A COMPARISON STUDY OF URBAN AND SMALL RURAL HOSPITALS FINANCIAL AND ECONOMIC PERFORMANCE

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ABSTRACT

This study examines the performance of hospitals based on location (geographical region, rural, urban). In this study, recent data has been used to better understand the hospitals performance after the introduction of Prospective Payment System (PPS). The data set used by the study is much comprehensive in its coverage and information on a number of relevant variables. We have included a number of new economic and financial variables in the analysis and examined the effects of conversion of hospitals from not-for-profit to for-profit on hospital performance. Our empirical findings suggest that the size of hospitals, occupancy rate of hospital beds, ownership status, degree of competition faced in the market, teaching status, and measure of financial indebtedness of hospitals are significant determinants of hospital performance holding location constant. The empirical model also suggests that the relationship between hospital efficiency measure and its various determinants is actually non-linear in nature and therefore, it is important to adopt appropriate non-linear econometric models for empirical estimation of the performance function. Finally, our findings show that rural and small hospitals face significant factors that hinder its performance in comparison to urban and larger hospitals such as the lack of (DSH) payments and economy of scale due to their smaller size and lower proportion of Medicaid patients.

INTRODUCTION

The profitability and financial performance of rural hospitals - and their determinants -have been important subjects of research and of great interest to federal and state agencies as well as banks, creditors, rating agencies, and regulators. Most studies to date have focused on the issues of differential access to urban and rural hospitals, and ignored the issues related to their financial performance. (Institute of Medicine, 2000)

Rural hospitals differ from urban hospitals by being smaller with average size of less than 50 beds. Another characteristic of rural hospitals is its dependence on Medicaid and Medicare as a source of payment. Medicare pays for almost 50% for all hospital discharge compared with 37% for urban hospitals. Medicaid patients count for 17% of rural hospitals inpatient days in comparison to 26% of urban hospitals. Urban hospitals showed an average length of stay (LOS) of 5.9 days versus 7.4 days in rural hospitals. (Ricketts, 1999).

There are many factors determine the level of access to hospitals healthcare such as health insurance, education, and race (Lee and Estes, 2000), however, an equally important factor contributing to health care access is the hospital's financial performance and profitability. In the long run, hospitals with financial insolvency problems would either be expected to reduce their level of care to the poor, uninsured, and other indigent populations, or face closure, bankruptcy or merger.

Sear (1990) examined the issue of profitability in a sample of 50 investor-owned or for-profit (FP) hospitals and 60 not-for-profit (NFP) hospitals in Florida during the period 1982-1988. His results indicated that FP hospitals are more profitable than NFP hospitals and the average length of stay (LOS) and wages per adjusted patient day were important in explaining hospital profitability. Walker (1993), using a logit regression model, found that financial variables, by themselves, failed to discriminate between profitable and non-profitable hospitals and thus did not provide a complete explanation of financial condition. Watt et al. (1986) reported that FP hospitals have higher average revenues than their NFP counterparts. Herzlinger and Krasker (1987) found that NFP hospitals neither perform as well financially as do FP hospitals, nor do they compensate for this by returning higher levels of social benefits. However, other authors (Haddock et al. 1989; Arrington and Haddock, 1990) reexamined Herzlinger and Krasker's (1987) methods and found that the NFP hospitals were less profitable than FP, but provided more access to care to the indgent population through the admission to their emergency room.. In short, the performance of hospitals varied by ownership, thus refuting the findings of Herzlinger and Krasker (1987). On the other hand, based on a sample of hospitals in Florida in 1980, Sloan and Vraciu (1983) found that FP and NFP hospitals were virtually identical in terms of profitability. Younis et.al. (2001) found that the most profitable hospitals are located in the southern region of the country and the hospitals located in the northeastern region where the least profitable.

