lublin (2000)]. 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-Mejia, 1998). Less attention has been directed toward compensation and performance in small firms; and it is not clear as to whether 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] profit-seeking and nonprofit nursing facilities in Texas. This effort is unique in that performance is measured using both cost and profit functions, which better reflect the resource-allocation choices by the firm's management. This study also considers the quality of care provided. We rank various nursing facility classifications in terms of technical (cost) efficiency and overall economic efficiency [that is, a combination of both technical (cost) and allocative (price) efficiency]. We employ both ordinary least squares and robust RDL1 regression techniques on 1998 data. Our empirical compensation function examines the impacts of organizational form, geographical location, chain affiliation, occupancy rate, case mix, firm size, and quality on administrative compensation. As far as we know, this is the first pay-performance study of the Texas nursing facility industry that takes into account variations in quality of care among facilities.

Analytical Framework

Historically, two fairly broad perspectives have been used to examine managerial compensation: the financial economists' approach of moral hazard/agency theory and the human-resource market model proposed by management theorists. Much of

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

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 pay-performance paradigms (Zajac and Westphal, 1995). The latter theories, however, yield ambiguous results in empirical tests. Tosi, Werner, Katz, and Gomez-Mejia (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 the principals. The principals face the problem of controlling agent behavior because (1) the agents rationally pursue their own self-interests, (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, and/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 the owners' and managers' goals are de-emphasized in the human resource approach.

Barkema and Gomez-Mejia (1998, p. 143) assert "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. 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, however, 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.

In a study of over 350 Fortune/Forbes 500 firms from 1976-1990, Zajac and Westphal (1995) test the agency theory of managerial compensation against the human-resource theory. Of interest in this study are the findings that (1) changes in compensation contingency levels of firms using pay-performance incentives did not increase compensation contingency any more than firms not using agency explanations and (2) firms using human-resource models did not increase the total compensation levels more than those firms not using human-resource models. If

these results may be generalized, the weak link between compensation and firm performance is not surprising.

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 investment and financial decision-making by management. In an insightful summary of the performance-pay paradigm, Jarrell (1993) calls for research to establish a stronger linkage between pay and performance that would justify higher executive compensation. Additionally, Jarrell 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 that do not correlate with changes in shareholder wealth would be inappropriate predictors in profit-seeking firms. 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, Boquist, Milborn, and Thakor (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 also should be included. Proposed explanatory variables include firm size, market forces, sales levels (Ciscel and Carroll, 1980; and Carr, 1997), 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 also should 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 profit-seeking and nonprofit nursing facilities 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. Because 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 that 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. Judith Kidd (2000), assistant dean of Howard College for Public Finance, asserts that the "nonquantifiable" issues such as satisfying multiple stakeholders, building passionate work forces, and developing nonfinancial measurements of goals faced by nonprofit managers may teach a thing or two to profit-seeking counterparts.

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 because 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 (Knox, Blankmeyer, and Stutzman, 1999; Claggett, Hollas, and Stansell, 1995; Stutzman and Stansell, 1992; and 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. 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, however, specifically reflect management's resource allocation decision-making ability to (1) use the optimal combination of input factors (labor and capital) that minimize the average cost of producing a given level of output and (2) align the variable factors' managerial revenue product with their costs. Stigler (1976) points out that the imposition of any arbitrary set of goals upon firms that, in fact, have other goals leads to the false conclusion that the firms are inefficient. We recognize that profit-maximization models represent a restricted view of the objectives of diverse firms. Making no *a priori* assumptions regarding a firm's objectives, we simply test for exhibited differences in functions reflecting profit maximization. We are able to rank various nursing facility classifications in terms of technical (cost) efficiency and relative overall economic efficiency [both cost and price (allocative) efficiency]. As expected, nonprofit nursing facilities are more costly and less profitable than profit-seeking facilities; however, our findings do not imply that nonprofit facilities are less successful in achieving goals other than profitability.

Data

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 Merrill Dow, 1997). Approximately 88 percent are profit-making facilities; the remainder includes government, fraternal, and church-affiliated entities (nonprofit). Some 80 percent are members of nursing home chains; the rest are independent. Further, approximately 75 percent of all nursing home residents in Texas are Medicaid beneficiaries (Texas Health Care Association, 1997).

All data, except quality information, are from the *1998 Texas Medicaid Nursing Facility Cost Report* (Texas Department of Human Services, 1998). Quality data are the Quality Reporting System (QRS) rating of each Texas nursing facility by state regulators (Texas Department of Human Services, 2000). Table 1 provides a detailed profile summary of the Texas nursing facility industry for 1998 in terms of various facility classifications and characteristics. The Texas Department of Human Services (TDHS) gathers data through annual cost reports for all facilities receiving Medicaid reimbursement (approximately 95 percent of all Texas nursing facilities) and regulates all nursing facilities in Texas. Table 2 provides descriptive statistics on compensation of the top administrator. We should note that: (1) approximately 11 percent of all facilities in Texas not are included in Tables 1 and 2, (2) although the

