Hospital financial performance in the United States of America: a follow-up study

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الأداء المالي للمستشفيات في الولايات المتحدة الأمريكية: دراسة للمتابعة

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الخلاصة: قام الباحثون باستخدام تصميم شامل لعدَّة قطاعات في اختبار معطيات سنة 1998 بهدف توضيح العوامل التي تؤثِّر على ربحية المستشفيات في الولايات المتحدة الأمريكية، والتحقُّق منها. وقد أثَّر العديد من التغيرات والنظم الحكومية التي أدخلت في مستهل التسعينيات على أداء المستشفيات. وقد قام الباحثون بإدراج هذه المتغيِّرات للمزيد من الإيضاح لنظام المدفوعات في المستشفيات. ومن بين المتغيِّرات الإيضاحية التي تم تناولها، اعتُبر الموقع الجغرافي، والمنافسة، وحجم المستشفى، ومعدل الإشغال، من أهم العوامل التي تُسهم في ربحية المستشفى.

ABSTRACT To clarify and validate the factors that influence hospital profitability in the United States of America, we used a cross-sectional design to examine data for 1998. Several changes and government regulations introduced in the early 1990s influenced hospital performance. We included those variables to give a better understanding of the hospital payment system. Among the explanatory variables considered, geographic location, competition, hospital size and occupancy rate were identified as the main contributors to hospital profitability.

Performance financière des hôpitaux aux États-Unis d'Amérique : étude de suivi

RÉSUMÉ Afin de clarifier et de valider les facteurs qui influencent la rentabilité hospitalière aux États-Unis d'Amérique, nous avons utilisé un modèle transversal pour examiner les données disponibles pour l'année 1998. Plusieurs modifications et réglementations gouvernementales introduites au début des années 90 ont influencé la performance des hôpitaux. Nous avons inclus ces variables pour permettre une meilleure compréhension du système de paiement hospitalier. Parmi les variables explicatives examinées, la situation géographique, la concurrence, la taille de l'hôpital et le taux d'occupation ont été identifiés comme les principaux éléments qui contribuent à la rentabilité hospitalière.

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Introduction

Many changes took place in hospitals in the United States of America (USA) after 1998 owing to the introduction of the Balanced Budget Act (Balanced Budget Act of 1997, PL 105-33). The provisions included an experimental payment programme that waived certain small rural hospitals from the prospective payment system mechanism and provided others with extra payment for providing services to uninsured and Medicaid patients. The prospective payment system, introduced in 1983, promised to change the way hospitals were reimbursed: payment was determined based on type of treatment or diagnostic related group. Since the introduction of this system, a large number of studies have examined its effect on hospital economic and financial performance and uncompensated care to the indigent population [*1–3,4*].

This report is a follow-up to the study conducted by Younis, Rice and Barkoulas which identified a number of economic and financial variables as significant contributors to hospital profitability for the years 1991 and 1995. Geographic region, ownership status, teaching affiliation and hospital size were the factors that determined hospital profitability [*1*]. That study, however, ignored the repeated measure to validate their result over a period of time since certain events or actions, e.g. technological advancements or new regulations which affect hospital performance, may have had an effect on the validity. Furthermore, additional variables crucial to hospital profitability such as critical access status (critical access hospitals are rural hospitals with < 30 beds and mean length of stay ≤ 96 hours), age of the facility and outlier payments to safety-net hospitals were not included.

