Revisiting 'The Determinants of Hospital Profitability' in Florida

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This Special Issue of the *Journal of Health Care Finance* honors Dr. Louis C. Gapenski for his contributions to the fields of health care finance, public health finance and health administration. In his writing, teaching and mentoring, he served as a role model for all of us.

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Abstract

Objectives: To re-evaluate previously identified determinants of hospital profitability in the post-Patient Protection and Affordable Care Act years.

Data: Data were obtained from the Florida Uniform Hospital Reporting System, for years 2010-2014.

Study sample: Sample consisted of general acute care or teaching, privately owned, urban hospitals in Florida.

Study design: Longitudinal panel data design was used to assess the association of two pre-tax measures of profitability – operating margin and return on assets – and 20 predictor variables each year. Predictor variables were categorized as (1) organizational, (2) area-level, (3) managerial, (4) patient-mix, or (5) quality. A difference-in-difference model with hospital fixed effects was used to estimate the effects of the proposed predictor variables on the two measures of hospital profitability.

Principal findings: Results exhibited unexpected associations of hospital markup of charges, and the average age of a hospital's equipment and facilities – negative and positive effects, respectively - with profitability. The results confirmed the negative association of debt utilization and bad debt expenses with profitability, and the positive association of labor yield and county-level hospital concentration. Bed size and system affiliation were also negatively associated with profits. The remaining characteristics, including the two quality measures (a Hospital Consumer Assessment of Healthcare Providers and Systems patient experience score and the hospital's Magnet Recognition designation), were not significantly associated with profitability.

Conclusion: While many determinants of hospital profitability have remained unchanged since before the Patient Protection and Affordable Care Act, some have not, either reversing the direction or losing the significance of their association with profitability. The effects of healthcare reform on hospital viability warrant continued monitoring.

Key words: healthcare reform, hospital profitability, determinants, hospital quality, Florida

Introduction

Since the first half of the 20th century, the delivery of healthcare in the United States has been centered on the hospital. Although recent years have seen attempts at shifting the emphasis to outpatient and primary care settings, hospitals remain a core component of the healthcare system, accounting for 32.1% of healthcare spending in 2014 (Centers for Disease Control and Prevention, 2016). Hospitals not only serve as a point of access for healthcare services, but also represent a vital component of local economies and in many cases are an important element of a community's identity (Bazzoli, et al., 2012; Romero, et al., 2012; Countouris, Gilmore and Yonas, 2014).

The healthcare landscape has changed in terms of reimbursement mechanisms and ownership structures over the past 30 years. Reimbursement has shifted from cost-based reimbursement to prospective payment systems to value-based payment models (Bazzoli, et al., 2004). The Social Security Amendments Act of 1983 shifted payment away from a fee-for-service methodology to a diagnosis-based prospective payment system. Hospitals responded by controlling Medicare costs, decreasing inpatient services, increasing outpatient services, and reducing staff, and overall saw an increase in profits. Hospitals responded similarly to the Balanced Budget Act of 1997, with variable results, as many saw decreased profitability (Bazzoli, et al., 2004). Other financial pressures included hospitals' diminished power to negotiate favorable payment rates due to the rise of managed care, increasing numbers of uninsured individuals. Safety-net hospitals experienced an increase in uncompensated care as Medicaid managed care organizations steered patients away from those hospitals. Hospitals coped with these changes at least in part by reducing the provision of uncompensated care (Bazzoli, et al., 2006; Bazzoli, Kang and Hasnain-Wynia, 2005).

In terms of ownership, system or network affiliation has become increasingly prevalent, resulting in fewer independent hospitals (Bazzoli, 2008). Hospitals also sought integration with physician groups, which resulted in administrative efficiency but with mixed results regarding operational and clinical efficiencies (Bazzoli, et al., 2004). Sometimes in response to community needs, there has been an increase in construction activity of both new and expanded hospitals (Bazzoli, Gerland and May, 2006).

Florida, the state examined in this study, mostly mirrored these patterns, seeing an increase in Medicaid managed care, and an increase in physician/hospital organizations where hospitals acquired primary care practices (Gavin, Farrelly and Simpson, 1998; Gordon, et al., 1996; Duke, 1996). The state's efforts to expand Medicaid focused on alternatives to managed care. For example, MediPass, a primary care case management system, expanded primary care access to indigent beneficiaries (Gavin, Farrelly and Simpson, 1998). However, like the rest of the nation at the turn of the century, Florida's hospitals were in a weakened position in negotiating rates with payers (Duke, 1996).

The Patient Protection and Affordable Care Act of 2010 (ACA) is the most recent legislatively-initiated development that required hospitals to rethink and adjust their operations. The transition in payment models towards a value based system and the increase in the number of insured persons represent landmark changes in the competitive environment of the nation's hospitals. A decrease in the percent of un- and underinsured people in states that have expanded Medicaid eligibility has led to a marked reduction in uncompensated care costs (Dranove, Garthwaite and Ody, 2016).