Table 1—1998 Texas Nursing Facility Industry Profile Summary

Facility & Characteristics	Profit Seeking	Nonprofit	Chain		Independent		Urban		Rural	
	π	nπ	π	nπ	π	nπ	π	nπ	π	nπ
Number of Facilities (1022)	884	138	764	71	120	67	459	72	425	66
(Avg/MSA)							(17.00)	(2.67)		
(Avg/County)							(9.37)	(1.47)	(2.07	(.32)
Number of Beds (112,747)	97,567	15,180	85,598	8,174	11,973	7,002	56,076	9,317	41,497	5,862
(Avg/MSA)							(2,077)	(345)		
(Avg/County)							(1,144)	(190)	(202)	(29)
Average Number of Beds	110.37	110.00	112.04	115.13	99.78	104.55	122.17	129.40	97.64	88.82
(Combined)			(112.30)		(101.49)		(123.15)		(96.45)	
Occupancy Rate (percent)	69	80	67	76	75	84	72	79	65	80
(Combined)			(68)		(78)		(73)		(67)	
Average Patient Days/Year	27,601	32,048	27,658	32,303	27,239	31,777	32,045	37,868	22,801	25,699
(Combined)			(28,053)		(28,865)		(32,834)		(23,191)	
Medicaid Patient Days (percent)	74	66	74	71	72	61	73	64	74	67
(Combined)			(73)		(68)		(72)		(73)	
Medicaid Revenue/Total Patient										
Revenue (percent)	70	62	70	66	70	59	69	60	72	65
(Combined)			(70)		(66)		(68)		(71)	
Average Cost (dollars): Patient Care	1,417,896	1,911,904	1,426,194	1,875,713	1,365,070	1,950,256	1,694,903	2,312,688	1,118,730	1,474,685
(Combined)			(1,464,416)		(1,574,736)		(1,778,670)		(1,166,577)	
Administrative	310,838	323,879	325,566	365,420	217,071	279,858	376,465	385,654	239,962	256,439
(Combined)			(328,956)		(239,567)		(377,711)		(242,184)	
Capital	434,277	444,219	449,105	517,603	339,874	366,454	517,423	544,935	344,480	334,292
(Combined)			(454,929)		(349,397)		(521,160)		(343,111)	
Average TILE Ranking	7.69	7.91	7.67	7.83	7.81	7.99	7.59	7.79	7.79	8.04
(Combined)			(7.68)		(7.87)		(7.62)		(7.82)	
Average Employee Turnover (times)	2.61	2.02	2.64	1.99	2.41	2.05	2.68	2.12	2.54	1.91
(Combined)			(2.59)		(2.28)		(2.60)		(2.45)	
Average Quality Rating (QRS)	59.03	61.59	58.66	59.69	61.38	63.51	56.87	58.04	61.37	65.40
(Combined)			(58.75)		(62.15)		(57.03)		(61.92)	

Table 1 (cont.)—1998 Texas Nursing Facility Industry Profile Summary

	Urban				Rural			
	Chain		Independent		Chain		Independent	
Facility & Characteristics	π	nπ	π	nπ	π	nπ	π	nπ
Number of Facilities (1022)	400	42	59	30	364	29	61	37
(Avg/MSA)	(14.81)	(1.56)	(2.18)	(1.11)				
(Avg/County)	(8.61)	(.86)	(1.20)	(.61)	(1.78)	(.14)	(.30)	(.18)
Number of Beds (112,474)	49,600	5,082	6,372	4,260	36,036	3,103	5,551	2,775
(Avg/MSA)	(1,837)	(188)	(236)	(158)				
(Avg/County)	(1,012)	(104)	(130)	(87)	(176)	(15)	(27)	(14)
Average Number of Beds	124	121	108	142	99	107	91	75
(Combined)	(124)		(120)		(99)		(85)	
Occupancy Rate (percent)	71	77	78	81	64	74	73	86
(Combined)	(71)		(79)		(64)		(78)	
Average Patient Days/Year	32,210	34,856	30,922	42,084	22,654	28,605	23,675	23,420
(Combined)	(32,462)		(34,685)		(23,094)		(23,579)	
Medicaid Patient Days (percent)	73	68	71	60	74	75	73	61
(Combined)	(73)		(67)		(74)		(69)	
Medicaid as % of Total Revenue	69	62	69	57	72	72	71	60
(Combined)	(68)		(65)		(72)		(67)	
Average Cost (dollars): Patient Care	1,712,352	2,120,610	1,576,604	2,581,599	1,111,734	1,521,035	1,160,471	1,438,357
(Combined)	(1,751,146)		(1,915,367)		(1,141,937)		(1,265,387)	
Administrative	392,856	396,045	265,340	371,106	251,623	321,067	170,384	205,874
(Combined)	(393,159)		(300,992)		(256,747)		(183,733)	
Capital	531,627	568,176	421,128	512,519	358,422	444,360	261,285	248,022
(Combined)	(535,100)		(451,934)		(364,764)		(256,278)	
Average TILE Ranking	7.57	7.72	7.73	7.90	7.77	7.99	7.90	8.07
(Combined)	(7.59)		(7.78)		(7.79)		(7.96)	
Average Employee Turnover (times)	2.69	2.05	2.62	2.21	2.59	1.90	2.21	1.91
(Combined)	(2.63)		(2.48)		(2.54)		(2.10)	
Average Quality Rating	56.06	57.33	62.48	59.00	61.53	63.07	60.43	76.16
(Combined)	(56.18)		(61.22)		(61.65)		(62.97)	

Table 2—1998 Texas Nursing Facility Compensation Profile Summary

Facility & Compensation	Profit-Seeking	Nonprofit	Chain		Independent		Urban		Rural	
	π	nπ	π	nπ	π	nπ	π	nπ	π	nπ
Top Administrator Only (dollars):										
Mean Salary & Benefits	55,182	52,135	55,341	51,882	54,156	52,403	58,748	55,482	51,339	48,483
(Combined)			(55,047)		(53,524)		(58,304)		(50,955)	
Range	0-155,821	0-157,189	0-155,821	13,707-133,365	6,250-114,587	0-157,189	0-155,821	12,667-157,189	0-144,214	0-133,365
(Combined)			(0-155,821)		(0-157,189)		(0-157,189)		(0-144,214)	
Standard Deviation	21,490	22,289	21,798	21,858	19,456	22,899	22,145	24,829	20,090	18,648
(Combined)			(21,811)		(20,717)		(22,531)		(19,908)	

