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Sustaining High and Low Profitability in Washington Hospitals

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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.

Sustaining High and Low Profitability in Washington Hospital

Abstract

The organizational and operational characteristics of 104 Washington hospitals with sustained high profitability and sustained low profitability were compared using operating margin and return on asset measures. Over the years 2011, 2012, and 2013, approximately 15% to 25% of hospitals were defined as having sustained high-profits or low-profits, respectively. In multivariate analyses only a lower outpatient mix is a significant determinant of high-profits with both measures. For operating margin, system membership, revenues per employee and accreditation status are uniquely significant. For return on assets, only a higher sub-acute care percentage is uniquely significant. As with the study of Langland, Gapenski, and Vogel (1996) concerning hospitals in Florida, there were few determinants of sustained high and low profitability, and some of the factors are under the control of management.

Introduction

Over twenty-years ago Professors Louis C. Gapenski, W. Bruce Vogel, and Barbara Langland-Orban began a series of analyses on the determinants of profitability among hospitals in Florida (Gapenski, Vogel and Langland-Orban, 1993; Vogel, Langland-Orban and Gapenski, 1993; Langland-Orban, Gapenski and Vogel, 1996). They initially took a broad look at measures of profitability that might be employed in an analysis and a broad look at factors that might potentially be associated with profitability. They found, somewhat surprisingly, that most environmental factors were not significantly associated with profitability. Instead they found a variety of variables under the control of management to be significantly associated with profitability. These findings may be viewed as good new or bad news for managers. If your hospital is earning profits, it may be due to your decisions; if your hospital is experiencing losses, it may be due to your decisions.

In the second study they examined the differences between exceptionally high and low profit hospitals, with exceptional defined as a top percentile and profit defined by operating margin and return on asset measures (Vogel, Langland-Orban and Gapenski, 1993). Logistic regression analysis of data from 169 hospitals in Florida in 1989 yielded consistently significant relationships between profits and the debt ratio, full-time equivalent employees per patient day and Medicare mix (percentage of patient days). At a minimum, debt and employment are variables under the control of management.

In their third analysis, they examined hospitals that sustained high or low profits over a three year period (Langland-Orban, Gapenski and Vogel, 1996). Of the 140 Florida hospitals with complete data for 1990, 1991 and 1992, approximately 20% were in the top one-third of profits all three years and approximately 15% were in the bottom one-third of profits all three years. In each year, only half of the hospitals in the top or bottom third in terms of profits were consistently in that group, with other hospitals having more varying levels of profitability. Logistic regression analysis revealed that high-profit hospitals had lower adjusted average lengths of stay and debt ratios, and higher revenues per worker, occupancy rates, and percent with high hospital accreditation ratings. For analyses using return-on-asset as a measure of profits, higher profits were also associated with higher case-mix indexes and Medicare mixes.

In our study, we attempt to use the same basic model as Langland-Orban, Gapenski and Vogel (1996), subject to data availability for Washington hospitals twenty years later.

Methods

Our study used data from three sources: 1) Financial and utilization data from the department of Health, Washington state, which is publically available (www.doh.wa. gov), 2) American Hospital Association annual survey data, and 3) the Area Health Resource File. All the above datasets were merged using Medicare Identification Number as the unique identifier. We collected data for three years: 2011, 2012, and 2013. These years were selected because 2013 was the most recent year with comprehensive data at the Department of Health, Washington. The financial and utilization data from State of Washington, which was our main dataset, contains 104 hospitals from Washington for each of these three years.

Dependent variables

Drawing from the model of Langland, Gapenski, and Vogel (1996), we used two measures of profitability: 1) the pretax operating margin (OM), a margin measure, and 2) pretax return on assets (ROA), a return on investment measure. Pretax measures were selected to reflect the profitability from operations while excluding the impact of taxes. Pretax operating margin is calculated as operating revenue before taxes divided by total operating revenue. It shows the hospital's ability to control expenses associated with the amount of revenues generated. Pretax return on assets is calculated as operating revenues before taxes divided by total assets. It reflects the hospital's ability to generate income from its assets.

Hospitals were divided into thirds based on each profitability measure (33^{rd} percentile and 66^{th} percentile). Based on the definitions of sustained high profit and sustained low profit, hospitals that were in the highest one-third for OM and ROA for each of 2011, 2012, and 2013 were sustained high profitability hospitals. There were 15 hospitals in the high profitability group for OM and there were 25 hospitals in the high profitability group for ROA. There were 13 hospitals in the low profitability group for both OM and ROA. Hospitals that did not sustain being in the high group and low group were considered in the middle group. Only the low and high profitability categories are considered in the analyses.

