Nonprofit and Voluntary Sector Quarterly
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Nonprofit and Voluntary Sector Quarterly 2006; 35; 631
DOI: 10.1177/0899764006289770

The online version of this article can be found at:
http://nvs.sagepub.com/cgi/content/abstract/35/4/631

Published by:
SAGE Publications
http://www.sagepublications.com

On behalf of:
Association for Research on Nonprofit Organizations and Voluntary Action

Comparative Performance and Quality Among Nonprofit Nursing Facilities in Texas

Kris Joseph Knox
Texas A&M University at Galveston
Eric C. Blankmeyer
J. R. Stutzman
Texas State University-San Marcos

Researchers have given little attention to relative economic efficiency among nonprofit nursing facilities. Presumably, religious-affiliated, government, and private secular nonprofit facilities pursue similar objectives, perform similarly, and receive tax exemptions accordingly. Using modified, translog cost- and profit-function regression analyses, this article rejects the hypothesis of homogeneous performance. In Texas, private secular nonprofit nursing homes are the most cost-efficient, followed by religious-affiliated and then government nursing facilities. When allocation efficiency is also considered, government and private secular facilities have similar overall economic efficiency; religious-affiliated and government facilities are similar as well; however, private secular facilities are significantly more efficient than religious-affiliated homes. Quality appears to be homogeneous among facility classifications. Given these significant differences, policy makers may want to consider the role of relative economic performance when granting nonprofit status to nursing facilities because nonprofit governance boards may allow their organizations to pursue the "socially superior" goal somewhat divergently.

Keywords: *nonprofit nursing facilities; comparative economic efficiency; governance*

MOTIVATION AND PURPOSE

Numerous studies have emphasized the divergent objectives of profit-seeking and nonprofit enterprises. The findings generally conclude that profit-seeking organizations are significantly more efficient than their nonprofit counterparts. The nursing-facility industry is no exception: profit-seeking homes are more technically (cost) efficient and more overall (technically and allocatively) economically efficient than nonprofit facilities. Theories

Nonprofit and Voluntary Sector Quarterly, vol. 35, no. 4, December 2006 631-667
DOI: 10.1177/0899764006289770

of agency, moral hazard, and property rights, emphasizing conflicts of interest, provide a foundation to support the evidence. There is, however, considerable debate whether nursing-facility differences are the result of operating differences (reflecting organizational goals, agency cost, asymmetric information, etc.) or differences in output, including quality (e.g., Harrington, Woolhandler, Mullan, Carrillo, & Himmelstein, 2001).

Only a few articles have explored variations in firm performance among the different classifications of nonprofit nursing homes. Because of their nonprofit status, these enterprises are usually aggregated across religious-affiliated, government (e.g., federal, state, county, municipal, and special district), and other private secular (e.g., fraternal) facilities (see Knox, Blankmeyer, & Stutzman, 1999). The aggregation implies, of course, that performance and goals are homogeneous among these classifications.

The purpose of the current study is to determine if firm performance (i.e., economic efficiency) among various nonprofit nursing facilities is as uniform as researchers have supposed. Nonprofit nursing-facility performance in Texas is examined using modified reduced-form, translog cost- and profit-function regression techniques (ordinary least squares [OLS] and robust distance L one norm [RDL1]), assuming that the quality of care is homogeneous across firms. Panel data from 1994, 1998, and 1999 are used to compare the relative economic efficiency of the three classes of nonprofit organizations, and chain member versus independent facilities and urban versus rural homes. The full sample contains 442 observations: 143 facilities in 1994, 138 facilities in 1998, and 161 facilities in 1999. The key finding is that there are statistically significant differences in the performance of the three nonprofit classifications.

The assumption of uniform quality of care can also be tested using a portion of the data. The quality measure is the multidimensional Quality Reporting System (QRS) rating of each Texas nursing facility by the Texas Department of Human Services. Unfortunately, no data are available for 1994; the series spans the 1998-1999 time period and is reported in 1999. Using the QRS values as the dependent variable, classical and robust linear regressions are used to compare quality in the various nonprofit-facility classifications, chains versus independent facilities, and urban versus rural homes controlling for facility size and case mix. There are approximately 135 observations. Except for the size of the facility, no systematic differences in quality are found among the various nonprofit categories. Hence, an assumption of quality homogeneity appears to be reasonable.

THE NURSING-FACILITY INDUSTRY: U.S. AND TEXAS PROFILES

Using data for 1997 and 1998, Giacalone (2001, chaps. 1, 4) provides a general quantitative description of nursing facilities in the United States. Some 17,000 nursing homes serve 1.6 million residents and employ almost 1.8 million workers. About two thirds of the facilities are profit seeking, and 56% are chain members. Giacalone (2001) remarked,

> 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. (p. 63)

Expenditures for nursing home services in the United States were approximately U.S. $98 billion in 1998 including outlays for hospital-based nursing facilities. More than 97% of nursing homes are certified to serve Medicare or Medicaid beneficiaries. 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.

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 vs. 1,170; Marion Merrell Dow, 1997). Approximately 88% are profit-seeking facilities, 12% are nonprofit organizations. Slightly more than 50% of all facilities are located in urban areas, and approximately 80% are chains.

Table 1 provides a detailed summary of the Texas nonprofit nursing-facility industry for 1999 in terms of various classifications and key characteristics. Approximately 16% of homes are government facilities, 33% are religious-affiliated facilities, and 51% are private secular facilities. All government facilities are rural and independent facilities (e.g., special districts), chains represent 51% of all nonprofit facilities, and religious-affiliated and private secular homes make up 100% of urban facilities and 67% of rural facilities. The Texas Department of Human Services (TDHS) gathers data through annual cost reports for all facilities.

OPERATING ENVIRONMENT IN TEXAS

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

To achieve the key objectives of nursing home care, the State of Texas repealed its Certificate of Need (CON) legislation in September 1986. The purpose of CON legislation was to restrict nursing-facility expansion, supposedly. No facility's request to expand has been denied. The repeal of CON has

Table 1. 1999 Texas Nonprofit Nursing-facility Industry Profile Summary

				Nonprofit					
	Nonprofit			Chain			Independent		
Facility and Characteristics	*Govt*	*Rel*	*Prvt*	*Govt*	*Rel*	*Prvt*	*Govt*	*Rel*	*Prvt*
Number of facilities (161)	26	53	82	0	28	54	26	25	28
Number of beds (17,096)	1,621	6,633	8,842	NA	3,458	5,547	1,621	3,175	3,295
Average number of beds	62	125	108	NA	124	103	62	127	118
(Combined)		(106)			(110)			(102)	
Occupancy rate (%)	84	88	75	NA	88	73	84	87	79
(Combined)		(80)			(78)			(83)	
Average number of patient days/year	18,910	40,227	28,409	NA	39,982	27,093	18,910	40,501	30,947
(Combined)		(30,765)			(31,494)			(30,009)	
Medicaid patient days (%)	65	58	72	NA	59	77	65	58	62
(Combined)		(66)			(71)			(62)	
Medicaid revenue/total patient revenue (%)	64	54	68	NA	54	72	64	54	58
(Combined)		(63)			(66)			(59)	
Average cost (dollars): Patient care	1,297,993	2,733,846	1,679,620	NA	2,610,412	1,571,367	1,297,993	2,872,093	1,888,392
(Combined)		(1,965,034)			(1,926,163)			(2,005,381)	
Administrative	189,550	461,038	315,470	NA	490,627	322,398	189,550	427,899	302,109
(Combined)		(343,055)			(379,842)			(304,871)	
Capital	197,362	477,666	469,699	NA	467,584	509,084	197,363	488,958	393,742
(Combined)		(428,342)			(494,913)			(359,242)	
Average TILE ranking	7.99	7.69	7.84	NA	7.64	7.82	7.99	7.74	7.88
(Combined)		(7.82)			(7.76)			(7.87)	
Average employee turnover (times)	1.73	1.97	2.04	NA	2.05	2.01	1.73	1.87	2.09
(Combined)		(1.96)			(2.03)			(1.90)	
Average quality rating (QRS)	68.52	62.00	58.97	NA	59.18	58.94	68.52	65.10	59.04
(Combined)		(61.40)			(59.01)			(64.05)	