	Urban				Rural			
	Chain		Independent		Chain		Independent	
	π	nπ	π	nπ	π	nπ	π	nπ
Top Administrator Only (dollars):								
Mean Salary & Benefits	58,819	52,380	58,259	59,825	51,520	51,160	50,254	46,385
(Combined)	(58,203)		(58,793)		(51,494)		(48,793)	
Range	0-155,821	13,707-106,535	13,855-114,587	12,667-157,189	0-144,214	22,227-133,365	6,250-101,416	0-82,915
(Combined)	(0-155,821)		(12,667-157,189)		(0-144,214)		(0-101,416)	
Standard Deviation	22,442	22,108	20,147	28,015	20,424	21,859	18,084	15,682
(Combined)	(22,466)		(22,981)		(20,504)		(17,237)	

data reflect information for both private-pay and Medicaid/Medicare residents, private pay information is not directly available, 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 1,000 facilities adequately reflect the nursing facility industry in Texas.

Most of the variables in Tables 1 and 2 are self-explanatory. The TILE (Texas Index for Level of Effort) ranking and the Quality Reporting System (QRS) require explanation. TILE is an index used to measure a facility's case mix. There are 11 categories based on activities-of-daily-living criteria. Reimbursement for a resident in a given category is the same for all facilities statewide. This per-diem reimbursement is an inflation-adjusted, prospective rate. It is based on the average costs of all participating facilities' 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.

Our quality-of-care measure is the QRS index value, a simple average of four components. Two components, the potential advantages score (PAS) and the potential disadvantages score (PDS), are derived from a detailed quarterly assessment of each resident by nursing home staff. The assessment, which evaluates the resident's health and quality of life, is based on the Center for Health Systems Research and Analysis (CHSRA) quality indicators adopted by the Health Care Financing Administration (HCFA) for use in monitoring nursing facility performance. This assessment is "not independently verified by the Department of Human Service" (TDHS, 2000, p. 2). The PAS is a measure of adverse

> conditions that appear to be less common among residents in the facility than they are among residents in 90 percent of all other facilities ... It is important to remember that the PAS is based on quality indicator conditions that may be less common in a particular facility simply because the residents in that facility are more healthy or less prone to those conditions. Low quality scores that create a favorable PAS do not always imply higher quality services ... The PAS rates each facility based on the number of indicator conditions that suggest potentially superior performance ... The most favorable PAS rating means that a facility has the most potential advantages (TDHS, 2000, p. 2).

Conversely, the PDS reflects adverse conditions that occur with exceptional frequency in the facility. A high number of adverse quality indicators generates a low PDS score. The PDS adverse quality indicator may reflect conditions that may be more common in a particular facility simply because the residents in that facility are less healthy or more prone to those conditions. A more favorable PDS rating indicates that the facility has the potential for superior performance. A favorable PAS or

PDS score raises a nursing home's overall quality index. The other two components of the QRS rating focus on deficiencies actually observed and verified by state regulators (compliance with state and federal regulation components), whether in response to complaints or in the course of regular inspections. According to TDHS (2000, p. 3), "The number of deficiencies does not determine the compliance score; it is the nature, scope, and severity of the most severe deficiency that determines the score."

The Texas Department of Human Services cautions that the QRS ratings "are based on a reporting period that tends to indicate each facility's recent performance. QRS ratings do not indicate facility performance over the long run" (TDHS, 2001, p. 1). A possible remedy is to average each facility's ratings over several years, an approach we intend to use when the data become available to us. The department also emphasizes that a nursing home providing superior care nevertheless may have a low PAS or a high PDS depending upon either the general health or condition of the residents. The case-mix variable in our regression equation is expected to help control for this effect. While the QRS ratings are an imperfect index of quality of care in Texas nursing facilities, we know of no other available proxy that seems more valid conceptually or that has greater informational content.

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), occupancy rate (capacity utilization), and quality of care.

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 analyzed by comparing two firms and allowing for 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 (or price 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 allo-

cation 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.

Performance Results

Table 3 displays our basic cost model, a description of the variables, and the results of both OLS and RDL1 regressions. RDL1 regression is an enhanced robust method designed to withstand outliers in either dependent or independent variables when the regression includes both continuous-valued and dummy variables (Hubert and Rousseeuw, 1997a, 1997b).[2] The RDL1 results provide a useful sensitivity analysis that highlights the existence of atypical firms in the industry.

[2] Hubert and Rousseeuw (1997a) discuss robust linear regression when the regressors include both continuous-valued variables and dummy variables. The authors show that this situation leads to conceptual and computational issues for robust regression. To address these issues, they propose the RDL1 method, a three-step procedure based on the reasonable assumption that the dummy variables themselves have been constructed correctly. This means, for example, that all the nursing facilities have been grouped accurately as urban or rural, profit seeking or nonprofit, and chain member or independent. Any data grossly inconsistent with the model therefore are restricted to the continuous-valued independent variables or the dependent variable.