Projections from one state's county indigent care program indicate that for-profit hospitals may see the biggest reductions in uncompensated care (Bazzoli, 2015). For both Medicaid expansion and non-expansion states, studies of the reduction in uncompensated care have largely focused on emergency services, either from decreased utilization of these services, or an increase in the percent of privately or publicly insured patients (Hernandez-Boussard, et al., 2014; Medford-Davis, et al., 2015; Joseph, et al., 2016). This reduction in uncompensated care may not improve profitability. The ACA also includes provisions to reduce historically important supplemental revenue streams, such as disproportionate share payments (Neuhausen, et al., 2014). Understanding the joint effects of these environmental changes on the determinants of hospital profitability is a key step in equipping healthcare managers to successfully navigate the new healthcare environment.

The years ahead will bring major developments in hospital efforts to sustain profits. Many studies focusing on the determinants of hospital profitability were conducted prior to the ACA (Gapenski, Vogel and Langland-Orban, 1993; Holt, et al., 2011; Pink, et al., 2007; Langland-Orban, Gapenski and Vogel, 1996; Younis, et al., 20013). While these studies have identified factors that are associated with hospital profitability, it is unknown what, if any, changes have occurred either in the magnitude or direction of these associations. The ACA has resulted in uncertainty in how to sustain financial profitability. In order to sustain operations, hospitals must understand how to remain financially viable.

The purpose of this study is to revisit the relationships between previously identified determinants and hospital profitability in the post ACA environment. Unlike previous studies, this study introduces two novel determinants related to healthcare quality: a hospital's Magnet Recognition status, a certification related to nursing quality, and a dimension of Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey. While the relationship between these quality indicators and hospital profitability has been studied previously, it has been pre-ACA, or has not been in conjunction with some other known profitability determinants included in this study (Richter and Muhlestein, 2016; Turner, Broom and Counte, 2015). The authors hypothesize that many of the previously identified determinants will have similar relationships with profitability as was determined in prior research studies. The authors also hypothesize that, given changes in payment models from volume-based fee-for-service payments to value-based payments, length of stay will be negatively associated with profitability whereas quality indicators will be positively associated with profitability. The results of this study will be informative to healthcare executives, policy makers, and researchers to further their understanding of the determinants of hospital profitability.

Research Design and Methods

Research Design and Data Sources

This study applies panel data methods to assess the relationship between profitability and the various determinants of hospital profitability. The data was obtained from the Florida Uniform Hospital Reporting System (FUHRS), which collects financial and operational information from hospitals each fiscal year. Since the dates of the fiscal year vary by hospital, the fiscal year end date for each hospital-year observation was deemed as the year variable.

Study Sample

The study sample consists of all general acute care, non-governmental, urban hospitals in Florida. Specialty, rural and government hospitals were excluded to achieve a more homogeneous sample. The data set consisted of an unbalanced panel of hospital-year observations, from 2010-2014.

Variables and Measurements

Table 1 presents the name, definition and source for each variable.

Table 1. Variable descriptions

Variable	Measure
Profitability Measures	
Pre-tax operating margin*	$$\frac{\text{Operating revenue - Operating expenses}}{\text{Operating revenue}}$$
Pre-tax return on assets*	$$\frac{\text{Operating revenue - Operating expenses}}{\text{Total assets}}$$
Organizational Characteristics	
Ownership**	0 = Not-for-profit hospitals 1 = Investor-owned hospitals
Size*	Number of beds staffed and available end of year
System status**	0 = Freestanding hospitals 1 = System hospitals
Teaching status*	$$\frac{\text{Number of residents employed}}{\text{Number of beds staffed and available end of year}}$$ 0 = 0 residents/bed 1 = More than 0 and less than 0.25 residents/bed 2 = 0.25 or more residents/bed
Market Characteristics	
Hospital concentration*	*Herfindahl-Hirschman Index by county, for n hospitals in county*: $$\sum_{i=1}^{n} \left[\frac{\text{Inpatient days}_i}{\sum \text{Inpatient days}_i} \right]^2$$

Table 1. Continued

Market share***	*For freestanding hospitals*: $$\frac{\text{Number of admissions}}{\text{Sum of admissions in all non-children's and non-veteran hospitals in}}$$ *For system-affiliated hospitals*: $$\frac{\text{Sum of admissions in all FL hospitals in the system}}{\text{Sum of admissions in all non-children's and non-veteran hospitals in l}}$$
Patient income‡	Median per capita income by county
Physician density‡	Number of physicians per 1,000 population by county
Managerial Characteristics	
Age of plant*	$$\frac{\text{Accumulated depreciation}}{\text{Annual depreciation expense}}$$
Debt utilization*	$$\frac{\text{Total debt including current liabilities}}{\text{Total assets}}$$
Labor yield*	$$\frac{\text{Net patient care revenue}}{\text{Total FTEs}}$$
Medicare markup*	$$\frac{\text{Total gross charges}}{\text{Total Medicare-allowable costs}}$$
Occupancy*	$$\frac{\text{Total inpatient days}}{\text{Total staffed and available inpatient days}}$$
Service intensity*	*For services measured in days and in visits*: $$\sum \left| \frac{\text{Amount of service-Median service amount across hospitals}}{\text{Standard deviation of service across hospitals}} \right|$$
Patient-mix Characteristics	
Average adjusted length of stay*	$$\frac{\text{Total inpatient days} / \text{Total admissions}}{\text{Average Medicare DRG weight}}$$
Bad debt ratio*	$$\frac{\text{Deductions for bad debt}}{\text{Gross patient care revenue}}$$
Medicaid mix*	$$\frac{\text{Total Medicaid inpatient days}}{\text{Total inpatient days}}$$
Medicare mix*	$$\frac{\text{Total Medicare inpatient days}}{\text{Total inpatient days}}$$