In this study, we revisit the issue of rural and urban hospitals financial performance by taking several new directions compared to previous studies. First, we examine the variation in financial performance between urban and rural hospitals.* Unlike earlier studies, which used data from the pre-Prospective Payment System (PPS) period, the data set employed in this study is obtained from the post-PPS period and is therefore more relevant to the payment system currently faced by the hospitals. Unlike the previous cost-based mechanism, reimbursement under PPS is set at a predetermined rate. PPS operating cost payment was initiated in 1983 and phased-in over the five-year period 1983-1988 to provide the hospitals the appropriate time to adjust to the new payment system. Second, we incorporate in our empirical analysis additional economic and financial variables (e.g., degree of competition and financial indebtedness) that are likely to affect hospital profitability. Moreover, since early 1990s, hospitals in the U.S. went through significant changes in ownership pattern, and the more recent data allow us to investigate the effect of conversion of not-for-profit (NFP) hospitals to for-profit (FP) status on profitability. Third, we used a proxy variable, consistent with the literature, to identify rural hospitals, and we acknowledge the potential limitations of this approach at the end of the paper. Fourth, since long-term and specialty hospitals are reimbursed under Tax Equity and Fiscal Responsibility Act of 1982 "TEFRA" we included only short-term care hospitals (Ettner, 2001).

BACKGROUND

This study examines the financial performance and conversion of U.S. hospitals in relation to geographic region and urban-rural differences. The area variation and change of ownership have been ignored in the past. This research contributes

significantly to the issue of variation of financial performance between small rural hospitals and its urban counterpart.

In this study, recent data from the Medicare Cost Report (MCR) have been used to understand the economic performance of hospitals following the introduction of the Prospective Payment System (PPS). The data set used includes information on a number of relevant variables such as length of stay, occupancy rate, and full-time employee case-mix. We also included to our regression analysis the effect of serving Medicaid population on rural and urban hospitals performance.

OBJECTIVES

To examine and compare the financial performance between rural and urban hospitals.

METHODS

Piecewise regression model.

ECONOMETRIC METHODOLOGY FOLLOWED

Using the return on assets (ROA) as the dependent variable to understand the factors affecting the hospital profitability and efficiency, the following regression model was estimated:

ROA = f(BEDSIZE, OCCURATE , OWNERSTATUS, LENGTHSTAY, DEBT, FTECMX, TEACHSTATUS, SOLE, YEAR, RATIO OF MEDICAID DAYS TO TOTAL HOSPITAL DAYS)

In this model, a number of variables were considered to have non-linear which can be approximated by piece-wise linear models. For example, it has been hypothesized that profitability is dependent on hospital size (BEDSIZE), which is the proxy variable for location in this model. But the effect of BEDSIZE on ROA should change if size exceeds a certain minimum level. At another higher level, the effect on ROA can change again. To allow this constant effect of BEDSIZE on ROA for a specific size range and another constant effect for another size range, the variable BEDSIZE was decomposed into three variables (BEDSIZE0-50, BEDSIZE50-400 and BEDSIZEover400). The first redefined variable shows the actual size of beds for all hospitals with bed sizes less than 50. And if the size is 50 or more, the variable takes the value of 50. Similarly, the second redefined variable (BEDSIZE30-400) is 0 if size is less than 50; it is actual bed-size minus 50 if the number of beds in the hospital is between 50-399, and 400 when the size is 400 or more. Similarly, BEDSIZEover400 takes the value of 0 if the size of the hospital is less than 400, and bed-size minus 400 if the size is over 400. Such redefinition allows the slope of hospital size to change in the regression model.

In this regression model, we have allowed non-linearity (piece-wise linear) for another variable -- occupancy rate (OCCURATE). OCCURATE was also redefined into three variables following the procedure mentioned for BEDSIZE. The categories defined

for the three variables are: occupancy rate less than 10%, 10 to 50%, and more than 50%. Other variables entered in the model are:

- FTECMX = number of full-time employees per 100 admissions adjusted for case mix.
- OWNERSTATUS = dummy variable indicating type of ownership (equals 1 for NFP status, 0 for FP status).
- EACHSTATUS = dummy variable, taking the value of 1 if the hospital provides teaching and interns training, 0 otherwise.
- OLE = dummy variable capturing the degree of competition facing a hospital (equals 1 if a hospital is the sole Medicare provider, 0 otherwise).
- YEAR = dummy variable, taking the value of 0 if year is 1991 and 1 if year is 1995.
- DEBT = debt per bed in service. Debt is defined as bonds issued plus loans.
- CONVERT = dummy variable, taking the value of 1 if a hospital is converted from NFP status to FP status between 1991 and 1995 and 0 otherwise.
- DAYS MEDICAID/TOTA DAYS = the ratio of inpatient days Medicaid to total hospital days

The estimation methodology used the ordinary least squares (OLS) with heteroscedasticity adjustment to standard errors, following White (1980).