The first RDL1 step identifies high-leverage observations among the continuous-valued independent variables (the logarithms of the wage rate, the output price, the quality index, the occupancy rate, and the capital input). Their mean vector and covariance matrix are estimated robustly, and for each observation a robust distance (RD) from the mean vector is computed. Data with large RDs are probable high-leverage points, which lie far from the majority of

Table 3—The Total Cost Function with 1998 Data (ln Total Cost is the dependent variable)

	OLS		RDL1	
Independent Variables	Coefficient	t-statistic	Coefficient	t-statistic
LOCATION	0.023	2.112	0.021	2.423
PROFIT-SEEKER	-0.126	-8.118	-0.116	-9.176
CHAIN	0.044	3.149	0.057	5.052
ln WAGE RATE	0.555	12.701	0.503	14.453
ln QUALITY	-0.035	-2.071	-0.041	-3.067
ln OCCU	-0.111	-6.566	-0.128	-8.754
ln DAYS	1.000	70.592	1.004	88.683
ln CSMX	0.379	6.923	0.429	9.719
CONSTANT	4.113	19.373	4.274	25.007
Standard Error of Estimate	0.158		0.123	
R^2	0.946		0.957	
F-statistic	2126.000		2594.000	
	(8,974)		(8,931)	
Sample Size	983		940	

Note: $\ln COST = \beta_0 + \beta_1$ LOCATION $+ \beta_2$ PROFIT-SEEKER $+ \beta_3$ CHAIN $+ \beta_4 \ln$ WAGE RATE $+ \beta_5 \ln$ QUALITY $+ \beta_6 \ln$ OCCU $+ \beta_7 \ln$ DAYS $+ \beta_8 \ln$ CASE MIX + U

where COST includes employees' wages and benefits, compensation of contract personnel, purchase of materials and equipment, administrative outlays, utilities, maintenance, depreciation, taxes, interest, and insurance. The dummy variables are: LOCATION (1 = urban, 0 = rural) which reflects 28 MSAs in Texas as being urban and all other facilities in counties outside the MSAs as rural, PROFIT-SEEKER (1 = profit-seeker, 0 = nonprofit) is the organizational structure variable, and CHAIN (1 = member of a chain of nursing homes, 0 = independent) indicates whether or not the facility is a member of either a profit-seeking or nonprofit chain. WAGE RATE is an estimate of each nursing facility's average hourly wage for licensed vocational nurses and aides (assistants to nurses and therapists as well as other employees providing general care for residents) combined. QUALITY is the QRS index for measuring care quality. OCCU is the occupancy rate (average resident days per bed/365 days). DAYS is a facility's total resident days in 1998. CSMX measures each nursing facility's average case mix, an index of the level of medical care and supervision provided to residents. 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

Table 3 shows that profit-seeking facilities are 12.6 percent (OLS) less costly than nonprofits, urban facilities are 2.3 percent (OLS) more costly than rural facili-

observations and can distort an OLS regression. These leverage points are downweighted accordingly.

The second RDL1 step deals with outliers in the dependent variable. The L1-norm regression minimizes the total absolute error instead of the total squared error. It detects observations on the logarithm of profit whose vertical distances from the regression line are large. In the third step, residuals from the weighted L1 regression are standardized in a robust way; and observations whose residuals exceed 2.5 in magnitude are dropped from the sample. Finally, OLS is applied to the purged sample to obtain the RDL1 regression coefficients that we report.

The RDL1 procedure highlights data that are significantly at variance with the linear model. These unusual observations need not be ignored; they can contribute to the evaluation of the model. For example, they may identify exceptionally efficient or inefficient nursing facilities, or facilities with atypically high or low quality levels or wage rates. Hubert and Rousseeuw (1997b) provide an instructive application of RDL1.

ties, and chains are 4.4 percent (OLS) more costly than independent facilities.[3] Of additional interest is the result that, as quality increases, costs decline.

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.

Table 4 displays regression results for the profit function. Profit-seekers clearly achieve higher overall efficiency (41.6-45.2 percent higher profits) than do nonprofits and, reversing the result of the total cost function, chain members appear to be significantly more efficient (13.9-14.4 percent higher profits) than independent facilities (RDL1 only). Additionally, the profit function indicates that urban facilities are more overall efficient (5.1-8.8 percent higher profits) than rural facilities. This conclusion, while not statistically significant, also reverses the findings of the total cost model. Table 5 provides a more detailed report of relative economic efficiency (i.e., both technical and allocative efficiency) between the various groups of facilities. Test 5 in Table 5 is noteworthy in that the efficiency of profit-seeking chain and independent facilities is not significantly different. When nonprofit facilities are included, however, chain facilities are marginally more efficient than independents (Test 2).

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 advantage found by the cost function. That is, chain and urban facilities appear to be better at matching the wages paid with employee productivity. These differences are numerically small and, for urban-rural comparisons, statistically insignificant. Based on the results (Tables 3, 4, and 5) of the cost and profit functions, Table 6 provides a performance ranking for technical efficiency and combined cost and price efficiency for the nursing facility industry in Texas.

[3] The surprising result that chain nursing facilities are more costly or less efficient than independent nursing facilities has been found previously by Anderson, Lewis, and Webb (1999) and Knox, Stutzman, and Blankmeyer (2000). 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 cost, Knox, Blankmeyer, and Stutzman (2001) find that chains are more cost efficient as expected. These results are not included.