Table 1. Continued

Quality Characteristics	
HCAHPS patient willingness to recommend hospital‡‡	Percent of patients responding who reported YES, they would definitely recommend the hospital to family and friends
Magnet Recognition designation‡‡‡	0 = Not a designated Magnet hospital 1 = Designated Magnet hospital

Data sources:
*FUHRS (Florida Uniform Hospital Reporting System)
**FHA (Florida Hospital Association)
***AHD (American Hospital Directory) (American Hospital Director, 2016)
‡FSA (Florida Statistical Abstract) (University of Florida, 2016)
‡‡HCAHPS (Hospital Consumer Assessment of Healthcare Providers and Systems Survey) (Centers for Medicare, 2016)
‡‡‡ANCC (American Nurses Credentialing Center) (American Nurses Credentialing, 2016)

Dependent Variables

Two measures of profitability were used as the dependent variables: (1) pre-tax operating margin (PTOM), a measure of revenue generation and expense control, and (2) pre-tax return on assets (PROA), an asset profitability measure. Pre-tax profitability measures were used to allow for comparison between for-profit and not-for-profit hospitals.

Independent Variables

Based on the literature, twenty factors previously found to be associated with hospital profitability were analyzed. These factors were divided into five categories: (1) organizational, (2) area level, (3) managerial, (4) patient-mix, and (5) quality.

Organizational

Organizational characteristics were measured using the following variables: hospital size, and ownership, system affiliation, and teaching status. Hospital size, measured by the number of beds, may be associated with profitability through either economies, or diseconomies, of scale (Langland-Orban, et al., 2015; Turner, et al., 2015; Gapenski, Vogel and Langland-Orban, 1993). Compared with not-for-profit ownership, for-profit ownership may lead to increased profitability as a result of cost containment or of heightened focus on growth and revenue-generating opportunities (Turner, et al., 2015). System affiliation, particularly membership in larger systems, may lead to increased profitability through either improved bargaining power in reimbursement rate negotiations or economies of scale (Bai and Anderson, 2015). Teaching hospitals receive additional payments through graduate medical education to cover the costs of residency programs. However, these additional payments may not entirely offset the costs of operating residency programs, leading to lower profits for these hospitals (Gapenski, Vogel and Langland-Orban, 1993; Langland-Orban, Gapenski and Vogel, 1996; Turner, et al., 2015).

Area-level

Area-level characteristics consist of state-level market share of the hospital, and county-level income, physician density, and concentration of hospitals. Market share is the percentage of the hospital's admissions (for a freestanding hospital) or the sum of admissions of Florida hospitals in the system (for a system-affiliated hospital) divided by the total admissions of all Florida hospitals included in the study. Market share is a measure of a hospital's ability to negotiate prices with payers, suppliers, and other contracts. To more accurately reflect negotiating power, total admissions included admissions at rural and public hospitals, in addition to those at the urban, privately-owned hospitals under study. Like system affiliation, the difference between market share and market concentration, sometimes termed 'regional power', is thought to be positively associated with profitability through an improved ability to negotiate higher reimbursement rates (Bai and Anderson, 2015).

Area-level income is calculated as the median income in the county. Hospitals may build expensive facilities or acquire newer technology to attract patients in more affluent areas, but reimbursement may not change to offset these expenses (Gapenski, Vogel and Langland-Orban, 1993). Therefore, it is anticipated that median income will be negatively associated with profitability.

Physician density, measured here as the number of physicians per 1,000 population in the county, is hypothesized to drive supply-sensitive care, where a higher supply of physicians leads to a greater amount of care delivered (e.g., procedures performed, visits conducted) (Gapenski, Vogel and Langland-Orban, 1993; Fisher, et al., 2003). While incurring both costs and revenue, more care may, on balance, contribute to increased profitability.

The Herfindahl-Hirschman Index, derived from the fraction of inpatient days seen by each hospital in a county, was used as the measure of the degree of competition a hospital faces. Inpatient days at rural and public hospitals were included as well as from the urban, privately-owned hospitals under study. Competition's influence on profitability may depend on the type of hospital(s) in the area, and their strategies for achieving market share (Gapenski, Vogel and Langland-Orban, 1993; Holt, et al., 2011; Bai and Anderson, 2015).

Managerial

Six characteristics that may be influenced by hospital managers were included. Age of plant (calculated as the ratio of total accumulated depreciation to annual depreciation expense) is a measure of the average age of a hospital's facilities and equipment. A negative association is anticipated between age of plant and profitability, for several possible reasons. It may be that newer equipment will attract more patients and more reputable physicians, or generate more revenue due to minimal wear and tear, leading to higher profit. It is also possible that more profitable hospitals will be able to buy newer equipment (Gapenski, Vogel and Langland-Orban, 1993).

Debt utilization, the debt-to-assets ratio, is an indication of the degree to which a hospital uses debt rather than equity to fund its projects. A negative association is anticipated between debt utilization and profitability, as the hospital would devote excess revenues to pay the interest incurred through debt financing (Gapenski, Vogel and Langland-Orban, 1993; Langland-Orban, Gapenski and

Vogel, 1996). To account for the hypothesized non-linear relationship between debt utilization and profitability, the squared value of the debt to assets ratio was added to the model.