Facility and Characteristics	Urban			Urban					
				Chain			Independent		
	Govt	Rel	Prvt	Govt	Rel	Prvt	Govt	Rel	Prvt
Number of facilities (82)	0	44	38	0	23	26	0	21	12
(Average/MSA)	NA	(1.63)	(1.41)	NA	(.85)	(.96)	NA	(.78)	(.44)
(Average/County)	NA	(.90)	(.78)	NA	(.47)	(.53)	NA	(.43)	(.25)
Number of beds (10,487)	NA	5,740	4,747	NA	3,000	2,804	NA	2,740	1,943
(Average/MSA)	NA	(213)	(176)	NA	(111)	(104)	NA	(101)	(72)
(Average/County)	NA	(117)	(97)	NA	(61)	(57)	NA	(56)	(40)
Average number of beds	NA	130	125	NA	130	108	NA	131	162
(Combined)		(128)			(118)			(142)	
Occupancy rate (%)	NA	89	78	NA	89	78	NA	90	78
(Combined)		(84)			(83)			(85)	
Average number of patient days/year	NA	42,549	34,578	NA	42,327	30,846	NA	42,793	42,665
(Combined)		(38,855)			(36,235)			(42,746)	
Medicaid patient days (%)	NA	59	71	NA	59	77	NA	59	61
(Combined)		(65)			(68)			(60)	
Medicaid revenue/total patient revenue (%)	NA	54	66	NA	52	72	NA	56	56
(Combined)		(60)			(62)			(56)	
Average Cost (dollars): Patient care	NA	2,960,323	2,159,121	NA	2,848,379	1,917,104	NA	3,082,928	2,683,490
(Combined)		(2,589,034)			(2,354,233)			(2,937,678)	
Administrative	NA	508,593	392,299	NA	547,583	373,279	NA	465,890	433,509
(Combined)		(454,701)			(455,095)			(454,115)	
Capital	NA	509,994	616,477	NA	505,535	629,770	NA	514,878	587,676
(Combined)		(559,340)			(571,456)			(541,350)	
Average TILE Ranking	NA	7.63	7.73	NA	7.62	7.75	NA	7.64	7.71
(Combined)		(7.68)			(7.69)			(7.67)	
Average employee turnover (times)	NA	1.95	2.05	NA	2.03	1.95	NA	1.86	2.28
(Combined)		(2.00)			(1.99)			(2.01)	
Average quality rating (QRS)	NA	61.71	54.71	NA	58.11	55.83	NA	65.53	52.27
(Combined)		(58.21)			56.81)			(60.32)	

(continued)

Table 1. (continued)

	Rural			Rural					
				Chain			Independent		
Facility and Characteristics	*Govt*	*Rel*	*Prvt*	*Govt*	*Rel*	*Prvt*	*Govt*	*Rel*	*Prvt*
Number of facilities (79)	26	9	44	0	5	28	26	4	16
(Average/County)	(.13)	(.04)	(.22)	NA	(.02)	(.14)	(.13)	(.02)	(.08)
Number of beds (6,609)	1,621	893	4,095	NA	458	2,743	1,621	435	1,352
(Average/County)	(8)	(4)	(20)	NA	(2)	(13)	(8)	(2)	(7)
Average number of beds	62	99	93	NA	92	98	62	109	85
(Combined)		(84)			(97)			(74)	
Occupancy Rate (%)	84	81	72	NA	87	67	84	74	79
(Combined)		(77)			(70)			(81)	
Average number of patient days/year	18,910	28,872	23,080	NA	29,197	23,608	18,910	28,468	22,157
(Combined)		(22,367)			(24,454)			(20,871)	
Medicaid patient days (%)	65	56	72	NA	60	77	65	50	64
(Combined)		(68)			(75)			(63)	
Medicaid revenue/total patient revenue (%)	64	55	69	NA	61	73	64	47	60
(Combined)		(65)			(72)			(61)	
Average Cost (dollars): Patient care	1,297,993	1,626,627	1,265,505	NA	1,515,763	1,250,326	1,297,933	1,765,206	1,292,069
(Combined)		(1,317,338)			(1,290,544)			(1,336,559)	
Administrative	189,550	228,554	249,118	NA	228,626	275,152	189,550	228,442	203,559
(Combined)		(227,170)			(268,103)			(197,804)	
Capital	197,362	319,616	342,936	NA	293,010	397,018	197,362	352,874	248,292
(Combined)		(292,369)			(381,259)			(228,600)	
Average TILE ranking	7.99	7.96	7.93	NA	7.73	7.89	7.99	8.25	8.02
(Combined)		(7.96)			(7.86)			(8.02)	
Average employee turnover (times)	1.73	2.03	2.02	NA	2.14	2.07	1.73	1.90	1.95
(Combined)		(1.93)			(2.08)			(1.82)	
Average quality rating (QRS)	68.52	63.43	63.00	NA	64.00	61.92	68.52	62.67	65.25
(Combined)		(64.83)			(62.21)			(66.94)	

Note: Govt = government; Rel = religious affiliated; Prvt = private secular; MSA = Metropolitan Statistical Areas; TILE = Texas Index for Level of Effort; QRS = Quality Reporting System.

encouraged facilities to maintain an excess supply of beds. However, these excess beds increase facility costs that, in turn, lead to an increase in Medicaid reimbursement payments. Because the average occupancy rate in Texas is about 70% to 75%, this legislation has apparently produced an oversupply of services statewide and excess capacity for many facilities. Furthermore, 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.

All nursing facilities in Texas are subject to the same regulatory environment, which has been characterized, in fact, as "limited regulation"; Texas ranks among five states having a less stringent regulatory environment (Spore, Mor, Larrat, Hawes, & Hiris, 1997). However, nonprofit nursing facilities are exposed to an additional level of oversight by the Internal Revenue Service (IRS), which grants tax-exempt status based on appropriate justification.

ANALYTICAL FRAMEWORK

EXISTENCE, ROLE, AND THEORY OF NONPROFIT NURSING FACILITIES

The existence and role of nonprofit organizations requires an examination of public versus private goods and services, government and nonprofits versus profit-seeking organizations, and individual versus collective payers. Donahue (1989) provided an excellent foundation for these issues. A critical issue is accountability, which manifests itself in the theory of agency and its corollaries (property rights, asymmetric information, etc.).

Many researchers have emphasized the divergent objectives of profit-seeking and nonprofit enterprises, for example, Dahlman (1979), De Alessi (1974, 1983), Demsetz (1966, 1967, 1968), and Furubotn and Pejovich (1972). *Ownership rights* may be poorly defined or hard to transfer in nonprofit firms. This creates a disincentive for risk bearing and planning for further contingencies because there is virtually no process for capitalizing future benefits into the current value of the firm. Jensen and Meckling (1976), highlighting the cost of monitoring and bonding agents within the organization, found that nonprofit firms have reduced incentives to enforce contracts and developing internal controls. Alchian and Demsetz (1972) noted that shirking is more likely to occur in nonprofit organizations. However, shirking, nonenforcement of contracts, control avoidance, and nondistribution of profits may provide positive consequences in the nonprofit organization in the form of either reduced asymmetric information exploitation or reduced negative externalities (Schlesinger, Gray, & Bradley, 1996).

Numerous stakeholders (owners, customers, community, society, government, etc.) expect that nonprofit organizations will efficiently allocate the available resources of the firm. Thus, accountability is as critical in nonprofit

organizations as it is in private sector firms. Because of the separation of ownership and control, Donahue (1989) noted that accountability is conceptually better maintained in profit-seeking firms than in public organizations by (a) the owners who have property rights and (b) market competition.

An agency relationship is a contractual agreement (either explicit or implicit) in which the principal delegates decision-making authority to the agent who is supposed to act in the best interest of the principal. The success of this relationship in the public sector is dependent on (a) how fully the principal can specify what is to be accomplished and at what cost, (b) competitiveness of supplier markets to the agent, (c) measurability of output, (d) risks associated with attaining the output, (e) the integrity of the agent, and (f) how agent behavior is controlled (Donahue, 1989).

Donahue (1989) explained that agency failure in the public sector results from organizational slack (i.e., a loosening of the links between agent behavior and the principal's interest) resulting from deficient competition, regulation, and individual principal vigilance. Slack enables agents to place their interest ahead of the principal's and tempts agents to overcompensate themselves. Leibenstein (1966) argued that all organizations tend toward increasing slack; however, Donahue noted that public (collective) organizations are especially likely to do so.

Following Oster (1986), this article raises questions of organizational governance (monitoring and control) in nonprofit nursing facilities. To whom are the governing bodies accountable and how well are these bodies performing their fiduciary responsibilities?

Justification. In addition to altruism, several theoretical justifications for the existence and role of the nonprofit firm have been proposed. These include government and market failure, lower costs and higher quality, contract failure and asymmetric information (Ben-Ner, 1986; Hansmann, 1980), agency relationships and cost (Jensen & Meckling, 1976), provision of substitute goods (Weisbrod, 1986), assurances that quality will not be sacrificed for private gain (Hansmann, 1980), ideological principles (Rose-Ackerman, 1986), and religious affiliation (James, 1986).

In a practical sense, the existence and role of the nonprofit nursing home probably reflect an integration of all these theories. In the formation of a nonprofit firm an appropriate dominant goal will emerge from these theories that reflects the market situation being addressed. For example, a government nonprofit nursing facility may be located in rural areas where long-term care is not available and no religious or fraternal group with access to adequate capital exists within the community. The presence of a religious-affiliated facility in a heavily populated area may reflect beliefs or doctrine or simply a commitment to high-quality care.

Tax-exempt status. Luksetich, Edwards, and Carroll (2000) assumed that tax exemptions are granted because policy makers believe that the performance of

nonprofit firms is socially superior to that of profit seekers. On the other hand, Hansmann (1981) argued that the exemption should not be given for "good works" but because of the inability of nonprofit firms to raise capital. From an economic efficiency perspective, he noted that an exemption should not be granted unless (a) nonprofit firms are more efficient than profit seekers and (b) nonprofit firms within an industry have not expanded to the point where capital productivity is below the before-tax rate of return on capital in other industries. More recent articles suggest that the value of special community benefits provided by nonprofits should (a) either exceed that of profit-seeking firms (including the taxes paid by these firms) or be more valuable than the granted tax exemptions (Claxton, Feder, Schactman, & Altman, 1997) and, being even more stringent, (b) be equal to the benefits provided by profit-seeking firms plus the profit these firms earn (Nicholson, Pauly, Burns, Baumritter, & Asch, 2000). Finally, as mentioned by James (1986), tax subsidies may be given to support the production of substitute goods and services in nonprofit firms as an alternative to government production simply because the costs are lower.