Table 4—The Profit Function (ln PROFIT is the dependent variable)

	OLS		RDL1	
Independent Variables	*Coefficient*	*t-statistic*	*Coefficient*	*t-statistic*
LOCATION	0.088	1.346	0.051	1.137
PROFIT-SEEKER	0.416	4.178	0.452	6.624
CHAIN	0.139	1.673	0.144	2.537
ln WAGE RATE	-1.011	-3.374	-0.669	-3.627
ln PRICE	1.558	4.773	1.418	6.296
ln QUALITY	0.238	2.459	0.159	2.322
ln OCCU	1.391	22.796	1.479	29.649
ln CAPITAL	1.278	14.870	1.318	22.687
CONSTANT	10.981	11.004	10.249	14.767
Standard Error of Estimate	0.867		0.568	
R^2	0.496		0.671	
F-statistic	102.500		196.300	
	(8,834)		(8,770)	
Sample Size	843		779	

Note: $\ln PROFIT = \beta_0 + \beta_1 LOCATION + \beta_2 PROFIT\text{-}SEEKER + \beta_3 CHAIN + \beta_4 \ln WAGE\ RATE + \beta_5 \ln PRICE + \beta_6 \ln QUALITY + \beta_7 \ln OCCU + \beta_8 \ln CAPITAL + e$

where the dependent variable, PROFIT, is defined to be operating profit (that is, earnings before tax plus interest, depreciation and property tax). The independent variables for the profit function include dummies: LOCATION, PROFIT-SEEKER and CHAIN. LOCATION (1 = urban, 0 = rural) reflects 28 MSAs in Texas as being urban and all other facilities in counties outside the MSAs 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-SEEKER (1 = profit-seeking, 0 = nonprofit) is the structural form variable.

The remaining variables in natural logs, are: hourly wage rate, price index, quality index, occupancy rate, and capital. The hourly wage rate (WAGE RATE) is the weighted average of the wage rates for LVNs and aides. This variable represents the price of variable inputs. The price variable (PRICE) is the TILE ranking index. The rankling is determined by classifying residents 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 residents are classified. (QUALITY) is the QRS quality of care index. The occupancy rate (OCCU) measures bed utilization (that is, capacity utilization). The capital (CAPITAL) variable is the number of beds in each nursing facility. This is our proxy for the quantity of fixed inputs.

Finally, although the comparative efficiency results of profit-seeking firms with nonprofit facilities is 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, Blankmeyer, and Stutzman, 2001; and Anderson, Lewis, and Webb, 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." The QRS index used in this study, although far from perfect, is the best measure we have encountered. By incorporating this variable in the cost and profit functions (the index is significant in both OLS and RDL1 regressions), we may conclude that there are significant differ-

Table 5—Tests of Relative Economic Efficiency

Facility Group Tested	OLS F-statistic	RDLI F-statistic
ALL FACILITIES:		
(1) Urban vs. Rural	1.963*	3.241*
	(1,834)	(1,773)
(2) Chain vs. Independent	4.423	8.779
	(1,834)	(1,773)
(3) Profit vs. Nonprofit	21.884	49.662
	(1,834)	(1,773)
PROFIT-SEEKING FACILITIES:		
(4) Urban vs. Rural	2.534*	3,559*
	(1,746)	(1,687)
(5) Chain vs. Independent	0.147*	1.471*
	(1,746)	(1,687)
NONPROFIT FACILITIES:		
(6) Urban vs. Rural	.261*	1.905*
	(1,81)	(1,79)
(7) Chain vs. Independent	9.917	9.166
	(1,81)	(1,79)
RURAL FACILITIES:		
(8) Profit v. Nonprofit	4.259	11.867
	(1,394)	(1,366)
URBAN FACILITIES:		
(9) Profit vs. Nonprofit	17.357	48.653
	(1,433)	(1,392)

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

ences in economic efficiency between profit-seeking and nonprofit nursing facilities, even when we control for quality of care.

According to our estimates, higher levels of quality of care reduce nursing-home cost and increase profit. Because quality improvement often requires additional resources and effort, our results may seem counterintuitive. It is worth emphasizing, however, that the cost and profit functions are reduced-form models. They describe the firm's minimized cost or its maximized profit in terms of various independent variables. Therefore, the measured impact of higher quality on cost and profit is the complex net effect of several behavioral and technological parameters.

It is perhaps not surprising that, in equilibrium, higher quality of care can reduce cost and increase profit. In the first place, a reputation for quality attracts new residents and raises the occupancy rate, boosting efficiency. In the second place, high quality satisfies regulatory requirements and avoids fines, restrictions on operations, and litigation.

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.

Table 6—Facility Performance Ranking Summary

Rank	Technical Efficiency (Cost Function)			Relative Economic Efficiency (Profit Function)		
1	π	Independent*	Rural	π	Chain	Urban**
2	$n\pi$	Chain*	Urban	$n\pi$	Independent	Rural**

Notes: *Rankings are significantly different when total facility costs are considered; however, when only resident costs are used, rankings are questionable

**Rankings are not statistically significantly different

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 numerous management texts (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 the level or changes in the level of management remuneration well. Therefore, we approach the following issues as basically empirical: (1) do higher levels of performance earn higher levels of compensation and (2) does the employment market recognize and compensate managers for making critical decisions about resource allocation? We employ the more general framework suggested by Barkema and Gomez-Mejia (1998). Our empirical compensation function is as follows:

$$\ln COMP = \beta_0 + \beta_1 LOCATION + \beta_2 PROFIT\text{-}SEEKING + \beta_3 CHAIN + \beta_4 \ln OCCU + \beta_5 \ln CSMX + \beta_6 \ln BEDS + \beta_7 \ln QUALITY + e$$

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.

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 performance 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)], the type of resident care provided (CSMX is each nursing facility's average case mix, an index of the level of medical care and supervision provided to residents [that is, the TILE variable found in Table 1)], and the quality of resident care provided (QUALITY is the Texas Department of Human Service's

QRS index found in Table 1). Again based on the suggested generalized framework, BEDS reflects firm size (Gomez-Mejia and Wiseman, 1997) and management's span of control; OCCU reflects sales levels (Carr, 1997; Ciscel and Carroll, 1980) and capacity utilization; CSMX reflects management risk-taking decisions (Carr, 1997); and QUALITY reflects the level of satisfaction with output (Ullmann, 1987; Davis, 1991).