Labor yield is the ratio of revenue to total hospital full-time equivalents (FTEs). Hospitals that produce services with fewer or less costly staff may have higher profits; thus, a positive association is expected between labor yield and hospital profitability (Langland-Orban, Gapenski and Vogel, 1996).

A hospital's markup of charges, defined here as the ratio of charges to Medicare-allowable costs, is expected to be positively associated with profitability, as hospitals may use charges as leverage to negotiate higher contracted rates from insurers (Holt, et al., 2011; Bai and Anderson, 2015).

Occupancy, the ratio of inpatient days to staffed and available inpatient days, is expected to have a positive association with profitability through its contribution to market share and hospital concentration. It is also representative of the amount of care delivered, and like supply-sensitive care, on balance it is expected to increase revenue more than costs (Langland-Orban, Gapenski and Vogel, 1996).

Service intensity is a measure of the amount of services a hospital delivers compared with other hospitals. It may be that the specific services offered, and their attractiveness to patients and physicians, predict hospital profitability (Gapenski, Vogel and Langland-Orban, 1993; Holt, et al., 2011).

Patient-mix

Patient-mix factors consist of average DRG-adjusted length of stay, bad debt ratio, and the mix of Medicare and Medicaid patients. Average length of stay, adjusted here by the hospital's average Medicare DRG weight, is expected to be negatively associated with profitability, as prospective payment systems do not provide extra reimbursement for additional days of a patient's stay (Langland-Orban, Gapenski and Vogel, 1996; Fisher, et al., 2003).

The ratio of bad debt deductions to gross patient revenue, a reflection of revenue the hospital expected to receive but did not, is thought to have a negative association with profitability through the decrease in anticipated revenue (Langland-Orban, Gapenski and Vogel, 1996; Singh and Wheeler, 2012).

The percentages of Medicare and Medicaid fee-for-service patients a hospital treats in the inpatient setting are expected to be negatively associated with profitability, due either to lower reimbursement rates compared with those of private insurers and capitated Medicare and Medicaid plans, or by the possibility that these patients are costlier to treat in ways that are not accounted for in reimbursement rates (Gapenski, Vogel and Langland-Orban, 1993; Langland-Orban, et al., 2012; Bai and Anderson, 2015).

Quality

Two measures of quality were included. The first indicates patient perception of quality, and is operationalized as the percent of patients responding to question 22 in the HCAHPS survey who

would "definitely recommend" the hospital to friends and family (Centers for Medicare, 2016). The second measure of quality is a hospital's Magnet Recognition designation, a measure of nursing excellence administered by the American Nurses Credentialing Center (American Nurses Credentialing, 2016). Previous literature has argued that a hospital is likely to be compliant with Magnet standards during the one to two-year process of becoming Magnet-designated (Karim, 2014; Kutney-Lee, et al., 2015). Consistent with this literature, this was assigned as a binary variable, with a value of "1" for years that a hospital is Magnet-designated and for two years before that designation, and a value of "0" otherwise.

A positive association is expected between hospital quality measures and profitability for three reasons. First hospitals may use these measures as leverage to negotiate favorable rates from payers (Bai and Anderson, 2015). Second learning about patient perceptions of their own care experiences may have a substantive impact in steering future patients toward or away from a hospital (Holt, et al., 2011). And third, as CMS increases the award and penalty amounts in the Value-based Purchasing program, differences in HCAHPS scores, one of the program's metrics, may lead to detectable differences in revenue, and thus to differences in profitability (Turner, Broom and Counte, 2015).

Statistical Analysis

Descriptive statistics were used to summarize the data. Bivariate analysis was used to test for differences in the percent of missing hospital-year observations between the subgroup means for organizational characteristics. Statistical significance was set at $\alpha=0.05$ for all analyses. Correlation analysis was completed to identify potential multicollinearity among the independent variables. The analysis was conducted using Stata 13.1 (StataCorp, College Station, Texas).

Empirical Analysis

A difference-in-difference model with hospital-level fixed effects was used to estimate the effects of the proposed profitability determinants on both measures of profitability.

Results

The final sample totaled 135 hospitals, with 646 hospital-year observations. Figure 1 presents the hospital count after applying each inclusion criteria.

Due to data that was likely erroneous, 12 hospital-year observations were excluded from analysis. Examples of data quality issues included hospitals reporting age of plant over 100 years old and a not-for-profit hospital reporting zero charity care. Of the 135 hospitals meeting the study criteria, 131 had the necessary two or more years of data to be included in the regression model.

Different operationalization of some variables was considered. The final analysis retained only the measurement method that best illustrated the relationship between that factor and hospital profitability. Table 2 presents the proportion of hospitals by key organizational characteristics. These characteristics were relatively stable over the five-year study period, except for the increasing prevalence of system-affiliated hospitals, increasing from 87 to 91 percent from 2010

to 2014. The percent missing values for any variable ranged from 1.5 to 3.9% across the five years.