A study done in Florida examined the issue of profitability in a sample of 50 investor-owned or for-profit hospitals and 60 not-for-profit hospitals (the legal distinction between for-profit and not-for-profit hospitals lies in issues related to tax exemption status, the ability to receive tax-deductible donations and limitation in the distribution of profits) during the period 1982–88 [*2*]. For-profit hospitals were more profitable than not-for-profit hospitals, and the average length of stay and wages per adjusted patient day were important in explaining hospital profitability. Using a logit regression model, Walker 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 conditions [*3*]. Watt et al. reported that for-profit hospitals had higher average revenues than their not-for-profit counterparts [*5*]. Herzlinger and Krasker found that not-for-profit hospitals neither perform as well financially nor compensate for this by returning higher levels of social benefits [*6*]. Those findings have, however, been disputed on conceptual and methodological grounds [*7–9*]. The not-for-profit hospitals were less profitable than the for-profit hospitals, but provided more access to care to the indigent population through the admissions to their emergency rooms. They showed that hospital performance varied according to ownership. In a study on a sample of hospitals in Florida in 1980, for-profit and not-for-profit hospitals were virtually identical in terms of profitability [*10*]. Two later studies found that for-profit hospitals tended to be half the size of not-for-profit hospitals, with a lower case mix, shorter length of stay, higher cost per day, lower cost per case, and greater profitability [*4,11*].

In the present study, we re-examined the issue of factors that influence hospital profitability by using more recent data and

adding other variables that affect hospital profitability in the USA. We considered a broad set of potential empirical determinants of hospital financial performance covering the year 1998. The sample period is in the prospective payment system era, under which payment is based on a predetermined rate. Our data set was comprehensive as it used a diverse and representative sample of hospitals from all 4 regions of the USA. The econometric methodology employed is piecewise, linear regression which accounts for the presence of a certain type of nonlinearity in the estimated relationships. The piecewise regression method provides the policy analyst with a simple way to examine and split off groups of hospitals by size.

Basic data for use in this report were supplied by Solucient LLC, Evanston, Illinois. Any analysis, interpretation or conclusions based on these data are solely those of the authors and Solucient LLC specifically disclaims responsibility for any analysis, interpretation or conclusions.

Methods

The dependent variable for economic performance of hospitals is the return on assets (ROA), a continuous financial status variable defined as net income divided by total assets. It reflects hospital operating revenue scaled by the size of the hospital. It is also a type of efficiency ratio as it relates hospital output to non-labour inputs [*12*].

To understand the factors affecting ROA, we estimated the following regression model:

ROA = *f*(LOCATION, OWNER, TEACH, CONVERTFP, CONVERTNFP, CAH, SOLE, AGE OF FACILITY, LENGTHSTAY, BEDCAPACITY, EMPLOYEES, OCCURATE, MEDIDAYS)

where:

- LOCATION = geographic location of hospital, modelled as a dummy variable as follows: SOUTH = 1 if a hospital is located in the southern region and 0 otherwise, MIDWEST = 1 if a hospital is located in the midwestern region and 0 otherwise, WEST = 1 if a hospital is located in the western region and 0 otherwise, with NORTHEAST being the reference category;
- OWNER = dummy variable indicating type of ownership, 1 for investor-owned or for-profit status, 0 for not-for-profit status;
- TEACH = dummy variable, taking the value of 1 if a hospital provides medical education (primarily graduate) and intern training, 0 otherwise;
- CONVERTFP = dummy variable, taking the value of 1 if a hospital was converted from not-for-profit to for-profit status between 1991 and 1998, 0 otherwise;
- CONVERTNFP = dummy variable, taking the value of 1 if a hospital was converted from for-profit to not-for-profit status between 1991 and 1998, 0 otherwise;
- CAH = dummy variable, taking the value of 1 if a hospital was designated as a critical access hospital, 0 otherwise;
- SOLE = dummy variable capturing the degree of competition facing a hospital, 1 if a hospital was the sole Medicare provider, 0 otherwise;
- AGE OF FACILITY = a proxy variable that influences the dominator (total assets) due to depreciation of buildings (expected to have positive coefficient);
- LENGTHSTAY = total number of acute care impatient days in a hospital divided by the total number of acute care

discharges from the hospital, adjusted for the complexity of the case mix of a particular hospital;