Table 7 presents the estimated results of our compensation function. If the coefficients of the higher performing facility classifications (as found in Table 6) 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, the number of residents, and the quality of care, 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, sales, and quality control. As each of these functional responsibilities increases, we expect compensation to increase as well.

Table 7—Compensation Function Estimates (ln COMP is the dependent variable)

	OLS		RDL1	
Independent Variables	Coefficient	t-statistic	Coefficient	t-statistic
LOCATION	-0.037	-1.591	-0.039	-2.527
PROFIT-SEEKING	0.126	3.684	0.102	4.591
CHAIN	0.066	2.175	0.033	1.696
ln OCCU	0.743	36.219	0.499	24.395
ln CSMX	0.452	3.752	0.404	5.046
ln BEDS	0.397	13.137	0.319	15.773
ln QUALITY	0.027	0.737	0.007	0.285
CONSTANT	9.981	30.134	10.312	47.106
Standard Error of Estimate	0.346		0.218	
R^2	0.616		0.506	
F-statistic	221.644		130.886	
	(7,969)		(7,894)	
Sample Size	977		902	

According to Table 7, the link between organizational type and compensation is the performance result with highest statistical validity. Profit-seeking facilities pay 10.2 percent to 12.6 percent more in salary and benefits than nonprofit facilities. This is an important finding, as Table 6 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).

According to Table 8, chains appear to pay 3.3 percent to 6.6 percent more than independent facilities. The RDL1 results, however, are not statistically significant. Table 6 indicates that independent facilities are more cost efficient than chains

unless (1) a more narrow definition of cost (that is, resident costs only consisting of compensation to LVNs and aides, medical equipment and supplies, laundry and housekeeping, food preparation, and utilities) is used or (2) allocation efficiency is combined with technical efficiency; then chains are statistically significantly superior performers.

Table 8—Compensation and Performance Comparison Study

Facility Comparison Groups	Relative Compensation Difference (%)		Relative Cost Difference (%)		Relative Profit Difference (%)	
	OLS	RDL1	OLS	RDL1	OLS	RDL1
Profit-Seeking vs. Nonprofit	12.6	10.2	-11.8	-10.0	46.8	48.6
Chain vs. Independent	6.6	3.3*	5.1	7.0	13.8*	14.4
Urban vs. Rural	-3.7*	-3.9	3.2	3.2	8.8*	5.1*

Note: *Values are not significant at the 95 percent confidence level

Urban facilities pay their top administrators 3.7 percent to 3.9 percent less than do rural facilities although the OLS coefficient is not significant. Table 6 indicates that urban facilities are less cost efficient. Profit function results indicate that there is no statistically significant difference between urban and rural facility performance despite the sign implication that urban facilities are overall more efficient than rural facilities. Table 8 provides a comparison summary of the performance and pay classifications discussed above.

As shown in Table 7, occupancy rates, case mix, and facility size are important determinants of managers' compensation. As expected, administrative compensation is higher when there are fewer empty beds, the case mix is riskier, and the facility is larger. Of significant interest is the finding that quality of care has no systematic impact on administrative compensation, despite its apparent positive effects on cost and profit.

Conclusion

According to the performance rankings obtained from the 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. Both OLS and RDL1 regressions support this conclusion. This may be due more to organizational structure than to pay-performance incentives, however. Further, we have not found convincing or statistically reliable relationships between management compensation and chain membership or urban location. Although the profile data in Table 2 indicate higher compensation in urban facilities, with adjustments for facility size, occupancy rate, case-mix, and quality, our model implies (RDL1 significance only) that rural administrations are paid more for less. We simply do not know if top administrative positions in rural facilities in Texas are considered hardship posts (as might be expected in a market model).

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 (Carr, 1997), risk-taking (case-mix) decisions, market forces (competition) (Finkelstein and Baylor, 1998), sales levels (Ciscel and Carroll, 1980), and capacity resource utilization. We believe that there is a direct link between management compensation and organizational performance. The link is weak, however, as has been found in previous research (Tosi, Werner, Katz, and Gomez-Mejia, 1998; Jensen and Murphy, 19909b). 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. Thus, we conclude that the human-resource market model appears to significantly overshadow the pay-performance paradigm.

Of course, the surprising result of this study is the impact of quality. Quality of care in nursing facilities is of prime concern to current and potential residents, their families, regulators, and society. Unfortunately, to date a definitive measure of the quality of nursing home care has been elusive. Given that the QRS index adequately reflects facility quality, administrators whose facilities are achieving higher quality-of-care levels in the Texas nursing facility industry are not being compensated accordingly. From our perspective, this outcome supports neither the human-resource market model nor the pay-performance paradigm. Presumably, quality is a determinant of performance (as both our cost and profit functions significantly indicate) and is recognizable by demanders, suppliers, and regulators of long-term healthcare services as well. Regulators should explore incentives that would enhance administrative pay for facilities achieving meaningful and substantive improvements in quality.

References

1. Alchian, A.A., and H. Demsetz, "Production, Information Costs, and Economic Organization," *American Economic Review*, 62 (1972), pp. 777-795.

2. Andersen, Randy, I., Danielle Lewis, and James R. Webb, "The Efficiency of Nursing Home Chains and the Implications of Non-profit Status," *Journal of Real Estate Portfolio Management*, 5 (1999), pp. 235-245.

3. Bacidore, Jeffery, John Boquirt, Todd Milborn, and Anjan Thakor, "The Search for the Best Financial Performance Measure," *Financial Analysts Journal*, 53 (1997), pp. 1-20.