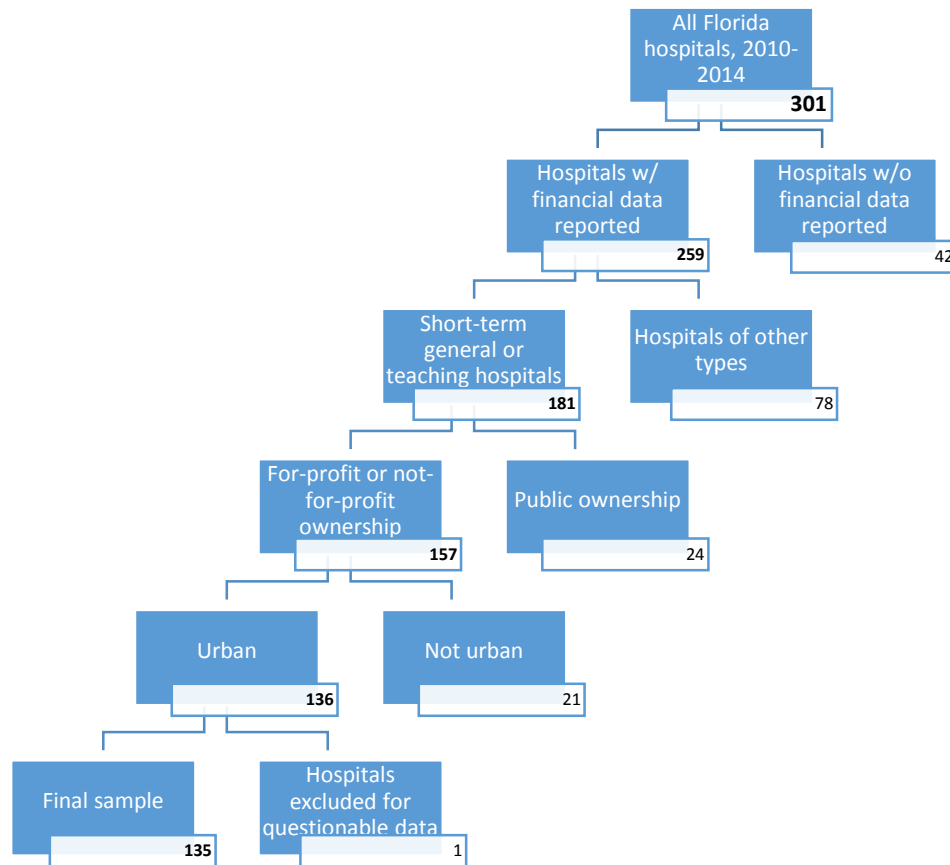**Figure 1.** Count of hospitals at each stage of exclusion

Table 2. Proportion of hospitals by category

Hospital characteristic	Average % of hospitals from 2010-2014
Ownership	
For-profit	58%
Not-for-profit	42%
System affiliation	
In a system	88%
Independent	12%
Teaching status	
0 residents/bed	73%
Between 0 and 0.025 residents/bed	22%
0.025 or more residents/bed	5%
Magnet Recognition status	
Not designated	92%
Designated, or in process	8%

Table 3 presents descriptive statistics for all financial, operational, and market-level characteristics of the hospitals. On average, general acute care privately-owned urban hospitals were profitable over the study period, with a mean profit of 3% and 5% for PTOM and PROA, respectively. A recent national study found the average hospital operating margin from 2007 – 2011 equaled -3%, while the average return on assets over the same time period was 3% (Collum, Menachemi and Sen, 2016). Moody's Investors Service found more favorable numbers for 2014, reporting the national median not-for-profit hospital operating margin as 2.6%, and the median return on assets as 4.5% (Becker's Hospital Review, 2015). The American Hospital Association reports even more favorable figures. Aggregate operating margins were reported as being at 3.4% in 1994 and increasing to 6.4% in 2014 (American Hospital Association, 2016).

Table 3. Descriptive Statistics of Hospital Characteristics

Hospital characteristic	Unit of measurement	Mean	Standard deviation	Minimum	Maximum
Pre-tax operating margin (%)	Percentage	0.03	0.14	-1.47	0.31
Pre-tax return on assets (%)	Percentage	0.05	0.12	-1.58	0.44
Size (# of beds)	# of beds	539	1,734	17	24,750
Hospital concentration	Fraction between 0-1, 1 = hospital sees all inpatients in the county	0.32	0.24	0.08	1.00
Market share	Fraction between 0-1, 1=hospital/system sees all admissions in Florida	0.11	0.10	0.00	0.26
Median per person income in county	Dollars	45,514.42	4,692.56	33,692.00	59,854.00
Physician density	# of physicians/ 1,000 population in county	2.65	0.88	0.40	7.47
Age of plant	Years	10.73	4.61	0.00	30.55
Debt utilization	Ratio of debt to assets	0.48	0.60	0.03	4.95
Labor yield	Dollars	171,238.68	41,030.04	57,315.74	350,716.73
Medicare markup	Ratio of charges to Medicare-allowable costs	6.49	2.08	2.18	13.24
Occupancy	Percentage	0.56	0.15	0.17	0.89
Service intensity	Standardized amount of services delivered	2.00	3.07	0.00	27.35

Table 3. Continued

Average adjusted length of stay	Days	3.14	0.43	1.76	5.59
Bad debt ratio	Ratio of bad debt to revenue	0.03	0.02	-0.01	0.15
Medicaid mix	Percentage	0.14	0.08	0.01	0.46
Medicare mix	Percentage	0.57	0.13	0.17	0.85
HCAHPS patient willingness to recommend hospital	Percentage	0.67	0.09	0.41	0.92

Table 4 presents the fixed effects regression results. The overall R^2 for PTOM and PROA was 0.21 and 0.06, respectively.