Unfortunately, as noted by Schlesinger et al. (1996), IRS tax exemptions and court decisions are summed up nicely by the statement: "'The decisions are reasoned on the bases that in some cases are unprincipled, in others inconsistent, and in others undiscernible' (Hall & Columbo, 1991: 344)" (p. 201). They also pointed out that certain aspects of organizational performance are missing in the tax-exempt discussion: quality, asymmetric information, and trustworthiness. From the perspective of the current study, an additional missing aspect is the lack of consideration of economic performance. Does an overuse of resources in this tax-exempt industry result in alternative production being sacrificed? If so, policy makers may want to consider the differences in the comparative economic performances of those firms before granting or extending nonprofit status.

Societal benefits. Nonprofit socially superior benefits take the form of trustworthiness in an asymmetric information environment, for example, maintaining or providing higher quality (Nicholson et al., 2000), and community benefits (Gray, 1997; Hansmann, 1980). Community benefits include, for example, charitable (and uncompensated) care, provision of unprofitable services, lower prices, activities creating positive externalities and reducing negative externalities, research and educational activities, and community involvement (Claxton et al., 1997; Schlesinger et al., 1996).

A specific community-benefit example for the nursing-facility industry is that of educating residents, family, and the community on the planning for and use of end-of-life sustaining medical treatment (Bradley & Walker, 1998). The Patient Self-Determination Act (1990) requires all Medicare and Medicaid nursing facilities to educate their staff and communities on this issue. Bradley and Walker (1998) found that profit-seeking and religious facilities are doing so; however, when the subtleties of the methods and comprehensiveness of education, the repetitiveness of the education, and the availability of support

decision-making groups (ethics committees) are considered, nonprofit facilities are significantly superior in meeting the intent of the legislation. Profit-seeking facilities provide the education to reduce litigation and gain residents, nonprofit facilities participate to enhance trustworthiness and reduce asymmetric information.

Performance measure. Inclusion of societal benefits in the broader definition of *organizational performance* is not easily quantifiable or comparable among firms (Gray, 1997). Nevertheless, the presumption in the current study is that whatever operational activities the firm undertakes appear in the cost and profit functions of the organization. Most nonprofit nursing facilities make operating profits either to help cover unforeseen future deficits or to grow and expand operations. Accordingly, this article defines *performance* as relative economic efficiency, a reasonable objective for any enterprise that does not exercise much market power. After all, efficiency is merely a strategy to avoid wasting scarce resources. Admittedly, this may be a rather narrow perspective for nonprofit organizations because they are charged with obtaining a "socially superior performance."

Theory. Academic scholars of health care have proposed variations of the traditional theory of the firm model for nonprofit organizations. For example, Newhouse (1970) addressed the quantity–quality trade-off in the management of nonprofit hospitals, which appears to be somewhat applicable to nursing facilities. The profit-seeking firm produces at the point where the marginal revenue product equals the marginal input factor costs. However, despite the nonprofit model's implication of least-cost production, the nonprofit firm does not attain the optimal outcome because of (a) a bias against producing lower-quality products and (b) barriers to entry as a result of nonprofit status. Although profit-seeking firms may have no bias against producing lower-quality products, competition (Nyman, 1988a) and regulation (Schlenker, 1991) help guarantee minimal standards. As for barriers to entry, the nursing-facility industry in Texas is dominated by profit-seeking firms that may tend to force the nonprofit facilities to produce at minimum average-cost levels and lower-quality levels within the limits set by regulators.

Newhouse's (1970) model also implies that (a) because there is no incentive for a credible threat of entry except for civic mindedness, excess demand for service may exist and (b) philanthropy places a constraint on the quality–quantity trade-off that permits the nonprofit firm some room for inefficiency.

Scanlon (1980) developed a theory specifically for the nursing home market. He assumed demand is like that of a standard economic good and that consumers have different information and face substantial out-of-pocket costs. However, third-party payments (Medicaid) mean that nursing-home residents are insensitive to price, while third-party payers are not. Monopsony-like power of the third-party payer creates a kinked demand curve. Nonprofit facilities are assumed to maximize their size subject to quality and break-even

constraints. Therefore, nonprofit homes will operate where average revenues equal average costs and allocate services between private and Medicaid patients such that the marginal revenue from each is equal. A combination of excess demand and an inelastic supply of beds in the short run means that private-pay residents will be given preference because they subsidize losses associated with Medicaid residents. Most studies of the industry assume excess demand. However, Texas is an excess supply market.

Ullmann (1987) argued that profit-seeking facilities attempt to maximize profits while maintaining the level of quality required for operating certification. Competitive economic theory indicates that a profit-maximizing firm must produce its product or service at the lowest possible cost per unit. Any other types of management behavior that affect quality and resident mix presumably enter the owner's objective function only if they are consistent with profit maximization. However, a different set of objectives for the nonprofit nursing facilities is identified: enhancement of the facility's prestige by increasing the quality and quantity of service. The goals are capital enhancement, an outstanding medical staff, and a heterogeneous mix of residents. Because it is unclear how quantity maximization (a large market share) affects quality of service, Ullmann assumed 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 philanthropic contributions or public subsidies, weakens the incentive for administrative control of costs.

An excellent comparison summary of economic theories for profit-seeking and nonprofit firms is provided by Yoder (1986).

SELECTED EMPIRICAL EVIDENCE ON NURSING-FACILITY PERFORMANCE AND QUALITY

Performance. Many studies have examined the comparative impact of organizational ownership form on facility costs considering additional variables such as chain versus independent facility status, resident care requirements, reimbursement methodologies, regulatory conditions, competition (location), quality, capacity, and so on. As a general summary, every empirical cost analysis of nursing facilities reviewed indicates that nonprofit facilities have significantly higher costs than profit-seeking facilities (e.g., Arling, Nordquist, & Capitman, 1987; Bishop & Dor, 1994; Davis, 1993; Holahan, 1985; McKay, 1991; Nyman, 1988b; Schlenker & Shaughnessy, 1984).

This finding concurs with that of Hawes and Phillips' (1986) review; however, they noted that much of the difference results from quality and facility characteristics other than ownership. Similar conclusions are drawn by Aaronson, Zinn, and Rosko (1994), who, based on a study of Pennsylvania nursing facilities, indicated that nonprofit-facility quality (using clinical outcome measures) is definitely superior to that of profit seekers, and nonprofit costs are higher, reflecting nursing care staffing levels, care giving loads, and

private-pay, Medicare, and Medicaid resident mix. However, no significant differences were found regarding accessibility.

Conflicting results have been reported on efficiency when profit-seeking and nonprofit chains are compared with independent facilities. The findings include (a) no differences in efficiency (Birnbaum, Bishop, Lee, & Jensen, 1981; Meiners, 1982; Schlenker & Shaughnessy, 1984), (b) chain members are more efficient (Arling et al., 1987), (c) chain members are advantageous only at relatively high levels of output (McKay, 1991), (d) multiplant economies within a chain may ease the rapid cost acceleration in the industry (Fizel & Nunnikhoven, 1993), and (e) chain facilities are more inefficient (Anderson, Lewis, & Webb, 1999; Knox, Stutzman, & Blankmeyer, 2000).

In addition, research indicates that (a) urban facilities are larger, have higher costs, and face more competitive markets than rural facilities (Bishop & Dor, 1994), (b) costs are higher in markets with more empty beds (i.e., more competitive markets) and lower when beds are owned by a few competitors (Davis, 1993; Nyman, 1988a), and (c) the level and structure of cost differences between profit-seeking and nonprofit facilities converge in highly competitive markets (Tuckman & Chang, 1988).

The most recent findings in the Texas nursing-facility industry generally support the evidence of the studies mentioned above. Texas nonprofit facilities in the 1990s were significantly more inefficient than their profit-seeking counterparts; however, profit-seeking firms are not very efficient either: They are too labor intensive; labor's marginal revenue product typically falls short of its wage rate (Knox et al., 1999). Chain members are found to be less efficient than independent facilities when all costs are considered; however, under a narrower definition of *costs* (equipment, food, and medicine) or when allocative efficiency is taken into account, chains are significantly more efficient than independents (Knox et al., 1999; Knox et al., 2000; Knox, Blankmeyer, & Stutzman, 2001a). Finally, urban facilities are more costly than rural homes; however, this conclusion is less clear when allocation efficiency is also considered (Knox, Blankmeyer, & Stutzman, 2003).

Very few studies specifically compare the economic efficiency of the different types of nonprofit nursing facilities within the industry. An exception is a study of Minnesota nursing homes by Luksetich et al. (2000) that provides some evidence.[1] These authors suggested that (a) performance differences by ownership type imply different organizational goals, (b) spending of surplus funds reveals the organizational objective formation, and (c) if performance converges, either competition or regulation makes ownership form irrelevant.

Furthermore, the current study finds that (a) the larger the predicted surplus, the greater the spending for general overhead, administrative costs, and nursing care in nonprofit and profit-seeking facilities, although profit seekers spend less overall; (b) private secular Minnesota chain members, independents, and government nonprofit facilities spend less of their surplus on nursing care than do other facility types; (c) private secular national chain members spend much of their surplus for general and administrative

purposes; and (d) religious-affiliated homes spend more on nursing care and generating more resident days.