4. Barkema, Harry G., and Luis R. Gomez-Mejia, "Managerial Compensation and Firm Performance: A General Research Framework," *Academy of Management Journal*, 47 (1998), pp. 135-145.

5. Bodvarsson, Örn B., and Raymond T. Brastow, "Do Employers Pay for Consistent Performance? Evidence from the NBA," *Economic Inquiry*, XXXVI (1998), pp. 145-160.

6. Carr, Linda L., "Strategic Determinants of Executive Compensation in Small Publicly Traded Firms," *Journal of Small Business Management*, 35 (1997), pp. 1-12.

7. Ciscel, D., and T. Carroll, "The Determinants of Executive Salaries: An Economic Survey," *The Review of Economics and Statistics*, 62 (1980), pp. 7-13.

8. Claggett, E. Tyler, Jr., Daniel R. Hollas, and Stanley R. Stansell, "The Effects of Ownership Form on Profit Maximization and Cost Minimization Behavior within Municipal and Cooperative Electrical Distribution Utilities," *The Quarterly Review of Economics and Finance*, 35 (1995), pp. 533-558.

9. Conyon, M.J., and S.I. Peck, "Board Control, Remuneration Committees, and Management Compensation," *Academy of Management Journal*, 41 (1998), pp. 135-145.

10. Dahlman, C.J., "The Problem of Externalities," *Journal of Law and Economics*, 21 (1979), pp. 141-162.

11. Davis, M.A., "On Nursing Home Quality: A Review and Analysis," *Medical Care Review*, 48 (1991), pp. 129-166.

12. DeAlessi, Louis, "An Economic Analysis of Government Ownership and Regulation: Theory and Evidence from the Electric Power Industry," *Public Choice*, XIX (1974), pp. 1-42.

13. DeAlessi, Louis, "Property Rights, Transaction Costs, and X-Efficiency: An Essay on Economic Theory," *American Economic Review*, 73 (1983), pp. 64-81.

14. Demsetz, Harold, "Some Aspects of Property Rights," *Journal of Law and Economics*, 9 (1966), pp. 61-70.

15. Demsetz, Harold, "Toward a Theory of Property Rights," *American Economic Review*, 57 (1967), pp. 347-359.

16. Demsetz, Harold, "Why Regulate Utilities?" *Journal of Law and Economics*, XI (1968), pp. 55-65.

17. Dillon, Ray D., and James E. Owers, "EVA™ as a Financial Metric: Attributes, Utilization, and Relationship to NPV," *Financial Practice and Education*, 7 (1997), pp. 32-40.

18. "Executive Pay Section," *The Wall Street Journal* (April 11, 1996), pp. R1-18.

19. "Executive Pay Section," *The Wall Street Journal* (April 10, 1997), pp. R1-20.

20. "Executive Pay Section," *The Wall Street Journal* (April 6, 2000), pp. R1-14.

21. Fama, Eugene F., "Agency Problems and the Theory of the Firm," *Journal of Political Economy*, 88 (1980), pp. 288-307.

22. Ferguson, Robert, and Dean Leistikow, "Search for the Best Financial Performance Measure: Basics Are Better," *Financial Analysts Journal*, 54 (1998), pp. 81-85.

23. Finkelstein, S., and B.K. Boyd, "How Much Does the CEO Matter? The Role of Managerial Discretion in the Setting of CEO Compensation," *Academy of Management Journal*, 41 (1998), pp. 179-199.

24. Furerbotn, Erik G., and Svetozar Pejovich, "Property Rights and Economic Theory: A Survey of Recent Literature," *Journal of Economic Literature*, 10 (1972), pp. 1137-1162.

25. Gaughan, Patrick A., *Mergers & Acquisitions* (New York, N.Y.: HarperCollins Publishers Inc., 1991), pp. 147-149.

26. Gibson, James L., John M. Ivancevich, and James H. Donnelly, Jr., *Organizations: Behavior, Structure, Processes*, 7th ed. (Boston, Mass: Richard D. Irwin, Inc., 1991).

27. Gomez-Mejia, L.R., and R.M. Wiseman, "Reframing Executive Compensation: An Assessment and Outlook," *Journal of Management*, 23 (1997), pp. 291-374.

28. Hollas, Daniel R., and Stanley R. Stansell, "An Examination of the Effect of Ownership Form on Price Efficiency: Proprietary, Cooperative and Municipal Electric Utilities," *Southern Economic Journal*, 55 (1988), pp. 331-350.

29. Hubert, Mia, and Peter J. Rousseeuw, "Robust Regression with Both Continuous and Binary Regressors," *Journal of Statistical Planning and Inference*, 57 (1997a), pp. 153-163.

30. Hubert, Mia, and Peter J. Rousseeuw, "A Regression Analysis with Categorical Covariables, Two-Way Heteroscedasticity, and Hidden Outliers," in D.R. Brillinger *et al.* (eds.), *The Practice of Data Analysis; Essays in Honor of John W Tukey* (Princeton, N.J.: Princeton University Press, 1997b), pp. 193-202.

31. Jarrell, Gregg A., "An Overview of the Executive Compensation Debate," *Journal of Applied Corporate Finance*, 5 (1993), pp. 76-82.

32. Jensen, Michael C. (1989). "Eclipse of the Public Corporation," *Harvard Business Review*, 67 (1989), pp. 61-74.

33. Jensen, Michael C., and William H. Meckling, "Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure," *Journal of Financial Economics*, 3 (1976), pp. 305-360.