Table 4. Fixed effects panel regression results

	Pre-tax operating margin		Pre-tax return on assets	
	Coefficient (Robust standard error)	95% Confidence interval	Coefficient (Robust standard error)	95% Confidence interval
Organizational characteristics				
Ownership	0.040 (0.028)	-0.015, 0.094	0.046 (0.030)	-0.014, 0.106
Size	-0.000*** (0.000)	-0.000, -0.000	-0.000 (0.000)	-0.000, 0.000
System status	-0.069*** (0.017)	-0.103, -0.036	-0.056* (0.024)	-0.104, -0.007
Teaching category 1: Between 0-0.25 residents/bed	0.017 (0.031)	-0.044, 0.078	0.012 (0.041)	-0.069, 0.093
Teaching category 2: ≥ 0.25 residents/bed	0.023 (0.034)	-0.045, 0.090	0.019 (0.044)	-0.067, 0.105
Area-level characteristics				
Hospital concentration	0.133 (0.090)	-0.044, 0.311	0.358* (0.167)	0.028, 0.687
Market share	-0.443 (0.604)	-1.637, 0.752	0.306 (0.893)	-1.460, 2.073
Patient income	0.000 (0.000)	-0.000, 0.000	0.000 (0.000)	-0.000, 0.000
Physician density	0.018 (0.035)	-0.051, 0.086	0.050 (0.061)	-0.070, 0.170

Table 4. Continued

Managerial characteristics				
Age of plant	0.003** (0.001)	0.001, 0.005	0.003 (0.002)	-0.000, 0.006)
Debt utilization	-0.192*** (0.049)	-0.289, -0.094	-0.252* (0.128)	-0.506, 0.002
(Debt utilization)^2	0.046** (0.019)	0.008, 0.085	0.068 (0.056)	-0.043, 0.179
Labor yield	0.000*** (0.000)	0.000, 0.000	0.000*** (0.000)	0.000, 0.000
Medicare markup	-0.010*** (0.003)	-0.015, -0.005	-0.010** (0.004)	-0.017, -0.002
Occupancy	0.009 (0.060)	-0.110, 0.129	-0.041 (0.096)	-0.232, 0.149
Service intensity	-0.000 (0.004)	-0.008, 0.007	0.000 (0.004)	-0.008, 0.008
Patient-mix characteristics				
Average adjusted length of stay	-0.022 (0.016)	-0.054, 0.009	-0.010 (0.016)	-0.041, 0.021
Bad debt ratio	-0.956** (0.384)	-1.715, -0.197	-1.580* (0.727)	-3.018, -0.141
Medicaid mix	-0.009 (0.102)	-0.210, 0.192	0.037 (0.144)	-0.249, 0.323
Medicare mix	-0.133 (0.100)	-0.331, 0.064	-0.232 (0.132)	-0.492, 0.029
Quality characteristics				
HCAHPS patient willingness to recommend hospital	0.001 (0.001)	-0.001, 0.002	-0.000 (0.001)	-0.002, 0.001
Magnet designation	-0.025 (0.039)	-0.102, 0.051	-0.024 (0.063)	-0.149, 0.102
Years				
2011	0.010 (0.006)	-0.003, 0.022	0.011 (0.012)	-0.014, 0.035
2012	0.007 (0.009)	-0.010, 0.024	-0.005 (0.017)	-0.039, 0.028
2013	-0.010 (0.009)	-0.028, 0.009	-0.025 (0.015)	-0.054, 0.005
2014	-0.011 (0.012)	-0.036, 0.013	-0.028 (0.017)	-0.061, 0.004
Constant	-0.018 (0.183)	-0.380, 0.344	-0.176 (0.284)	-0.737, 0.385
R^2 Within hospitals	0.38		0.24	
R^2 Between hospitals	0.25		0.07	
R^2 Overall	0.26		0.06	

*$p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

Organizational

There have been mixed findings regarding the association between profitability and both number of beds (Gapenski, Vogel and Langland0Orban, 1993; Langland-Orban, et al., 2015; Turner, et al., 2015) and system affiliation (Gapenski, Vogel and Langland-Orban, 1993; Holt, et al., 2011; Langland-Orban, Gapenski and Vogel, 1996; Turner, et al., 2015; Bai and Anderson, 2015). In this study hospital size was negatively associated with PTOM, while system status was negatively associated with both measures of profitability. While previous literature has consistently shown negative associations with profitability for both teaching hospitals (Gapenski, Vogel, Langland-Orban, 1993; Turner, et al., 2015; Bai and Anderson, 2015) and not-for-profit ownership (compared with for-profit ownership) (Gapenski, Vogel, Langland-Orban, 1993; Holt, et al., 2011; Langland-Orban, Gapenski and Vogel, 1996; Turner, et al., 2015; Bai and Anderson, 2015), the findings here show no significant association between these two variables and either measure of profitability.