A longstanding impression that many nonprofit firms are in effect profit-maximizing facilities supports the findings of Luksetich et al. (2000); that is, nonprofits may (a) take advantage of tax incentives and (b) claim nonexistent higher-quality levels. In a study of New York nonprofit nursing homes, Vitaliano (2003) found that 79% exhibit profit-seeking behavior. His sample consisted of 228 nonprofit facilities (61% are private secular, 21% are religious affiliated, and 18% are government), with only 21% operating where marginal cost exceeds marginal revenue, a criterion for altruistic, nonprofit-seeking management. Of those exhibiting profit-seeking behavior, 63% are private secular, 20% are religious-affiliated, and 17% are government facilities.

Quality. Issues of quality of care in nursing facilities are perplexing and unresolved. More than a decade ago, Davis (1991) remarked 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" (p. 130). In an earlier historical and comprehensive literature review of the nursing-facility industry, Hawes and Phillips (1986) indicated that quality comparisons are dependent on the dimension of quality used; however, they concluded that despite measurement limitations (e.g., lumping all nonprofits into the same ownership category), resource input measures, licensure violations, complaints, and outcome-oriented measures all lead to a finding that nonprofit facilities provide superior quality—particularly in religious-affiliated homes.

Since then, the literature on nursing-facility quality has grown rapidly. A sample of more recent findings includes Davis, Freeman, and Kirby (1998) who asserted that a case-mix system of Medicaid reimbursement encourages facilities to accept intensive-care patients. (Texas uses a system of this type.) However, it seems that increases in efficiency and profitability lower the quality of resident care. The findings of lower quality via increased efficiency and profitability are substantiated by Cohen and Spector (1996). They also show that the method of Medicaid reimbursement influences the ratio of registered nurses (RNs) to patients and that a more skilled staff is correlated with better quality of resident care. In addition, profit-seeking facilities use fewer RNs and more licensed vocational nurses than nonprofit homes. Furthermore, although trade-offs are made based on the wage differentials between professional and nonprofessional nursing care, Zinn (1993) noted that there is a higher percentage of professional nurses in nonprofit facilities, which suggests a higher quality of outcomes relative to those of profit-seeking facilities.

On the other hand, surveys indicate that RN staffing ratios are not significant predictors of quality (Steffen & Nystrom, 1997). In questionnaires mailed to family members of residents, Steffen and Nystrom (1997) found that nursing home size is negatively correlated with resident care; however, they do agree with Cohen and Spector that nonprofits provide a higher quality of service than profit-seeking facilities.

Residents' diagnostic health profiles and demographic backgrounds are found to be effective predictors of quality outcomes; however, facility attributes (e.g., ownership status, number of beds, and nursing staff composition and skill levels) are not (Porrell, Caro, Silva, & Monane, 1998).

A greater emphasis on clinical outcomes as quality measurement has resulted from the passage of the Nursing Home Reform Act of 1987 (Zinn, Weech, & Brannon, 1998). For example, inappropriate drug usage (either over- or misprescribed) has been used as a quality measure (Spore et al., 1997). Furthermore, use of physical restraints and psychotropic medication has been examined in traditional and special care units for Alzheimer nursing facilities (Phillips, Hawes, & Fries, 1993; Phillips, Spry, Sloane, & Hawes, 2000). In Texas, less use of physical constraints (i.e., implied higher quality) reduces nursing time costs (which average 60% of typical facility costs). Unfortunately, organizational structure differences were not provided. Bedsores, incontinence, and urinary tract infections have been used in many studies (Mor et al., 2003).

In Texas, higher levels of care reduce nursing-facility costs and increase profit (Knox et al., 2001a, 2003). Using the Texas regulatory agent's measure of quality, Knox et al. (2001a, 2003) also concluded that operating-efficiency differences between profit-seeking and nonprofit nursing facilities are not the result of quality differences. Finally, these authors found that there is no statistically significant difference in the average quality measures for profit-seeking and nonprofit facilities when control variables (e.g., case mix, facility size, etc.) are considered. In a study unrelated to Texas, these findings are supported in situations where patients and their families have reliable information about quality of care (i.e., no asymmetric information) in a nursing facility (Chou, 2002).

Alternatively, an early study indicates that private secular nonprofits appear to generate more regulatory violations than either religious-affiliated or government homes. However, with respect to formal complaints, all three nonprofits were comparable. Except for regulatory violations in private nonprofits, the group appears to provide higher-quality service than profit-seeking facilities (Weisbrod & Schlesinger, 1986).

Unfortunately, nursing-facility studies often assume that if costs increase, quality goes up (e.g., Luksetich et al., 2000; Vitaliano, 2003). However, cost seems to be a poor proxy for quality of care; and when independent measures of quality of care exist, they are often only weakly correlated with measures of nursing inputs.

METHOD

EFFICIENCY

A firm is technically (cost) 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) noted 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 nonmeasurable fixed factors of production.

In addition, Yotopoulos and Lau (1973) noted that price efficiency (i.e., allocation efficiency) can be classified as either relative price efficiency or 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. Although 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 pointed 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 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).

Anecdotal evidence and Vitaliano's (2003) findings notwithstanding, the presumption is that nonprofit firms do not pursue the goal of profit maximization. However, as Newhouse (1970) implied, the misallocation of resources is undesirable from society's viewpoint whether a facility is operated for profit or not.

MODELS AND HYPOTHESES

Nonprofit nursing-facility efficiency is measured using modified reduced-form, translog cost- and profit-function regression techniques (OLS and robust RDL1).[2] Stigler (1976) pointed out that the imposition of any arbitrary set of goals on firms that in fact have other goals leads to the mistaken conclusion that the firms are inefficient. Making no a priori assumptions regarding a firm's objectives, a test is conducted on the differences in outcomes reflecting the economic optimal goal of profit maximization (Newhouse, 1970). As expected, nonprofit facilities do not achieve this goal (nor do profit seekers); however, these findings do not imply that nonprofit facilities are less successful in achieving goals other than profitability.

Christensen, Jorgenson, and Lau (1973) introduced the translog production function. Griliches and Ringstad (1971) and Sargan (1971) proposed one-output special cases of translog functions. Diewert (1973) and Lau (1978)

provided a second-order approximation to an arbitrary twice differentiable profit function. There are numerous applications of the translog development, of which Mullineaux's (1978) is directly applicable to the current study in terms of efficiency analysis.

The key model used to construct a long-run cost function was developed by Nerlove (1963) in his examination of the U.S. power industry. Assuming a Cobb–Douglas production function, Nerlove obtained a log-linear expression for total cost in terms of output and resource prices. (This is, of course, a particular case of a translog production model.) 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. Similarly, the same reasoning applies, at least approximately, to the nursing-facility industry in Texas.

Hypothesis tests are found in Table 2 for the estimated cost function below:

$$\begin{aligned} \ln \text{COST} = {} & \beta_0 + \beta_1 \text{ LOCATION} + \beta_2 \text{ CHAIN} + \beta_3 \text{ PRVT vs} \\ & \text{GOVT} + \beta_4 \text{ REL vs PRVT} + \beta_5 \text{ 1999 vs 1994} + \beta_6 \text{ 1998 vs 1994} \\ & + \beta_7 \ln \text{WAGE} + \beta_8 \ln \text{OCC} + \beta_9 \ln \text{CSMX} + \beta_{10} \ln \text{DAYS} + U \end{aligned} \quad (1)$$

where *COST* is total cost and includes employee's 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) that classifies 28 Metropolitan Statistical Areas (MSAs) in Texas as urban and all other facilities as rural; *CHAIN* (1 = member of chain of nursing homes, 0 = independent) indicates whether or not the facility is a member of a nonprofit chain; *PRVT vs GOVT* (1 = private secular facilities, 0 = government facilities) differentiates the private secular from government nonprofit classifications; *REL vs PRVT* (1 = religious-affiliated facilities, 0 = private secular facilities) differentiates the religious-affiliated facilities from private secular nonprofit classifications; *1999 vs 1994* (1 = 1999 nonwage costs, 0 = 1994 nonwage costs) differentiates the nonwage panel data in 1999 from data in 1994; *1998 vs 1994* (1 = 1998 nonwage costs, 0 = 1994 nonwage costs) differentiates the nonwage panel data in 1998 from the data in 1994. *WAGE* is an estimate of each nursing facility's average hourly wages for licensed vocational nurses (LVNs) and aides (assistants to nurses and therapists as well as other employees providing general care for residents). *OCC* is the occupancy rate (average resident days per bed/356 days). *CSMX* (i.e., the TILE variable) measures each nursing facility's average case mix (i.e., the level of medical care and supervision provided to residents) and is multiplied by –1 because a lower-level value indicates more acute care required. *DAYS* is the facility's total resident days for each year, and *ln* is the natural logarithmic transformation, and *U* is the error term.