- BEDCAPACITY = number of beds in service, entering the regression equation as follows: BEDCAPACITY 0 to 100 = number of beds in service if BEDCAPACITY < 100, = 100 if BEDCAPACITY ≥ 100; BEDCAPACITY 100 to 500 = 0 if BEDCAPACITY < 100, = number of beds in service minus 100 if 100 ≥ BEDCAPACITY < 500, = 500 if BEDCAPACITY ≥ 500; BEDCAPACITY over 500 = 0 if BEDCAPACITY < 500, = number of beds in service minus 500 if BEDCAPACITY ≥ 500;
- EMPLOYEES = number of full-time-equivalent employees per 100 discharges, adjusted for case mix;
- OCCURATE = percentage of beds in service occupied, entering the regression equation as follows: OCCURATE 0 to 10 = number of beds in service if OCCURATE < 10, = 10 if OCCURATE ≥ 10; OCCURATE 10 to 50 = 0 if OCCURATE < 10, = number of beds in service minus 10 if 10 < OCCURATE < 50, = 50 if OCCURATE ≥ 50; OCCURATE > 50 = 0 if OCCURATE < 50, = number of beds in service minus 50 if OCCURATE ≥ 50;
- MEDIDAYS = the number of inpatient Medicaid days divided by the total hospital days.

While case mix-adjusted average length of stay does not take quality into account, it allows for high-level comparison between groupings related to hospital efficiency. Favourable values are below the median length of stay [case mix adjusted] = (total inpatient days, acute care/total discharge, acute care)/Medicare case mix index (Medicare case mix index is a measure of the complexity of the Medicare cases treated by an individual hospital relative to complexity of the average Medicare patient nationwide).

We assumed linearity in the functional relationship between ROA and all predictors except for BEDCAPACITY and OCCURATE. For these 2 regressors, we modelled their effect on ROA as piecewise linear with 2 changes in the slope coefficients. Such modelling is supported by the data and represents a relatively parsimonious way of relaxing the assumption of linearity in the relationship. Specifically we assumed the linear relationship between profitability and occupancy rate may differ over a certain range of occupancy rate. For example we hypothesize that profitability may increase (or decrease in case of diseconomy of scale) at a rate > 10% and < 50% of occupancy, i.e. the slope will change when occupancy rate = 10% and occupancy rate = 50%. Therefore, the model proposes a different linear relationship for a different interval over the range of the occupancy rate. The same applies for hospital size.

The estimation methodology, using *SAS*, version 7.1, used the ordinary least squares regression with heteroscedasticity adjustment to standard errors according to White [*13*].

Results

The data set contained 3461 hospitals (out of 5400 hospitals) for the year 1998. The source of the data was the Medicare Cost Report [*12*] (provided by Solucient LLC). Table 1 provides descriptive statistics for the variables of the sample year.

The empirical results from the piecewise linear regression are presented in Table 2. The *F*-test statistic was significant at the

Table 1 Descriptive statistics (mean) for dependent and some independent variables, 1998

Variable	Mean value
Return on assets (%)	2.46
OWNER: ownership status (hospitals)	857
TEACH: teaching status (hospitals)	942
CONVERT: conversion of ownership status during 1991–1998 (hospitals)	
From NFP to FP	189
From FP to NFP	54
Critical access hospitals (hospitals)	14
SOLE: sole community provider (hospitals)	368
LENGTHSTAY: length of stay per adjusted acute case mix (days)	3.28
EMPLOYEES: full-time employees per 100 adjusted discharges, adjusted for case mix (employees)	8.13
MEDIDAYS (days)	0.41
Regional distribution (hospitals)	
Total	3461
Northeast	1328
Midwest	619
West	838
South	676
BEDCAPACITY: hospital size (beds in service)	205.38
OCCURATE: occupancy rate (%)	49.96

NFP = not-for-profit.
FP = for-profit.
Source: Medicare Cost Report Data. Data provided by Solucient LLC, Illinois.

5% level, thus providing empirical support to our modelling strategy.

The dummy variable for hospital location in the south was statistically significant. SOLE, the dummy variable for competition was also statistically significant.

Hospital size, measured by the number of beds in service and denoted by BEDCAPACITY, varied nonlinearly with profitability. The relationship was non-monotonic, piecewise linear with threshold values at 100 and 500 beds.