DATA AND DESCRIPTIVE ANALYSIS

Hospital data for the years 1991 and 1995 were obtained from the Medicare Cost Report (MCR) with support from HCIA, Inc. We consider the data is recent given the untimely release of the Medicare Cost Report to the public and skills needed to make the file in readable format. The hospitals in this study were divided into three categories: not-for profit hospitals in both 1991 and 1995, for-profit hospitals in these two years, and hospitals that were converted from not-for-profit status to for-profit status between 1991 and 1995. Table 1 shows some basic characteristics of the hospitals during these two years.

Note that for the year 1991, the data set contains 521 for-profit hospitals, 3,478 not-for-profit hospitals, 614 for-profit hospitals, and 3,406 not-for-profit hospitals in the year 1995. Table 1 also presents descriptive statistics on the hospitals in the sample for the years 1991 and 1995. Full-time employees per 100 adjusted discharges declined by about nine percent (9%) for rural hospitals over 1991 and 1995, but the decline was much steeper for urban hospitals (15.5%). In general, rural hospitals are smaller in size than urban and suburban hospitals, and over the years hospitals in general experienced an approximately 1.6 % decrease in size. The length of stay per adjusted acute case also declined from about 4.3 days to about 3.7 days between 1991 and 1995 for rural hospitals, while urban hospitals experienced more extensive declines in LOS. However, hospitals converting from NP to FP showed steeper declines in occupancy rates than non-converting hospitals. It appears that the hospitals experiencing a change in profit status found themselves relatively weak in terms of market power (Needleman et al. 1997). The

Table 1
Descriptive Statistics for Dependent and Independent Variables

Variable		1991	1995
Regional distribution (Number of hospitals)	Total	3,999	4,020
	Northeast	705	706
	Midwest	1,070	1,067
	West	1,531	1,559
	South	693	688
Return on assets (ROA)	FP and NFP	3.44	5.32
	FP	3.52	8.55
	NFP	3.22	4.76
Ownership status (OWNERSTATUS) (Number of hospitals)	FP and NFP	3,999	4,020
	FP	521	614
	NFP	3,478	3,406
Teaching status (TEACHSTATUS) (Number of hospitals)	FP and NFP	904	988
	FP	51	93
	NFP	853	895
Conversion of ownership status during 1991-1995 (CONVERT) (Number of hospitals)	From NFP to FP		138
Full-time employees per 100 adjusted discharges, adjusted for case mix (ADJFULLTIME)	FP and NFP	6.01	5.24
	FP	5.06	4.53
	NFP	6.24	5.35
Length of stay per adjusted acute case mix (ADJLENGTHSTAY)	FP and NFP	4.34	3.6
	FP	4.35	3.57
	NFP	4.34	3.6
Debt per bed (DEBT)	FP and NFP	105,432.21	133,795.79
	FP	109,144	97,756.95
	NFP	104,871.62	140,302.96
Sole community provider (SOLE) (Number of hospitals)	FP and NFP	516	518
	FP	16	19
	NFP	500	499
Number of beds in service (BEDCAPACITY)	FP and NFP	207.07	203.07
	FP	160.67	176.28
	NFP	214.29	208.81
Occupancy rate (OCCURATE)	FP and NFP	52.84	48.71
	FP	50.25	47.51
	NFP	53.24	48.93

Notes: FP (NFP) denotes for-profit (not-for-profit) hospitals. The source of data is the Medicare Cost Report Data and the data were provided by HCIA, Inc. Baltimore, Maryland.

number of sole community providers in urban locations was only 4 in 1995, indicating that most urban hospitals face competition from other hospitals in the community.

The measure of profitability used in this study is return-on-assets (ROA), a continuous financial status variable defined as net income divided by total assets. ROA reflects the efficiency score of hospitals as it relates hospital output to non-labor inputs. The profitability of the hospitals in the sample increased over the years 1991 and 1995. This is true both for rural and non-rural hospitals. The enhanced financial performance of hospitals is often considered to be related to improvements in collections and electronic payments. It should be noted that rural hospitals in general were losing money in 1991, whereas urban hospitals were doing much better than even the for-profit hospitals in terms of profitability.

RESULTS

We found that hospitals profitability has improved over time. However, the magnitude of the improvement was far lower for rural hospitals than urban hospitals. Lower profitability will hinder the ability of the rural hospitals to provide charity care and other uncompensated care.