Table 2. Cost Function Hypothesis Tests for Texas Nonprofit Nursing Facilities

Hypothesis Test	*(RDL1* p *value)*	*Explanation*
(1) H_0: $\beta_1 = 0$	.013	A test of equal technical efficiency between rural and urban facilities
(2) H_0: $\beta_2 = 0$	.021	A test of equal technical efficiency between independent and chain-member facilities
(3) H_0: $\beta_3 = 0$	.000	A test of equal technical efficiency between private secular and government facilities
(4) H_0: $\beta_4 = 0$	.000	A test of equal technical efficiency between religious-affiliated and government facilities
(5) H_0: $\beta_5 = 0$ H_0: $\beta_6 = 0$	.000 .000	As panel data are used, control variables are included to test for possible nonwage cost differences occurring over time: 1999 versus 1994 and 1998 versus 1994
(6) H_0: $\beta_7 = 0$	.000	A test of the impact of wages on cost efficiency
(7) H_0: $\beta_8 = 0$	.000	A test of the impact of the occupancy rate on cost efficiency
(8) H_0: $\beta_9 = 0$	.000	A test of the impact of degree of caseload difficulty on cost efficiency
(9) H_0: $\beta_{10} = 0$	.000	A test of the impact of the number of resident days (the assumed output) on cost efficiency

Hypothesis Test	*(RDL1* F *value/*p *value)*	*Explanation*
(1) H_0: Equation 1 is not a meaningful model.	778.5/.000	A test to determine if the specified model is valid for determining technical efficiency
(2) H_0: Religious facilities = government facilities	43.6/.000	As the impact of three different facility types on technical efficiency is considered, direct tests of all three pairings are not included simultaneously in the model. Thus, the approach taken is to include two pairings in the model and use an *F* test on the remaining pair.

Note: RDL1 = robust distance L one norm.

The model does not include an explicit cost of capital as an independent variable. This omission reflects the well-known difficulties of constructing a capital price for each firm. Instead, all nursing facilities are assumed to have the same cost of capital because they have access to well-integrated, competitive financial markets.

The regression coefficient for the price of capital can be inferred from the regression coefficients for ln WAGE and ln DAYS. In the cost function, the degree of returns to scale is estimated by $1/\beta_{10}$, the reciprocal of the coefficient of ln DAYS. The output elasticity of LVNs and aides is estimated by β_7/β_{10}. The output elasticity of "capital" is obtained implicitly as $(1 - \beta_7)/\beta_{10}$,

in view of the requirement that the elasticities must add up to the degree of returns to scale in a Cobb–Douglas production function.

Output is measured as each facility's total resident days. There are two reasons to treat output as an exogenous variable. First, the existence of significant excess beds in Texas nursing homes implies that additional resident days can be produced on demand. Second, the industry is providing long-term care for elderly people, many of them indigent and frail. It seems implausible that this service would typically be initiated or terminated primarily in response to random variations in a nursing home's costs.

By definition, the profit function represents the maximized profit for a firm as a function of prices of output, prices of variable factor inputs, and quantities of the fixed factors of production. The function is nonnegative, convex, increasing in output prices, decreasing in input prices, and increasing in the quantities of fixed factors. The profit function is linearly homogeneous in inputs and prices and continuously differentiable. Thus, the profit function expresses the value of the maximized profit for a profit-maximizing, price-taking (in input and output variables) firm operating with a given technology level.

Production and cost functions examine the technical efficiency of the firm as reflected by economies of scale. However, decision makers are responsible for not only selection of resource combinations and levels of operation but also for the efficient allocation of these resources. The profit function ideally allows a comprehensive efficiency study of firm behavior by considering cost-efficiency and allocation efficiency simultaneously. The function relies on three basic assumptions: (a) firms are profit maximizing, (b) firms operate in competitive markets (i.e., they are price takers in variable input and output markets), and (c) the production function is concave in the variable inputs.

Output prices are not included as an independent variable in the profit function for price setting (i.e., monopolistic) firms by assumption (2). A test of market competitiveness can therefore be made by including output prices in the model and examining the significance of this variable in the explanation of profits. If this variable makes no significant contribution, a conclusion that the firms are not price takers in their output markets may be drawn.

Lau (1978) developed the general translog form of the normalized profit function. Lau and Yotopoulos (1971) and Yotopoulos and Lau (1973) formulated the Cobb–Douglas case of the normalized profit function and estimating equations.

Mullineaux (1978) stated that direct estimation of the translog profit function is often complicated by multicollinearity. If all the squared and cross-product terms are constrained to be zero, the translog function reduces to a Cobb–Douglas profit function, which allows direct estimation and tests of relative efficiency. The implications of constraining all product terms to zero are that (a) the substitution elasticity between each pair of factors is unity and (b) the production function is identical for the various classes of nonprofit firms

up to a Hicksian neutral technical efficiency parameter. The Cobb–Douglas form is employed in the current study.

Hypotheses tested in this examination of relative profit seeking by nonprofit firms assume that all classes of firms behave as profit maximizers and that the firms are price takers in input and output markets. Even though output prices may not be determined directly by the market, from the point of view of the firm they are presumed to be exogenously determined by a surrogate, the regulatory agency. Hypothesis tests are provided in Table 3 for the final form of the profit function estimating equation below:

$$\begin{aligned} \ln \text{PROFIT} = {} & \beta_0 + \beta_1 \text{ LOCATION} + \beta_2 \text{ CHAIN} + \beta_3 \text{ PRVT} \\ & \text{vs GOVT} + \beta_4 \text{ REL vs PRVT} + \beta_5 \text{ 1999} + \beta_6 \text{ 1998} + \beta_7 \ln \text{WAGE} \\ & + \beta_8 \ln \text{OCC} + \beta_9 \ln \text{TILE} + \beta_{10} \ln \text{BEDS} + U \end{aligned} \tag{2}$$

where the dependent variable, *PROFIT*, is defined to be operating profit (i.e., earnings before tax plus interest, depreciation, and property tax [equivalently, EBITDA]). The independent variables for the profit function include the same dummy variables, the wage rate, and the occupancy rate, as in the cost function (Equation 1). The remaining variables in natural logs are the price index and the capital input. The price variable (TILE) is the TILE ranking index multiplied by –1 and is equivalent to the CSMX variable in the cost function. The capital (BEDS) variable is the number of beds (i.e., firm size) in each nursing facility. This is the proxy variable for the quantity of fixed inputs.

Equation (2) reflects modification of the reduced-form, translog model by including nonprofit classification types, case mix (output prices), and occupancy rate variables to help explain costs and profits. These modifications warrant comment. Jensen and Meckling (1976) asserted that the maximum attainable output of a firm is not simply a matter of combining resources given a level of technology. The production function is also dependent on the contracting and property rights system within which the firm operates. In addition, Newhouse (1970) noted the philanthropy and public subsidies cause nonprofit facilities to deviate from the optimal economic goal. Despite all firms being nonprofit facilities, the classification dummy variables are included to capture these possible effects among these types of firms.

Although microeconomic theory is very specific about the explanatory variables in cost and profit functions, Mullineaux (1978) and Neuberg (1977) pointed out that additional variables may be necessary to specify differences in the production system or technology from firm to firm—hence the case mix, occupancy rates, and nonwage cost variables in this specification.

An important explanatory variable that is missing is a proxy for quality; homogeneous quality among these nonprofit-facility classifications is assumed. As noted previously, quality data are only reported for 1999. For that year, tests for systematic differences in quality of care (see Table 4 for various hypotheses tested) are conducted using the following model:

Table 3. Profit Function Hypothesis Tests for Texas Nonprofit Nursing Facilities

Hypothesis Test	*(RDL1* p *value)*	*Explanation*
(1) H_0: $\beta_1 = 0$	.615	A test of equal overall economic efficiency between rural and urban facilities
(2) H_0: $\beta_2 = 0$	.000	A test of equal overall economic efficiency between independent and chain-member facilities
(3) H_0: $\beta_3 = 0$	.122	A test of equal overall economic efficiency between private secular and government facilities
(4) H_0: $\beta_4 = 0$	.002	A test of equal overall economic efficiency between religious-affiliated and private secular facilities
(5) H_0: $\beta_5 = 0$ H_0: $\beta_6 = 0$	.046 .126	As panel data are used, control variables are included to test for possible nonwage cost differences occurring over time: 1999 versus 1994 and 1998 versus 1994.
(6) H_0: $\beta_7 = 0$	.019	A test of the impact of wages on overall economic efficiency (profit)
(7) H_0: $\beta_8 = 0$	.000	A test of the impact of occupancy rates on overall economic efficiency (profit)
(8) H_0: $\beta_9 = 0$	.000	A test of the impact of price on overall economic efficiency. As nursing facilities are reimbursed by Medicaid based on case mix, the TILE and case mix variables are the same. Furthermore, inclusion of an output price variable in the profit function provides a basis for a test of the competitiveness of the product market.
(9) H_0: $\beta_{10} = 0$	.000	A test of the impact of firm size (capital) on overall economic efficiency

Hypothesis Test	*(RDL1* F *value/*p *value)*	*Explanation*
(1) H_0: Equation 2 is not a meaningful model.	43.930/.000	A test to determine if the specified model is valid for determining overall economic efficiency
(2) H_0: Religious facilities = government facilities	7.5/.007	As the impact of three different facility types on overall economic efficiency is considered, direct tests of all three pairings may not be included in the model. Thus, the approach taken is to include two pairings in the model and use an *F* test on the remaining pair.

Note: RDL1 = robust distance L one norm; TILE = Texas Index for Level of Effort.

$$QRS = \beta_0 + \beta_1 \text{ LOCATION} + \beta_2 \text{ CHAIN} + \beta_3 \text{ PRVT vs GOVT} + \beta_4 \text{ REL vs PRVT} + \beta_5 \ln \text{OCC} + \beta_6 \ln \text{CSMX} + \beta_7 \ln \text{BEDS} + U \quad (3)$$

where the dependent variable, *QRS*, is the Quality Rating System provided by the Texas Department of Human Services in 1999. The independent variables have already been defined.