Independent variables

We used nineteen hospital characteristics and in six categories: 1) structural, 2) payer mix, 3) patient mix, 4) financial, 5) efficiency, and 6) quality. Each category had several characteristics as described in Table 1.

Analytic approach

For analytic purposes, we first identified hospitals with any missing values and excluded them. Since less than 5% of the sample involved missing data, no imputation techniques were employed. Next, we used an independent sample t-tests to compare means of our determinants (hospital characteristics) for each profitability measures, OM and ROA. An independent sample t-test is used to determine if there is a statistically significant difference between the means of two unrelated categories. For comparisons among categorical variables, we used chi-square tests. We assessed significance levels at 95%, and 99% confidence intervals. For multivariate analyses, we used logistic regression methodology since our dependent variables were binary with two categories: low and high profitability. Since we have longitudinal data, we used clustering to adjust for within hospital correlations. We ran separate model for each set of characteristics.

Table 1: Definitions of Potential Determinants of Hospital Profitability

Determinants	Definition
Structural	
Age of Plant	Accumulated depreciation / annual depreciation expense
Competition	Beds per thousand population within a county
Hospital size	Number of beds staffed and available at year end
Investor owned	Investor owned=1, not for profit and others=0
System membership	System affiliated hospital=1, no system affiliation=0
Payer Mix	
Charity care mix	Charity care deductions / gross patient care revenues
Medicaid mix	Total Medicaid inpatient days / total inpatient days
Medicare mix	Total Medicare inpatient days / total inpatient days
Patient Mix	
Case mix index	Average Medicare DRG weight
Intensive care index	Intensive care mix(intensive care inpatient days/total inpatient days) / case mix index
Outpatient mix	Total outpatient revenue / total patient care revenue
Sub-acute care mix	Total sub-acute inpatient days / total inpatient days
Financial	
Bad debt	Deductions for bad debt / patient care revenues
Debt ratio	Total debt / total assets
Non-operating revenue	Non-operating revenue / total revenue
Efficiency	
Adjusted Average Length of Stay	Average length of stay (total inpatient days / total number of admissions) / case mix index
Labor Yield	Net patient care revenues / total hospital full time employees
Occupancy	(Total inpatient days/365) / total staffed and available beds
Quality	
Accreditation	Hospital accreditation=1, No accreditation=0

Results

Descriptive Statistics

For OM, our final sample included 84 hospital year observations with 13 hospitals in the low profitability category and 15 hospitals in the high profitability category. For ROA, our final sample consisted of 102 hospital year observations with 13 hospitals in the low profitability category and 25 hospitals in the high profitability category. The 13 hospitals in the low profitability category for OM and ROA were exactly same hospitals. Tables 2 displays the mean and standard deviations of OM and ROA for low and high profitability categories.

Table 2: Descriptive Statistics: Operating Margin and Return on Assets

Operating Margin			
Year	Total sample	Low	High
	Mean (SD)	Mean (SD)	Mean (SD)
2011	2.6% (7.4%)	-5.15% (2.5%)	13.13% (4.7%)
2012	2.2% (9.4%)	-4.96% (3.9%)	13.19% (9.2%)
2013	2.4% (7.6%)	-5.20% (6.3%)	10.48% (7.6%)
Return on Assets			
2011	4.4% (16.1%)	-4.76% (4.0%)	9.55% (18.1%)
2012	-0.8% (40.8%)	-4.97% (3.2%)	10.12% (19.9%)
2013	3.1% (9.6%)	-3.87% (5.0%)	8.04% (11.84%)

The average OM for low profitability hospitals ranged from approximately -5% to -4% in the three years of study. For high profitability hospitals, the average OM started at approximately 13% in 2011 and decreased to approximately 10% in 2013. The average ROA for the low profitability category ranged approximately from -4% to -3%. For the high profitability category, the ROA started at approximately 10% in 2011 and decreased to 8% in 2013.

Bivariate statistics

Table 3 presents the means of hospital characteristics for each sustained low profit, and high profit categories for OM and ROA. For OM, the difference in means for hospital sizes, for profit ownership, and system membership were found statistically significant for low and high profitability categories. There was a significant difference between low and high profitability categories for Medicaid mix and Medicare mix. Among patient mixes, the low and high categories were significantly different on outpatient mix, and sub-acute care mix, though in the latter case the differences are very small. The means of low and high categories were significantly different for debt ratio and non-operating revenue. Finally, the means low and high categories were significantly different for labor yield, occupancy, and accreditation.