Table 2 presents the results of the regression model. A major controversy in the health care field centers around the effect of ownership on economic performance of hospitals. The variable of ownership status was found to be negative and statistically significant which indicate that FP hospitals are more profitable than NP. On the average, for-profit hospitals are likely to have higher ROA ratios than not-for-profit hospitals. This result is obtained after controlling for the time trend in profitability. The estimated coefficient of time trend is quite high (2.18) with high t-values, implying that hospitals in general had a higher ROA in 1995 compared to 1991. This is consistent with earlier studies, most of which found for-profit hospitals to be more efficient and profitable than not-for-profit entities (Younis et al. (2001).

The Teaching Status variable in the model turned out to be negative and significant. Teaching hospitals are less profitable than non-teaching hospitals possibly due to the costs associated with training as well as the charitable services these hospitals provide. Teaching hospitals provide training for interns and residents, which increase the cost of operation of the hospitals. In many cases, teaching hospitals have affiliations with medical schools and try to maintain a charitable image in the community in order to attract donations and contributions. The significant difference between teaching and non-teaching hospitals may also be due to the scope of services provided by the teaching hospitals. Teaching hospitals tend to be larger and located in urban and economically depressed inner-city areas (HCIA, 1997). Consequently, teaching hospitals provide access to the indigent population from the surrounding areas with little or no compensation.

Hospitals with less than 50 beds in service appear to be less profitable than larger hospitals. In fact, hospital sizes 50-400 and more than hospitals with less than 50 beds, thereafter profitability declines for hospitals over 400 beds because the economy of scale cease after the 400 beds range. The larger the hospital, beyond a certain point the lower its profitability. The variable SOLE (measure of lack of competition) was also significant in the model, although the value of the coefficient is positive and small. This may be

Table 2
Descriptive Statistics for Dependent and Independent Variables

Variable		1991	1995
Return on assets (ROA)	Rural hospitals	-0.1785	2.87
	Average size hospitals	3.55	5.39
	Large size hospitals	3.84	5.62
Ownership status (OWNERSTATUS) (Number of hospitals)	Rural (F-P)	6	6
	Rural (NFP)	134	146
Teaching status (TEACHSTATUS) (Number of hospitals)	Rural hospitals	4	4
	Average size hospitals	504	596
	Large size hospitals	391	371
Full-time employees per 100 adjusted discharges, adjusted for case mix (ADJFULLTIME)	Rural hospitals	7.19	6.49
	Average size hospitals	6.05	5.11
	Large size hospitals	5.97	5.63
Length of stay per adjusted acute case mix (ADJLENGTHSTAY)	Rural hospitals	4.29	3.76
	Average size hospitals	4.31	3.56
	Large size hospitals	4.57	3.64
Debt per bed (DEBT)	Rural hospitals	46,500.10	57,055.96
	Average size hospitals	99,487.00	124,571.84
	Large size hospitals	168,121.14	219,292.30
Sole community provider (SOLE) (Number of hospitals)	Rural hospitals	46	47
	Average size hospitals	464	465
	Large size hospitals	3	4
Number of beds in service (BEDCAPACITY)	Rural hospitals	24.99	24.42
	Average size hospitals	154.52	155.34
	Large size hospitals	582.25	581.12
Occupancy rate (OCCURATE)	Rural hospitals	27.16	23.53
	Average size hospitals	51.02	47.36
	Large size hospitals	60.57	55.32

Notes: F-P, (NFP) denotes for-profit (not-for-profit) hospitals. Rural hospitals are a proxy for hospitals with less than or equal 50 bed. Average size hospitals, has beds between 51 and 400 beds, Large Size hospitals has over 400 beds. The source of data is the Medicare Cost Report Minimum Data Set.

because the number of hospitals in this category is simply regulated to overcharge patients for hospital care. Occupancy rate also shows a significant impact on profitability, and only statistically significant coefficient was for OCCURATE0to10 and OCCURATE10to50. The sample sizes in other groups were too small to obtain significant results.

The higher the number of full-time employees adjusted for case mixes, the lower the profitability, holding all other variables constant. Case mix index (CMI) is analogous to product mix in a manufacturing context. It is a measure of the mix of patient illness types treated in the hospital, relative to the national average, and proxies for relative resource consumption. Thus, a hospital with an above-average CMI is expected to consume more resources than a hospital with a lower CMI. Employee full-time-equivalents (FTEs) are divided by the CMI to provide an adjusted (standardized) FTE measure. A full-time employee is a good proxy for the variable cost of the hospital. However, EMPLOYEES has a low coefficient value with a low significance level. This suggests that hospitals may be operating on an optimal number of employees, and any reduction in the number of employees would not lead to significant improvement in profitability, however, the level of significance does not warrant strong conclusions.