Area-level

The literature shows mixed results on the association between hospital competition and profitability (Gapenski, Vogel and Langland-Orban, 1993; Holt, et al., 2011; Bai and Anderson, 2015). Hospital concentration was found in this study to be positively associated with PROA. Note that higher values of hospital concentration indicate lower levels of competition in the county. While earlier studies found significant associations between profitability and market share (Bai and Anderson, 2015), physician density (Gapenski, Vogel and Langland-Orban, 1993), and area income (Gapenski, Vogel and Langland-Orban, 1993), no significant association was seen between these variables.

Managerial

Contrary to the literature on profitability's association with age of plant (Gapenski, Vogel and Langland-Orban, 1993) and Medicare markup (Holt, et al., 2011; Bai and Anderson, 2015), the results show a significant positive association between age of plant and PTOM, and a significant negative association between Medicare markup and both measures of profitability. As anticipated based on previous literature (Gapenski, Vogel and Langland-Orban, 1993; Langland-Orban, Gapenski and Vogel, 1996), debt utilization had a marginally significant negative association, and labor yield was positively associated with both measures of profitability. Occupancy rate showed no significant association with profitability, an unanticipated result based on previous literature (Langland-Orban, Gapenski and Vogel, 1996). Service intensity also showed no significant association with either measure of profitability, as expected by the mixed results in the literature (Gapenski, Vogel and Langland-Orban, 1993; Holt, et al., 2011).

Patient-mix

Contrary to previous studies showing a negative association of average adjusted length of stay (Langland-Orban, Gapenski and Vogel, 1996; Bai and Anderson, 2015), and the mix of Medicaid and Medicaid patients (Gapenski, Vogel and Langland-Orban, 1993; Langland-Orban, et al., 2015; Bai and Anderson, 2015), no association was found between any of these patient-mix factors and

profitability. Bad debt was negatively associated with both profitability measures, consistent with previous literature (Singh and Wheeler, 2012).

Quality

Neither measure of quality was significantly associated with profitability. Previous studies have examined different types and measures of quality, and have found mixed results regarding the relationship between quality and hospital profitability. Studies have found a positive association between profitability and JCAHCO (now Joint Commission) accreditation status (Langland-Orban, Gapenski and Vogel, 1996), a hospital's presence on the US News and World Report's Best Hospital Honor Roll (Bai and Anderson, 2015), and a hospital's Magnet Recognition status (Karim, 2014). However, a 2015 study examined the award and penalty inpatient payment adjustments for HCAHPS scores in the Centers for Medicaid and Medicare Services (CMS) Value-based Purchasing program, and found no association with profitability (Turner, Broom and Counte, 2015). The authors note that the small amount of adjustment overall may not have been enough to detect an association with profitability.

Discussion

This exploration of how the determinants of hospital profitability in Florida have changed since the early 1990s has identified both expected and unexpected results. A notably unexpected result was the small but significantly negative association between Medicare markup and both PTOM and PROA. A possible explanation lies in the unique nature of Florida's insurance market. Previous studies testing the association between profitability and a hospital's charge to Medicare cost ratio examined hospitals nationwide (Holt, et al., 2011; Bai and Anderson, 2015), while this study focused on Florida hospitals. While a high Medicare markup may reflect a hospital's bargaining strength with private payers, in the case of Florida, this signaling may not hold true. Florida has a smaller than average pool of privately insured patients compared to the rest of the nation (Henry J. Kaiser, 2016), which may permit Florida payers more flexibility to influence use of certain providers. That is, payers may steer patients away from hospitals which have higher reimbursement rates, causing these hospitals to have reduced profits.

Another unexpected finding was the significant, positive association between age of plant and PTOM. A 1996 follow-up of the original Gapenski, Vogel and Langland-Orban (1993) study also showed a positive association between age of plant and profitability. This may be explained by older equipment and facilities impose diminishing interest expense burdens. Revenue that would have been used to cover expenses instead contributed to profits.

Several hospital characteristics demonstrated an unexpected lack of association with either profitability measure. A study by Langland-Orban et al. (2015), focusing on Florida hospitals, could help explain the finding that investor-owned hospitals did not show higher profits than not-for-profit hospitals. From 2000 to 2010, there was a reduction in the variation in PTOMs between for-profit and not-for-profit hospitals. In 2000, approximately ten percentage points separated PTOM at for-profits and not-for-profits. By 2010, the average range decreased to less than two percentage points. This convergence in PTOM between ownership types may be explained by an overall trend of reduced hospital revenue. Langland-Orban et al. (2015) suggested the reason for

this profitability reduction was the increased oversight of medical necessity and denial of payments for unnecessary admissions (Langland-Orban, et al., 2015). The standards which set the stage for this new oversight derived from Medicare Advantage and Medicare's Recovery Audit Contractor programs.

All area-level factors had an expected, though largely non-significant, positive association with profitability. Greater availability and use of outpatient services may have diluted the effect of both physician density and market share. More physicians in an area have been shown to increase the amount of care delivered in both inpatient and outpatient settings. However, outpatient settings represent either substitution or competition for hospitals, and this study did not account for care delivered in outpatient settings. Occupancy rate is the sole managerial factor that displayed an unexpected non-significant association with either measure of profitability. Again, greater reliance on outpatient services could explain the diminished impact of inpatient occupancy on profitability. With the exception of bad debt ratio, none of the patient-mix factors showed the anticipated negative significant association with profitability. For average adjusted length of stay, a possible explanation for this lack of significant association could be that higher reimbursements for more serious illnesses have neutralized any negative impact on profitability which could have resulted from longer hospital stays. Since Florida did not expand Medicaid under the Affordable Care Act (ACA), hospitals in the state may experience a greater financial impact from patients who have obtained private insurance on an exchange established under the ACA. This could have diluted the negative impact of Medicaid on profitability to a degree that made its association insignificant.