For ROA, the means for low and high profitability categories were significantly different for ownership status. Case mix index showed significantly different means for low and high profitability categories.

Table 3: Comparison of Means of Determinants for Low and High Profitability Categories

		Operating Margin		Return on Assets	
Determinants	All	Low	High	Low	High
Structural					
Age of Plant	9.68	10.31	10.06	9.97	11.09
Competition	0.97	0.55	0.46	0.44	1.14
Hospital size	130	114	182*	135	134
Investor owned	10%	0%	100%**	0%	100%*
System membership	44%	25%	75%**	24%	76%
Payer Mix					
Charity care mix	2.7%	2.7%	3.8%	2.9%	3.3%
Medicaid mix	33.6%	60.5%	24.1%*	21.2%	46.8%
Medicare mix	66.3%	89.3%	46.3%**	62.3%	68.2%
Patient Mix					
Case mix index	0.92	1.04	0.90	1.15	0.86**
Intensive care index	19.0%	17.6%	21.9%	22.6%	19.8%
Outpatient mix	57.0%	58.5%	44.4%**	54.3%	51.9%
Sub-acute care mix	0.1%	0.3%	0.0%*	0.0%	0.2%
Financial					
Bad debt	3.2%	3.3%	4.2%	3.1%	3.8%
Debt utilization	0.55	0.34	0.16*	0.32	0.22
Non-operating revenue	0.3%	1.0%	0.2%*	0.4%	0.6%
Efficiency					
Adjusted ALOS	5.1	5.4	5.4	6.0	5.2
Labor Yield	195,352	134,159	238,465**	145,716	197,160
Occupancy	50.9%	41.1%	57.0%**	47.1%	49.2%
Quality					
Accreditation	58.6%	33.9%	66.1%**	30.0%	70.0%

* significant at $p<0.05$; **significant at $p<0.01$

Multivariate analysis

Table 4 presents results from logistic regressions that represent the association between nineteen hospital characteristics and hospital profitability measures. The values presented are the odds ratio associated with being in the high profit category of each measure.

Among, the first set of structural characteristics; ownership status was omitted from the analyses because all of the investor owned hospitals were in the high profitability category. For pretax operating margin, age of plant and system membership were structural characteristics that were found significantly associated with high profitability group as compared to low profitability group. Hospitals that had a higher age of plant had 1.1 times higher odds of being in the high profitability category as compared to low profitability category. Hospitals that belonged to a system had approximately 20 times higher odds of being in the high profitability category as compared to low profitability category.

Table 4: Logistic Regression Analyses of Determinants of Profitability

	Operating Margin	Return on Assets
Structural		
Age of Plant	1.10	1.06
Competition	1.39	2.25
Size	1.00	1.00
System membership	20.27*	2.23
Payer mix		
Charity care mix	21.50	1.47
Medicaid Mix	0.21	6.47
Medicare Mix	0.05	0.41
Patient mix		
Case mix index	0.01	0.03
Intensive care index	1.06	0.88
Outpatient mix	0.00*	0.00*
Sub-acute care mix	0.00	2.12e+**
Financial		
Bad debt	2.45	4.80
Debt utilization	0.31	0.39
Non-operating revenue	5.67e-	71811
Efficiency		
Adjusted ALOS	1.09	0.98
Labor Yield	1.00**	1.00
Occupancy	1.00	1.00
Quality		
Accreditation	0.11*	0.89

* significant at p<0.05; **significant at p<0.01

Patient characteristics were found to have significant associations with high profitability category as compared to low profitability. In particular, for OM, hospitals with a higher case mix index (average DRG weight) had 0.01 lower odds of being in the high profit group as compared to low profit group. For ROA, hospitals with a higher case mix index (average DRG weight) had 0.03 times lower odds of being in the high profit category as compared to the low profit category. Both for OM and ROA, hospitals with a higher outpatient mix had equal odds of being in the high profit group as well as the low profit group. For ROA, hospitals with a higher sub-acute care mix had higher odds of being in the high profit group as compared to the low profit group.

Among efficiency characteristics, labor yield was significantly associated with profitability categories for OM. In particular, hospitals with a high labor yield had equal odds of being in the high and low profitability categories. Among quality characteristics, hospitals that were accredited by Joint Commission had a 0.1 times lower odds of being in the high profit category as compared to the low profit category.