Similarly, there was a piecewise linear relationship between OCCURATE and ROA with thresholds at 10% and 50%. Occupancy rates up to 50% were associated with increased profitability.

Discussion

In their 2001 study, Younis, Rice and Barkoulas concluded that teaching status and ownership status had a negative effect on profitability, while sole community provider hospitals were more profitable [*1*]. In this follow-up study, we found that teaching hospitals were more profitable than non-teaching hospitals and hospital monopoly did not improve profitability. We included several variables that were not discussed in the previous study, such as critical access hospitals and age of the facility. We consider our current study more comprehensive and providing a more up-to-date insight on this topic.

Regional differences in profitability appear to exist as the dummy variable for hospital location in the south of the USA was statistically significant. Given that the reference category was the northeast, the positive coefficient for the indicator variable for the south suggests that hospitals in that region were more profitable.

The indicator variable for ownership status, OWNER, does enter significantly in the regression equation, suggesting that the effect of ownership status (investor-owned versus not-for-profit) on the economic performance of hospitals was small. For-profit hospitals appear to have a higher ROA than not-for-profit hospitals. The small weight of

Table 2 Piecewise linear generalized least squares regression of return on assets on hospital characteristics for 1998 (n = 3461)

Independent variable	Coefficient estimate (t-statistic)
Constant (alpha value)	5.3789 (3.79)
OWNER	0.003 (1.98)
TEACH	0.0013 (2.24)
CONVERTFP	0.0034 (1.72)
CONVERTNFP	0.0068 (1.03)
CAH	0.0142 (0.94)
SOLE	0.00017 (–2.03)***
AGE of FACILITY	0.0047 (1.79)
LENGTHSTAY	0.00323 (0.920)
EMPLOYEES	0.0001 (0.36)
MEDIDAYS	0.0009 (0.49)
Geographic location dummy variable[a]	
Midwest	–0.0035 (–0.97)
West	–0.0018 (–0.57)
South	0.0014 (3.13)***
BEDCAPACITY	
0–99	0.000016 (1.65)
100–499	–0.0013 (–2.76)***
500	–0.0021 (–1.983)*
OCCURATE	
0–9	–0.0017 (–0.86)
10–49	0.0008 (2.35)***
50	0.00012 (0.79)
F statistic (marginal significance level)	3.84 (0.00821)
R^2 0.3521	

[a]Reference category northeast.
Sandard errors are adjusted for heteroscedasticity according to White [13].
CAH = critical access hospital.
BEDCAPACITY 0 to 100 = number of beds in service if BEDCAPACITY < 100, = 100 if BEDCAPACITY ≥ 100.
BEDCAPACITY 100–500 = 0 if BEDCAPACITY < 100, = number of beds in service minus 100 if 10 ≥ BEDCAPACITY < 500, = 500 if BEDCAPACITY ≥ 500.
BEDCAPACITY over 500 = 0 if BEDCAPACITY < 500, = number of beds in service minus 500 if BEDCAPACITY ≥ ⅔ 500.
OCCURATE = percentage of beds in service occupied, entering the regression equation as follows: OCCURATE 0 to 10 = percentage of beds in service occupied if OCCURATE < 10, = 10 if OCCURATE ≥ 10; OCCURATE 10 to 50 = 0 if OCCURATE < 10, = percentage of beds in service occupied minus 10 if 10 ≤ OCCURATE < 50, = 50 if OCCURATE ≥ 50.
The F-test statistic corresponds to the null hypothesis that the coefficient estimates for all variables included in the regression equation are jointly zero.
R^2 is the coefficient of determination.
***Statistically significant at the 1% level.
*Statistically significant at the 10% level.

type of ownership could be an effect of the strict regulations on the hospital industry and the universal set payment per diagnosis, (the prospective payment system). Type of ownership was, therefore, irrelevant to hospital profitability.