Finally, the ratio of total Medicaid days to total days had a significant contribution to hospitals financial performance because hospitals with higher proportion of Medicaid patients will get additional payment through Medicaid disproportionate hospital share (DSH) payments system. Rural hospitals are in disadvantaged position to receive (DSH) payments because most of Medicaid patients are located in the large metropolitan areas and inner cities.

CONCLUSIONS AND POLICY IMPLICATIONS

Our empirical findings suggest that rural hospitals generate less revenue per bed than urban hospitals due to several factors such as lower Medicaid volume, which lead to a lower Disproportionate Share Hospital (DSH) reimbursement rate and the lack of economy of scale due to their small size and large overhead cost. Other variables such as, occupancy rate, ownership status, degree of competition faced in the market, teaching status, and financial indebtedness are significant predictors of hospitals financial performance. The model also suggests that the relationship between hospitals profitability and its various determinants is non-linear in nature and therefore, it is important to adopt appropriate non-linear econometric models for empirical estimation of the performance function. The findings also indicate that rural and small hospitals are significantly disadvantaged in terms of performance compared to urban and larger hospitals. Furthermore we conclude that NFP rural are in disadvantage because they receive no or little donation in comparison to larger urban NFP hospitals (Cutler, 2000).

Traditionally, the measure of performance of hospital industry has relied on the calculation of the financial ratios from hospitals' financial statements (income statement and balance sheet). The financial ratios measure the hospital's historic performance. Banks, creditors and rating agencies use these ratios to predict the hospital's future performance and credit extension. However, this research demonstrates that there are equally important measures that should be used in evaluating hospital performance. These factors are occupancy rate, staffing ratio, and total expense per adjusted discharge.

These measures tend to clarify the underlying factors that produce a favorable or unfavorable financial performance.

For example, since the implementation of PPS, and in the current era of declining use of inpatient services *vis a vis* outpatient treatments, occupancy rate has been considered a key predictor of financial performance. A declining trend in occupancy rate would have an adverse effect on efficiency, profitability, and liquidity. At a lower rate of occupancy, operating expense per adjusted discharge will be greater, which will hinder ability to operate efficiently.

In conclusion, the financial performance of the hospital industry cannot be expressed by any one measure alone. Major differences exist among hospitals in terms of their location, scope of services provided, size, ownership, organizational structure, and amount of graduate medical education provided. Moreover, associated with these structural and locational differences are factors such as in-patient and payor mix, government regulations, and several non-financial factors, over which a hospital may have little or no control. Such diversity in hospital market structure makes any analysis of hospital efficiency and profitability extremely difficult to interpret.

Other empirical analyses have shown that affiliation with a School of Medicine has an important influence on hospital profitability, services, and access for indigent populations (HCIA, Inc., 1997), which is comparable with the regression results of this study.

LIMITATIONS AND FUTURE RESEARCH

Due to rapid changes in the health care system, current models may not work two years from now. New research related to the prediction of hospitals' mergers and takeovers can be suggested. As discussed in Morck et al. (1988), insider ownership may reduce the probability of mergers and takeovers in non-health care industries. Research related to the prediction to prediction of hospitals', mergers and takeover is therefore suggested. Prediction of hospital bankruptcy is another area for future research. There might be a strong correlation between bankruptcy, payment system, location, access to health care, mergers, and acquisitions.

Finally, the trend in rural hospital closures and mergers (mostly through conversion from NFP to FP status) is attracting the attention of the regulators and public citizens' groups.

A full analysis of rural hospital performance and access to health care possible endogeneity of location, size and characteristics of the rural populations could not be carried out here due to data limitation. The study was constrained by the variables obtained from the Medicare Cost Report.

Another limitation of the study is that although each of the hospitals occurred twice in the sample, this research did not correct for the repeated measure issues. Also, non-reporting hospitals may have created some selectivity bias and led to having a fewer number of rural hospitals in the data set. The non-reporting problem could be related to the going administrative and organizational changes in such hospitals.

This study should be updated with more recent data to examine the effect of the Balanced Budge Act of 1997 (BBA) which includes a significant cut in Medicaid disproportionate hospital share (DSH) payments. The Balance Budget Act no doubts

would affect the financial performance and profitability for hospitals with high volume of Medicaid patients.

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