Table 4. Quality Model Hypothesis Tests for Texas Nonprofit Nursing Facilities

Hypothesis Test	*(RDL1* p *value)*	*Explanation*
(1) H_0: $\beta_1 = 0$	.108	A test of equal quality between urban and rural facilities
(2) H_0: $\beta_2 = 0$	.473	A test of equal quality between independent and chain-affiliated facilities
(3) H_0: $\beta_3 = 0$	.902	A test of equal quality between private secular and government facilities
(4) H_0: $\beta_4 = 0$	.423	A test of equal quality between religious-affiliated and private secular facilities
(5) H_0: $\beta_5 = 0$	.222	A test of the impact of occupancy rate on quality
(6) H_0: $\beta_6 = 0$	.070	A test of the impact of the degree of caseload difficulty on quality
(7) H_0: $\beta_7 = 0$	.000	A test of the impact of facility size on quality

Hypothesis Test	*(RDL1* F *value/*p *value)*	*Explanation*
(1) H_0: Equation 3 is not a meaningful model.	4.91/.000	A test to determine if the ad hoc specified model is valid for determining quality levels
(2) H_0: Religious facilities = Government facilities	.119/.731	As the impact of three different facility types on quality is considered, direct tests of all three pairings may not be included in the model. Thus, the approach taken is to include two pairings in the model and use an *F* test on the remaining pair.

Note: RDL1 = robust distance L one norm.

A list of various "creative empirical proxies" for quality that have been used in the literature is provided by Fried, Schmidt, and Yaisawarng (1998). These include a nursing facility's funding mix (the proportion of total resident days funded by Medicaid, a ratio that is supposed to correlate inversely with quality); the history of a facility's regulatory violations and deficiencies; the skill level of the nursing staff; the number of beds per room; the availability of rehabilitative and recreational services; and the interview responses of staff members, patients, and their relatives and friends.

There is also a long list of candidates for the independent variables. Davis (1991) mentioned facility size, expenditures on resident care, and size and composition of staff. Alluding to economies of scale, an increase in facility size is presumably accompanied by greater efficiency. However, Davis concluded this relationship is inconsistent. Furthermore, he noted that increases in cost do not vary reliably with quality. Finally, higher nonprofessional staff-to-patient ratios appear to contribute little to quality compared with RN or professional staff-to-patient ratios. However, RN hours could vary according to the level of care provided.

As for ownership status and the high-Medicaid–lower-quality relationship, Davis (1991) concluded that there appears to be no consistent ownership–quality

relationship and the majority support for the higher number of Medicaid residents–lower-quality findings occur primarily within the context of tight bed supplies. Texas is, of course, an oversupply of beds state.

Sainfort, Ramsey, and Monato (1995) indicated that size, ownership, and costs are used most often as predictor variables. However, in their survey of more than 24 models, there is a great variation in findings. Furthermore, findings are mixed for location and occupancy rates. As for the facility's level of certification, larger number of RNs per resident, lower percentage of skilled care beds, and higher percentage of private-pay residents, higher quality levels appear to be consistently reported.

DATA

All data except the quality measure are from the 1994, 1998, and 1999 Texas Medicaid Nursing Facility Cost Reports (TDHS, 1994, 1998, 1999). Quality data are based on the QRS rating of each Texas nursing facility by state regulators (TDHS, 2000). The TDHS gathers data through annual cost reports for all facilities receiving Medicaid reimbursement (approximately 95% of all Texas nursing facilities are approved) and regulates all nursing facilities in Texas.

Nonprofit facilities are about 12% of all nursing facilities in Texas. Approximately 75% of all nursing home residents in Texas are Medicaid beneficiaries (Texas Health Care Association, 1997). Revenues are reported for private-pay and Medicaid/Medicare residents; however, most costs cannot be allocated among these groups of residents. In 1999, nonprofit facilities typically earned 63% of their revenue from Medicaid and between 7% to 14% from Medicare. Private-pay revenues in private secular, government, and religious-affiliated facilities accounted for approximately 18%, 28%, and 32%, respectively. As Table 1 indicates, religious facilities are less likely to accept Medicaid residents than are government facilities that, in turn, are less likely to accept Medicaid residents than are private secular nonprofit facilities. More Medicaid residents are accepted in rural areas of Texas than in urban areas.

Most of the variables in Table 1 are self-explanatory. However, the TILE (Texas Index for Level of Effort) ranking and the QRS merit some discussion. TILE is an index used to measure a facility's case mix and hence its Medicaid reimbursement. There are 11 categories based on the 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). TILE is used as a price variable in the profit function and as a case-mix variable in the cost function.

The 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 uses HCFA quality indicators to identify potentially superior performance. It measures 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" (TDHS, 2000, p. 2). A low number of deficiencies (quality indicators) implies a favorable PAS score. Conversely, the PDS reflects adverse conditions that occur with exceptional frequency in the facility. A low number of deficiency indicators implies a favorable PDS score. Obviously, a nursing home's overall quality index is raised by either favorable PAS or PDS scores. 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. For survey and investigative scores, "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" (TDHS, 2000, p. 3).

The TDHS 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" (2000, p. 1). TDHS also emphasizes that a nursing home providing superior care may nevertheless have an unfavorable PAS or PDS score if many residents are very sick or infirm. Although the QRS ratings are an imperfect index of quality of care in Texas nursing facilities, no other available proxy seems more valid conceptually or has greater informational content.

ESTIMATION RESULTS

Technical efficiency is examined using tests of several hypotheses implied by the cost function (Equation 1). Table 2 lists and briefly explains the hypotheses tested.

Estimated parameters for the cost function are shown in Table 5. To summarize, (a) urban facilities are 3% to 10% more costly than rural facilities (OLS and RDL1 significant); (b) there appears to be no systematic difference in the technical efficiency of chain and independent facilities (OLS); however, chains

Table 5. Total Cost Function for Texas Nonprofit Nursing Facilities Using Panel Data for 1994, 1998 and 1999 (ln *TOTAL COST* is the dependent variable)

	Ordinary Least Squares		*RDL1*	
Independent Variables	*Coefficient*	p *value*	*Coefficient*	p *value*
LOCATION	.097	.000[a]	.043	.013[a]
CHAIN	–.002	.929	–.035	.021[a]
PRVT vs. GOVT	–.159	.000[a]	–.125	.000[a]
REL vs. PRVT	.013	.532	.072	.000[a]
1999 vs. 1994	.209	.000[a]	.211	.000[a]
1998 vs. 1994	.191	.000[a]	.188	.000[a]
ln WAGE	.288	.000[a]	.302	.000[a]
ln OCC	–.115	.000[a]	–.182	.000[a]
ln CSMX	.199	.048[a]	.405	.000[a]
ln DAYS	.990	.000[a]	.979	.000[a]
Intercept	4.181	.000[a]	4.658	.000[a]
SE of estimate	.188		.137	
R^2	.920		.950	
F statistic	498.4[a]		778.5[a]	
df	(10,431)		(10,400)	
p value	.000[a]		.000[a]	
No. of observations	442		411	
F statistic for REL vs. GOVT	17.9[a]		43.6[a]	
df	(1,431)		(1,400)	
p value	.000[a]		.000[a]	

Note: ln = natural logarithm; RDL1 = robust distance L one norm; LOCATION = classifies 28 Metropolitan Statistical Areas (MSAs) in Texas as urban and all other facilities as rural; CHAIN = facility is or is not member of nonprofit chain; PRVT = private secular; GOVT = government; REL = religious affiliated; WAGE = estimate of each nursing facility's average hourly wage for licensed vocational nurses and aides; OCC = occupancy rate; CSMX = average case mix; DAYS = total resident days.

a. Significant at the 95% confidence level or better.

are less costly when robust analysis is considered (RDL1 significant); (c) the cost of government facilities is approximately 13% to 16% higher than private secular nonprofits (OLS and RDL1 significant); (d) religious-affiliated nonprofits are approximately 1% to 6% less efficient than private secular nonprofit nursing facilities (RDL1 significant only); thus government facilities are implied to be approximately 8% to 12% more costly to operate than religious-affiliated facilities (OLS and RDL1 *F* test significant); and (e) nonwage costs are approximately 21% higher in 1999 than in 1994 and 19% higher in 1998 than in 1994 (OLS and RDL1 significant).

The other coefficients have signs and magnitudes that are consistent in terms of cost theory, and they are all OLS and RDL1 statistically significant; that is, higher wage rates, more intensive care, and increases in total resident days all contribute to higher costs whereas higher occupancy rates reduce costs.

Overall relative economic efficiency, that is combined technical (cost) and allocation (price) efficiency, is examined using tests of several hypotheses implied by the profit function (Equation 2). Table 3 lists and briefly explains the hypotheses tested.

Results for the profit function are reported in Table 6: (a) there appears to be no significant difference in profits (i.e., overall efficiency) between urban and rural facilities, (b) chain members are more than 45% significantly more profitable than independent nonprofit facilities (OLS and RDL1 significant), (c) private secular nonprofits do not appear to earn more than government facilities, and (d) religious-affiliated facilities are significantly less profitable than private secular nursing facilities (OLS and RDL1 significant). Furthermore, based on *F* tests, religious-affiliated facilities do not appear to be more profitable than government nursing homes (OLS only); however, the more robust analysis implies government facilities are more profitable than religious-affiliated facilities (RDL1 significant).

The nondummy-variable results are as expected. Increases in wage rates reduce profits (RLD1 significant only); increases in occupancy rates, the degree of case-mix difficulty, and firm size as measured by the number of beds increase profits (all are OLS and RDL1 significant).