34. Jensen, Michael C., and Kevin J. Murphy, "CEO Incentives—It's Not How Much You Pay, But How," *Harvard Business Review*, 68 (1990a), pp. 138-153.

35. Jensen, Michael C., and Kevin J. Murphy, "Performance Pay and Top Management Incentives," *Journal of Political Economy*, 98 (1990b), pp. 225-264.

36. Kidd, Judith, *The Wall Street Journal* (January 6, 2000), p. A1.

37. Knox, J.K., E.C. Blankmeyer, and J.R. Stutzman, "Relative Economic Efficiency in Texas Nursing Facilities: A Profit Function Analysis," *Journal of Economics and Finance*, 23 (1999), pp. 199-213.

38. Knox, Joseph Kris, Eric C. Blankmeyer, and J. R. Stutzman, "The Efficiency of Nursing Home Chains and the Implications of Non-profit Status: A Comment," *Journal of Real Estate Portfolio Management*, 7 (2001), pp. 177-182.

39. Knox, Kris Joseph, J.R. Stutzman, and E.C. Blankmeyer, "A Cost Model for Texas Nursing Facilities," *Southwestern Journal of Economics*, III (2000), pp. 111-127.

40. Kramer, Jonathan K., and George Pushner, "An Empirical Analysis of Economic Value Added as a Proxy for Market Value Added," *Financial Practice and Education*, 7 (1997), pp. 41-49.

41. Lau, Lawrence J., "Application of Profit Functions," in M. Fuss and D. McFadden (eds.), *Production Economics: A Dual Approach to Theory and Application* (New York, N.Y.: North Holland, 1978).

42. Lau, Lawrence J., and Pan A. Yotopoulos, "A Test for Relative Efficiency and Application to Indian Agriculture," *American Economic Review*, 61 (1971), pp. 94-109.

43. Loughran, Tim, and Anand M. Vijh, "Do Long-Term Shareholders Benefit from Corporate Acquisition?" *Journal of Finance*, 52 (1997), pp. 1765-1790.

44. Lublin, Joann A., "CEO Pay at Best Performers Soared, Study Says," *The Wall Street Journal* (February 28, 2000), p. A16.

45. Marion Merrell Dow, Inc., *Institutional Digest* (1997).

46. Morgan, Celia, Betty Anderson, Margaret DeMoss, Maria Johnson, Carol Wilson, Jensie Madden, Carolie Mullan, and Linda Wassenich, "A Continuum of Care: Health Issues for Older Adults," Austin, Texas League of Women Voters of Texas Education Fund (2000).

47. Mullineaux, Donald J., "Economies of Scale and Organizational Efficiency in Banking: A Profit-Function Approach," *Journal of Finance*, 33 (1978), pp. 259-280.

48. Murphy, Kevin J., "Corporate Performance and Managerial Remuneration: An Empirical Analysis," *Journal of Accounting and Economics*, 7 (1985), pp. 11-42.

49. Nerlove, Marc, "Return to Scale in Electric Supply," in Carl Christ *et al.* (eds.), *Measurement in Economics and Econometrics in Memory of Yehuda Grunfeld* (Stanford, Calif.: Stanford University Press, 1963). Reprinted in Arnold Zellner (ed.), *Readings in Economic Statistics and Econometrics* (Boston, Mass.: Little, Brown and Company, 1968).

50. Sanders, Wi G., and M.A. Carpenter, "Internationalization and Firm Governance: The Roles of CEO Compensation, Top Team Composition, and Board Structures," *Academy of Management Journal*, 41 (1998), pp. 158-178.

51. Stewart III, G. Bennett, "EVA™: Fact and Fantasy," *Journal of Applied Corporate Finance*, 7 (1994), pp. 71-84.

52. Stigler, George J., "The Xistence of X-Efficiency," *The American Economic Review*, 66 (1976), pp. 213-216.

53. Stutzman, J.R., and Stanley R. Stansell, "An Examination of the Relative Economic Efficiency of Commercial vs. Cooperative Telephone Companies," *The Journal of Economics and Finance*, 16 (1992), pp. 47-68.

54. Texas Department of Human Services, *Texas Medicaid Nursing Facility 1998 Cost Report* (Austin, Texas: Texas Department of Human Services, 1998).

55. Texas Department of Human Services, *How QRS Rates Nursing Homes* (Austin, Texas: Texas Department of Human Services, 2000).

56. Texas Health Care Association, *Basic Facts About Texas Nursing Facilities* (Austin, Texas: Texas Health Care Association, 1997).

57. Tosi, H.L., S. Werner, J. Katz, and L.R. Gomez-Mejia, "A Meta-Analysis of Executive Compensation Studies," unpublished manuscript, University of Florida at Gainesville (1998).

58. Ullmann, Steven G., "Ownership, Regulation, Quality Assessment, and Performance in the Long-Term Health Care Industry," *Gerontologist*, 27 (1987), pp. 233-239.

59. Watts, Ross L., "Accounting for Executive Compensation," *Journal of Applied Corporate Finance*, 5 (1993), pp. 83-88.

60. Werner, Steve, and Henry L. Tosi, "Other People's Money: The Effect of Ownership on Compensation Strategy and Managerial Pay," *Academy of Management Journal*, 38 (1995), pp. 1672-1691.

61. Yotopoulos, Pan A., and Lawrence J. Lau, "A Test for Relative Economic Efficiency: Some Further Results," *The American Economic Review*, 63 (1973), pp. 214-223.

62. Zajac, Edward J., and James D. Westphal, "Accounting for the Explanations of CEO Compensation: Substance and Symbolism," *Administrative Service Quarterly*, 40 (1995), pp. 283-308.