Discussion

As compared to the analysis by Langland-Orban, Gapenski and Vogel (1996) covering Florida hospitals for 1990-1992, our analysis covering Washington state hospitals for 2011-2013 yielded some similar findings. In both studies about 20% of hospitals sustain being among the lowest or highest in their state in terms of profitability. This means that the profitability of about one-quarter of hospitals fluctuates such that they are in multiple profitability categories during a given three year period. To our knowledge, there have been no other studies of hospitals that examine changes in hospitals sustained profitability and factors leading towards fluctuations in profits. In part, this lack of research may be associated with the relatively small number of persons engaged in the field of health care finance (Carroll and Smith, 2016).

The organizational and operational characteristics associated with sustained high profitability and sustained low profitability were somewhat different between these two studies. In the current study, lower outpatient mix was significant for both measures. For OM, both studies found higher revenues per worker and hospital accreditation to be significant determinants. Langland-Orban, Gapenski and Vogel (1996) also found average lengths of stay, debt ratios and occupancy rates to be significant while we found system membership to be significant. There is no clear explanation for the differences in findings for lengths of stay, debt and occupancy, all of which one could imagine being associated with profitability, though perhaps not sustained profitability. The effects of system membership on profitability may well have changed over time, as hospitals systems have grown and matured.

For ROA, Langland-Orban, Gapenski and Vogel (1996) found case-mix indexes and Medicare mixes to be significantly associated with sustained profitability. We found only the sub-acute care percentage to be significant. While different factors, it is interesting to note that the factors associated with OM and ROA largely differ for both studies, and that it is the patient care mix variables that are associated with ROA and not OM.

We are all left with the conclusion that at least some of the factors associated with sustained profitability are under the control of management. In any particular short period of time, management may have limited ability to influence structural factors like system membership or patient demographics like the percentage of patients covered by Medicare. In the longer-run, almost all of these factors can be influenced by management's decisions.

Limitations

In each of their analyses, Gapenski, Vogel, and Langland-Orban (1993) included a list of several factors that might potentially be associated with profitability, consistent with analyses of the time that examined other dimensions of hospital performance. In the twenty years since their study, a few other factors have been introduced as predictors of profitability, including use of information technology (Devaraj and Kohli, 2003), safety net status (Zwanziger, Khan and Bamezai, 2010), various quality measures (Beauvais and Wells, 2006), and various board performance measures (Collum, et al, 2014). Inclusion of any of several newly introduced predictors may improve the performance of statistical models, though at the cost of complexity and a requirement seeking additional data sources.

Of perhaps greater importance as a caution to studies of this type is the analysis by Dong (2016) indicating evidence of earnings management by hospitals. If decision-making on accounting-related matters can affect reported profitability during a short period of time, classifications of low or high profitability may not be meaningful. There is a limited extent to which decisions can affect reported earnings, but hospitals near the margin of being classified as low or high in terms of profitability, especially the former, may be precisely those hospitals that would seek to alter reported profitability.

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References

Beauvais, B., & Wells, R. (2006). Does money really matter? A review of the literature on the relationships between healthcare organization finances and quality. *Hospital Topics*, 84(2), 20-29.

Carroll, N.W., & Smith, D.G. (2016). Addressing the healthcare finance faculty shortage: Perspectives and paths forward. *Journal of Health Administration Education*, 33(2), 311-320.

Collum, T., Menachemi, N., Kilgore, M., & Weech-Maldonado, R. (2014). Management involvement on the board of directors and hospital financial performance. *Journal of Healthcare Management*, 59(6), 429-445.

Devaraj, S., & Kohli, R. (2003). Performance impacts of information technology: Is actual usage the missing link? *Management Science*, 49(3), 273-289.

Dong, G.N. (2016). Earnings Management In US Hospitals. *Journal of Health and Human Services Administration*, 39(1), 41-71.

Gapenski, L.C., Vogel, W.B., & Langland-Orban, B. (1993). The determinants of hospital profitability. *Journal of Healthcare Management*, 38(1), 63-80.

Langland-Orban, B., Gapenski, L. C., & Vogel, W. B. (1996). Differences in characteristics of hospitals with sustained high and sustained low profitability. *Journal of Healthcare Management*, 41(3), 385-399.

Tennyson, D.H., & Fottler, M.D. (2000). Does system membership enhance financial performance in hospitals? *Medical Care Research and Review*, 57(1), 29-50.

Vogel, W.B., Langland-Orban, B., & Gapenski, L.C. (1993). Factors influencing high and low profitability among hospitals. *Health Care Management Review*, 18(2), 15-26.

Zwanziger, J., Khan, N., & Bamezai, A. (2010) The relationship between safety net activities and hospital financial performance. *BMC Health Services Research*, 10(1), 1-15.