Hypotheses and regression results for the quality model are provided in Tables 4 and 7, respectively. The model is estimated using OLS and RDL1 techniques with 1998 nonprofit-facility characteristic data and the 1998-1999 quality data. The results are interesting in that no significant quality differences are found among chain member and independent facilities and the various nonprofit classification of facilities (OLS and RDL1 significant). However, the size (BEDS) of the facility and a more difficult case mix (CSMX; OLS significant only) are statistically significant, indicating negative relationships with quality. Furthermore, urban facilities appear to have lower quality than their rural counterparts (RDL1 significant only).

Based on the results (Tables 3, 5, and 7) of the cost, profit, and quality functions, Table 8 provides a ranking summary for technical efficiency, overall economic efficiency, and quality for the nonprofit nursing-facility industry in Texas.

SUMMARY

OBSERVATIONS

These findings indicate that significantly different performance levels exist among the various nonprofit classifications. In terms of technical efficiency, in a robust sense, the nonprofit classifications may be ranked in order of increasing inefficiency: Private secular facilities are the least inefficient of the three classifications, religious-affiliated are more inefficient, and government facilities are the most costly. Furthermore, the nonprofit nursing-facility industry in Texas is characterized by constant returns to scale.

Table 6. Profit Function for Texas Nonprofit Nursing Facilities Using Panel Data for 1994, 1998, and 1999 (ln *PROFIT* is the dependent variable)

	Ordinary Least Squares		*RDL1*	
Independent Variables	*Coefficient*	p *value*	*Coefficient*	p *value*
LOCATION	–.090	.421	–.043	.615
CHAIN	.452	.000[a]	.500	.000[a]
PRVT vs. GOVT	.208	.308	.241	.122
REL vs. PRVT	–.228	.033[a]	–.257	.002[a]
1999 vs. 1994	.174	.237	.228	.046 [a]
1998 vs. 1994	.051	.708	.161	.126
ln WAGE	–.517	.214	–.748	.019[a]
ln OCC	1.048	.000[a]	1.229	.000[a]
ln TILE	2.288	.000[a]	2.296	.000[a]
ln BEDS	1.168	.000[a]	1.292	.000[a]
Intercept	12.556	.000[a]	12.469	.000[a]
SE of estimate	.768		.580	
R^2	.446		.626	
F statistic	22.320[a]		43.930[a]	
df	(10,277)		(10,265)	
p value	.000[a]		.000[a]	
No. of observations	288		276	
F statistic for REL vs. GOVT	3.4		7.5	
df	(1,277)		(1,263)	
p value	.068		.007[a]	

Note: ln = natural logarithm; RDL1 = robust distance L one norm; LOCATION = classifies 28 Metropolitan Statistical Areas (MSAs) in Texas as urban and all other facilities as rural; CHAIN = facility is or is not member of nonprofit chain; PRVT = private secular; GOVT = government; REL = religious affiliated; WAGE = estimate of each nursing facility's average hourly wage for licensed vocational nurses and aides; OCC = occupancy rate; TILE = Texas Index for Level of Effort; BEDS = number of beds.

a. Significant at the 95 % confidence level or better.

The profit function results broadly reinforce the findings of the cost function. However, chain members become significantly more efficient when allocation efficiency is considered together with technical efficiency; and urban facilities are no longer less efficient than rural facilities. This implies that the allocation efficiency of chains and urban facilities is strong enough to offset the technical efficiency disadvantage found by the cost function; that is, chain and urban facilities appear to be better at matching wages paid with employee productivity than independent and rural facilities.

For overall efficiency, again relying on RDL1 estimates, the results imply that private secular and government facilities are equally efficient, religious-affiliated and government nursing facilities are also equally efficient; however, private secular homes are more efficient than religious-affiliated facilities. Thus, to assume homogeneous performance among Texas nursing facilities classified as nonprofit organizations for tax purposes appears to be an error.

Table 7. Quality Comparisons in Texas Nonprofit Nursing Facilities with 1998-1999 Data (QRS [quality index] is the dependent variable)

	Ordinary Least Squares		*RDL1*	
Independent Variables	*Coefficient*	p *value*	*Coefficient*	p *value*
Intercept	32.166	.317	61.393	.038[a]
LOCATION	–3.702	.250	–4.684	.108
CHAIN	–1.214	.694	–2.013	.473
PRVT vs. GOVT	–.881	.849	.518	.902
REL vs. PRVT	5.080	.135	2.437	.423
ln OCC	10.402	.296	11.022	.222
ln CSMX	–36.727	.010[a]	–23.400	.070
ln BEDS	–9.369	.001[a]	–9.260	.000[a]
SE of estimate	15.135		13.338	
R^2	.205		.221	
F statistic	4.68		4.91	
df	(7,127)		(7,121)	
p value	.000[a]		.000[a]	
No. of observations	135		129	
F statistic for REL vs. GOVT	.956		.119	
df	(1,127)		(1,121)	
p value	.330		.731	

Note: RDL1 = robust distance L one norm; LOCATION = classifies 28 Metropolitan Statistical Areas (MSAs) in Texas as urban and all other facilities as rural; CHAIN = facility is or is not member of nonprofit chain; PRVT = private secular; GOVT = government; REL = religious affiliated; OCC = occupancy rate; CSMX = average case mix; BEDS = total number of beds.
a. Significant at the 95% confidence level or better.

Finally, the significant TILE variable (i.e., proxy variable for price) indicates that the nursing-home managers tend to behave like price takers when they admit their "mix" of residents based on the Medicaid reimbursement schedule. This implies an effectively competitive output market.

Table 1 provides some additional insight into the operating behavior of these nonprofit facilities. Religious-affiliated facilities have an 88% occupancy rate compared with 84% and 75% in government and private secular facilities, respectively. The combined 80% occupancy rate exceeds the low 70% for the industry in Texas. Higher occupancy rates along with private-pay revenues in nonprofit facilities exceed those of profit-seeking facilities by 10% or more. As is apparent, the explanation that nonprofits have a bias against producing lower-quality products (Newhouse, 1970) is believed in Texas. Belief in this bias is probably held by the nonprofit nursing facilities producing the care and their potential customers, particularly in religious-affiliated facilities. However, the average raw quality ratings shown in Table 1 indicate government facilities have the highest quality followed by religious-affiliated and private secular facilities, respectively. Nevertheless, the quality regression (Equation 3) indicates no differences among the nonprofit classifications when control variables

Table 8. Facility Performance and Quality Ranking Summary

Facility Rank	*Technical Efficiency (Cost Function)*			*Relative Economic Efficiency (Profit Function)*			*Quality (Quality Function)*		
(1)	Rural	Chain	PRVT	Rural = Urban	Chain	PRVT = GOVT[c]	Rural = Urban	Chain = Independent	REL = PRVT = GOVT
(2)	Urban	Independent	REL[a]		Independent	REL[b]			
(3)			GOVT						
Significance difference at 95% confidence level	OLS & RDL1	RDL1 only	RDL1 only	Accept null	OLS & RDL1	[†]Accept null& RDL1 only	Accept null	Accept null	Accept null

Note: PRVT = private secular; GOVT = government; REL = religious affiliated; RDL1 = robust distance L one norm; OLS = ordinary least squares.

a. REL = PRVT (OLS only)

b. REL = GOVT (OLS only)

c. Private secular and government nonprofit facilities are equally relatively economically efficient (i.e., accept null in the bottom portion of the table); however, government facilities are ranked more efficiently than religious facilities based on the RDL1 robust regression technique only.

are considered, so the assumption of homogeneous quality appears to be reasonable. Furthermore, the combined nonprofit quality level is not statistically different from that of Texas profit-seeking facilities when control variables are included (Knox et al., 2001b).

All government facilities in Texas (mainly county, municipal, or special district) are found in rural areas and have been created to provide services where none existed (Ullmann, 1987). Religious-affiliated facilities, predominately urban, take on a more difficult caseload than is found in private secular facilities. However, this case-mix level is essentially equal to the average level in profit-seeking facilities (Knox et al., 2003). It is also notable that religious-affiliated facilities admitted the lowest number of Medicaid residents, which supposedly implies higher quality (Davis, 1991), followed by government and private secular facilities. Nonprofit facilities as a group admit approximately 8% to 18% fewer Medicaid residents than do profit seekers. As Scanlon (1980) predicted, nonprofits produce higher levels of output, discriminate between residents, and use private-pay residents to subsidize losses from Medicaid patients.

Finally, religious-affiliated facilities are typically about twice the size of government facilities; however, their average costs are greater for patient care (210%), administration (243%), and capital (242%). Private secular facilities are about 75% larger than government facilities, with average costs only 29%, 66%, and 237% greater for patient care, administration, and capital, respectively. As Newhouse (1970) indicated, philanthropy and tax-base support may significantly influence behavior and allocation of resources through size of reserves and the ability to absorb deficits. For example, the rural government facilities appear to admit lighter care residents, require less capital, pay less for patient care, and have lower administrative cost, presumably operating from a small rural tax base; whereas urban religious-affiliated facilities, operating in a more competitive environment, accept more difficult care loads in densely populated areas. Urban operations require more capital investment and pay higher administrative salaries.

DISCUSSION

Why might these efficiency differences exist? Are they the result of operating differences or differences in output? Assuming that the Texas Department of Human Services' Quality Rating System is valid, there appear to be no important quality differences among these nonprofit organizations. It seems that these efficiency differences occur because of disparate operating goals reflecting agency costs, lack of property rights, asymmetric information, and so on. This conclusion, however, does not appear to command a consensus among long-term care scholars and practitioners.