This study found no association between quality and profitability. Gauging only a patient's willingness to recommend a hospital and a hospital's Magnet Recognition status may have been insufficient to detect quality's impact on profitability. Another possible explanation for these findings is that the financial penalties incurred as a result of failing to meet value-based purchasing targets are not sufficiently large or have not been in place long enough to significantly impact hospital profitability (Turner, Broom and Counte, 2015).

Table 5 summarizes the findings with respect to consistency or lack thereof with previous research.

Implications

These findings raise several questions for hospital executives, policy makers, and researchers. First, the lack of association found between quality variables and profitability is worth consideration on all fronts. Policy makers could take a more active role in designing methods of improving quality in consultation with hospital leaders. For researchers, these results indicate a need for further exploration of quality's association with profitability, along with the directionality of any association. Only a hospital's Magnet Recognition status and a patient's willingness to recommend a hospital were included here. It may be necessary to combine these with other quality measures to detect an association with profitability. Hospital executives should gather information from several studies, and from regional and national levels, to gain a more complete understanding of quality's importance to profitability.

Table 5. Summary of Expected and Unexpected Results

		Organization	Area-level	Managerial	Patient-mix	Quality
Association with profitability measures	**Direction anticipated**		(+) Hospital concentration	(-) Debt utilization (+) Labor yield (0) Service intensity	(-) Bad debt	
	Direction unanticipated			(-) Medicare markup (+) Age of plant		
	Lack of association unanticipated	⬩ Ownership ⬩ Teaching status	⬩ Median income ⬩ Market share ⬩ Physician density	⬩ Occupancy	⬩ Average adjusted length of stay ⬩ Medicaid mix ⬩ Medicare mix	⬩ Average willingness to recommend ⬩ Magnet Recognition status
	Direction neither anticipated or unanticipated	(-) Bed size (-) System affiliation				

Medicare markup also has important implications for policy makers, researchers, and hospital executives in Florida. Policy makers may be interested in an exploration of the structure of Florida's insurance market to determine whether insurance providers are indeed steering patients away from hospitals with higher markups. Holding out for the highest reimbursement rates attainable from private payers may be more than offset by this decrease in patient volume, and may adversely affect a hospital's overall profitability. For researchers, an exploration of insurance markets in similar states may reveal different financial implications attributed to high markups that could inform Florida hospital executives. These executives may reconsider how they approach decisions regarding markups, and the possible implications for profitability.

Before investing in new facilities and equipment, hospital executives in particular may also consider the unexpected finding that age of plant is positively associated with profitability. This study showed that it is possible for older equipment and facilities to benefit a hospital financially through reduced capital expenditures, consistent efficiency achieved via regular maintenance, and diminished or nonexistent interest payments.

While the findings regarding quality and profitability were unexpected, it is no less important for hospital managers to understand quality's importance to future payment systems. Value-based payment systems offer incentives for achieving better quality. It is in the best interest of managers, researchers, and policy makers to understand how improved quality can be utilized to generate increased profits. If reductions in reimbursement lead to lower profits throughout the industry, hospitals must develop new means of cost reduction to preserve positive profit margins.

Limitations

There are several limitations to this study. First, the Florida Uniform Hospital Reporting System, the primary data source, is not independently audited as are other, national hospital data, such as CMS Medicare Cost Reports. As noted, several observations were removed from the sample due to improbable values. There may have been further inaccurate data that potentially influenced the findings. While a limited number of data quality issues were observed, these represented a small proportion of the overall data used in this study.

The generalizability of this study is limited since the focus was only on hospitals in the state of Florida. The association between hospital characteristics and profitability was examined concurrently (i.e. within the same year). It is possible that at least some characteristics effect profitability only after a period of time. However, several other studies have used this approach, (Gapenski, Vogel and Langland-Orban, 1993; Langland-Orban, Gapenski and Vogel, 1996; Langland-Orban, et al., 2015) and it is reasonable that many, if not all of the characteristics exhibit at least a portion of their full potential association with profitability when measured contemporaneously.

Finally, although the literature was reviewed for characteristics considered important determinants of hospital profitability, there are likely other relevant factors not measured here. Not only may these unobserved factors decrease the explanatory power of the model, but they may also confound the association of some or all observed factors included.

Conclusions

While many of the determinants of hospital profitability examined in the early 90s remain important determinants, many were found to be no longer significantly associated with profitability. Others – Medicare markup and age of plant - demonstrated the opposite sign of association than was expected, and neither quality measure considered here was significantly associated with profitability.

These findings leave many areas for future research, including an examination of the interaction between quality and time to determine if quality is becoming a more prominent factor in profitability as value-based purchasing becomes more prevalent. Further research could also include rural and public hospitals to gain a broader view of the determinants of hospital profitability.

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