Do these efficiency differences imply that studies comparing profit-seeking nursing facilities as a group with their nonprofit counterparts are subject to serious aggregation bias? Not necessarily. For example, the range of technical efficiency differences among the nonprofit classifications is approximately

15% to 20%. The overall efficiency differences are approximately 25% between religious-affiliated facilities and private secular facilities. Knox et al. (2003) showed that, in 1998, profit-seeking nursing facilities in Texas were 41% to 60% more overall efficient than nonprofits. Although the differences among nonprofits are statistically significant, it seems unwarranted to conclude that there is a large distortion in aggregating nonprofit facilities for models that compare nonprofits to profit-seeking firms.

This article's empirical results underline the importance of accountability in the agency relationship. In addition to regulation, a critical component of "agency" is the role of the organizational governing body (i.e., the board of directors). Agency failure is endemic to the private sector not only in health care but also in most other profit-seeking endeavors. As a result, much of the recent literature in finance and economics has focused on corporate governance.

Although nonprofit governing bodies have usually escaped this scrutiny, the verification of significant economic efficiency difference findings should stimulate additional research in this area. In a discussion of converting nonprofit hospitals to profit seekers, Gray (1997) indicated that no one is responsible for considering the community impact of conversions. Where are the governing boards? Recently a nonprofit hospital lost its nonprofit status for suing patients for nonpayment (Lagnado, 2004). Where was the governing board? Finally, as some nonprofits apparently use their tax-exempt status to give excess compensation and benefits to the agents, the IRS has recently indicated a desire to look into this practice (Dalrymple, 2004). Where are the governing boards? Excess compensation does not appear to be a problem in nonprofit Texas nursing facilities (Knox, Blankmeyer, & Stutzman, 2001b).

The point is that one of the responsibilities of nonprofit boards of directors is to mitigate losses resulting from organizational slack. Asymmetric information, corruption, excess compensation, and so on affect the economic efficiency of the firm. So does the pursuit of different organizational goals. Should not the various nonprofit nursing facilities have the same socially superior public goal? If not, should tax-exempt status be retained? Analyses of comparative relative economic efficiency may be useful to authorities who confer or deny tax exemptions.

Finally, is it plausible that nonprofit nursing facilities are not as altruistic as is often supposed (e.g., Vitaliano, 2003)? Ullmann (1987) argued that there is no a priori reason to expect a more disabled resident mix in nonprofit facilities. More dependent residents, for whom noticeable improvements are less likely, may lower the prestige of a facility. Furthermore, the opportunity to "cherry pick" residents in terms of care requirements and ability to pay may be congenial to healthier residents, private pay residents, and contributors.

STUDY LIMITATIONS

It is appropriate to recognize several conceptual and data-analytic limitations in the current study, which may, in fact, provide additional avenues for future research.

First, the current study examines a fairly small sample of nonprofit nursing facilities in Texas, whose industry is composed of predominantly profit-seeking facilities having an excess bed supply. To infer that the findings for Texas are applicable to other states (particularly those having excess demand) might be inappropriate. Comparative studies would be interesting.

Second, the apparent openness of Texas to profit-seeking facilities and the leniency of state regulators in monitoring nursing home operations have caused the Texas industry to be considered undersupervised when compared with other states (Hawes, Wildfire, & Lux, 1993). Typically, TDHS regulators inspect facilities on an annual basis or in response to specific complaints based on the nature and seriousness of the complaint. This environment has implications for the quality of care provided and market competition.

The current study has not examined concentration ratios, nor has it explored the impact of profit-seeking facilities on nonprofit behavior except for citations in the literature review. However, the LOCATION variable in this article's models provides a crude proxy for market concentration and competition. Presumably, there is higher market concentration and less competition in rural areas relative to urban areas. Moreover, the current study infers that Medicaid pricing creates an effectively competitive output market. The input factor market for labor appears to be competitive as well.

As for quality, using the TDHS QRS index, the current study and others of Texas (e.g., Knox et al., 2003) find average uniform quality in nonprofit and profit-seeking facilities with the consideration of a control variable such as case mix, occupancy rate, facility size, and so on. As noted previously, portions of the index are based on facility evaluations that are not independently verified by the regulator; and the TDHS strongly cautions users on the interpretations and implications of the QRS index. One implication of these Texas studies is that facilities are complying with the minimum regulatory operating standards to remain open. Clearly, uniform quality, particularly between profit-seeking and nonprofit facilities, is not the perception held by many long-term health care researchers and practitioners. A simple means test of the QRS variable, however, would support that perception. The problematic nature of quality measurement has precluded a consensus on the adequacy of long-term care in Texas and elsewhere.

Third, problems with defining output for multiproduct firms are well known. For the most part, nursing-facility operations are fairly homogeneous, so resident days are used to measure output in the current study. Case mix is used as a control variable in the models. In Texas, there are 11 case classifications for residents; however, the residents are classified by the nursing-facility personnel. Clearly, reliability issues and audit disagreements are present. In fact, the TILE classification system may already be outmoded. Banaszok-Holl, Zinn, and Mor (1996) indicated that nursing homes are developing specialty care units for Alzheimer's, subacute care, head trauma, and so on based on (a) hospital-to-nursing home ratios, (b) health maintenance organization (HMO) penetration, (c) ratio of Medicare to Medicaid

residents, (d) market competition, (e) moratoria on new construction, (f) stringent Medicaid reimbursement payments, (g) organizational structure (profit-seeking vs. nonprofit or chain member vs. independent facility), and (h) facility size.

Finally, use of cost and profit models may appear to be inappropriate for nonprofit facilities that are charged with providing societal benefits beyond those achievable in profit maximization. Still the evidence is that different types of nonprofit facilities approach the socially superior goal differently. The current study assumes that however the organization allocates its resources to achieve its goal, the activities show up in cost and profits. Although this perspective of efficiency for nonprofits is narrow, it avoids ambiguity.

FINAL CONCLUSIONS

The findings of significant efficiency differences in nonprofit nursing facilities are somewhat surprising. Luksetich et al. (2000) concluded that different organizational goals, even among nonprofit facilities, contribute to operating differences. The current study supports that conclusion. However, it also begs the questions: (a) Should different nonprofit nursing facilities types be pursuing different organizational goals? (b) Furthermore, are the organizational governing bodies meeting their fiduciary responsibilities to society, residents, resident families, and government or are these governing bodies simply trying to preserve the organization? (c) What is the makeup of these bodies? (d) How are they selected? and so on. Significant research is needed to examine nonprofit governance.

Furthermore, given that nonprofit nursing-facility goals are divergent, would not the key regulator of the status of nonprofit determination and maintenance (the IRS) be interested in examining these divergences? Finally, if aspects of performance converge (e.g., no quality differences exist among nonprofit organizational types), either competition or regulation make ownership form irrelevant.

Notes

1. Luksetich, Edwards, and Carroll (2000) found that (a) nonprofit facilities are more costly to operate than profit seekers that implies that nonprofits exhibit bonoficing behavior; (b) nonprofit homes have lower general and administrative costs and provide fewer resident days than independent profit seekers; (c) private secular independent nonprofits spend more on nursing care than profit-seeking facilities; (d) chain member facilities have lower costs than independents except for profit-seeking Minnesota chain members; (e) nonprofit chains are less costly to operate than independent religious facilities; (f) chain-affiliated private secular facilities spend less on nursing care than private secular independents; however, both groups spend more than profit-seeking firms; (g) nonprofit Minnesota national chain members have lower nursing care

costs than independent nonprofit firms; (h) administrative costs in national profit-seeking chain members are higher than those in independent profit-seeking and Minnesota chain facilities, suggesting an agency problem; (i) chain affiliation in nonprofit firms increases general and administrative costs for religious-affiliated and private secular facilities in Minnesota chains; and (j) all costs in private secular nonprofits and profit-seeking chains converge to profit-seeking average cost; however, religious-affiliated chains do not converge.

2. Hubert and Rousseeuw (1997b) discussed robust linear regression when the regressors include continuous-valued variables and dummy variables. The authors showed that this situation leads to conceptual and computational issues for robust regression. To address these issues, they propose the robust distance L one norm (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, chain member or independent, and government owned or religious affiliated or private secular. Any data grossly inconsistent with the model are therefore 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. 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 observations and can distort an OLS regression. These leverage points are down weighted 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 very 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, ordinary least squares (OLS) is applied to the purged sample to obtain the RDL1 regression coefficients which 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 atypical quality levels or wage rates. Hubert and Rousseeuw (1997a) provided an instructive application of RDL1.

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Kris Joseph Knox is a senior lecturer of economics and finance in the Department of Maritime Administration at Texas A&M University at Galveston. He received his BBA and MBA through the University of Houston and PhD from the University of Texas Health Science Center at Houston. His current research interest includes the economic analysis of the nursing-facility industry and has resulted in numerous articles in a variety of academic journals.

Eric C. Blankmeyer is a professor of economics at Texas State University-San Marcos. He earned a doctorate in economics from Princeton University, taught and conducted research in Mexico, and worked at the U.S. Office of Management and Budget. His research and teaching interests include microeconomics, international trade, and econometrics.

J. R. Stutzman is a professor of finance at Texas State University-San Marcos. His doctorate is from the University of Houston. Industry experience includes past employment with Lockheed and the Tennessee Valley Authority as well as domestic and international consulting assignments. His research interests have centered on firm performance in the electrical power, telephone, and nursing-facility industries.