The conversion in ownership status from not-for-profit to for-profit and vice versa (CONVERTFP and CONVERTNFP) did not show a major effect on the economic performance of the hospitals, possibly owing to the culture of management and/or constraining regulation in the health care industry. It also is likely that the sample sizes for these groups were too small to obtain significant results (189 hospitals in CONVERTFP and 54 hospitals in CONVERTNFP).

The indicator variable for critical access hospitals [small rural hospitals having 15 or fewer acute care beds and at least 35 miles (15 miles in mountainous terrain or over secondary roads) from the next hospital] was not significant. The small number of critical access hospitals in our sample, however, did not allow for enough variation to detect statistical significance.

The dummy variable indicating whether a hospital is the sole community provider (measure of lack of competition, SOLE) enters negatively in the regression equation: profitability was lower for groups with monopoly power. It appears that the hospital power emanating from being a sole community provider produces managerial inefficiencies manifested in reduced profitability because the prospective payment system provided a uniform payment system. Owing to the uniform payment system and regulations, hospitals with monopoly status are not in general able to use market forces to their advantage. Furthermore, hospitals with such a market position had to offer uncompensated care to their communities regardless of their monopoly power in the market.

Hospitals with > 100 beds in service were less profitable than hospitals with < 100 beds. Small hospitals, usually located in rural areas, are characterized with no, or low, penetration of managed care. Moreover, rural hospitals usually face less competition and provide a wider range of services. Larger hospitals usually operate in urban locations with more local competition and a higher penetration of managed care, which puts substantial downward pressure on revenues and shifts a greater uncompensated charity care burden onto the hospitals [*14*].

The slope for the variable EMPLOYEES, the number of full-time employees adjusted for case mix, was not statistically significant. Number of employees was included to represent variable cost even though it has a low coefficient. 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 are divided by the CMI to provide an adjusted (standardized) full-time-equivalents measure. A full-time employee is a good proxy for the variable cost of the hospital. The lack of significance for EMPLOYEES in our study suggests that hospitals may have been operating on an optimal number of employees, and any reduction in the number of employees would not lead to significant improvement in profitability.

Occupancy rates up to 50% were associated with increased profitability. Increases in OCCURATE above the 50% level did not appear to make any significant contribution

to profitability. Therefore, a declining trend in occupancy rate would have an adverse effect on efficiency, profitability and liquidity. At a lower rate of occupancy, operating expenses per adjusted discharge will be greater which will hinder the ability to operate efficiently. Since the implementation of the prospective payment system and with the current decline in use of inpatient services in comparison with outpatient treatments, occupancy rate has been considered a key predictor of financial performance, which is confirmed by our empirical findings. The cut-off points at 10% and 50% produced the most significant results.

Conclusion

The prospective payment system dramatically influenced the profitability of the hospital industry. However, other factors also influenced profitability: geographic location, hospital size, occupancy rate and competition. The southern region appeared to be the most profitable, probably because there is less regulation in comparison with the other geographic regions [*15*]. Since the age of the equipment and facility will influence the magnitude of the ROA, it is suggested this ratio be used with other profitability ratios such as total profit margin and return on equity.

Hospital conversion did not have any effect on hospital profitability. Furthermore, hospitals with monopoly position did not have any advantage in generating abnormal profit in comparison to other hospitals owing to the federal and state regulations and the standardized prospective payment system. This should lessen the fear of civic groups regarding consolidations in the hospital industry.

References

1. Younis M, Rice J, Barkoulas J. An empirical investigation of hospital profitability in the post-PPS era. Journal of health care finance, 2001, 28(2):65–72.
2. Sear AM. Operating characteristics and comparative performance of investor-owned multihospital systems. Hospital and health services administration, 1992, 37(3):403–15.
3. Walker C. A cross-sectional analysis of hospital profitability. Journal of hospital marketing, 1993, 7(2):121–38.
4. Forgione DA, Schiff AD, Crumbley DL. Assessing hospital performance: an inventory of financial and nonfinancial metrics. International Association of Management journal, 1996, 8(2):65–83.
5. Watt JM et al. The effects of ownership and multihospital system membership on hospital functional strategies and economic performance. In: Gray BH, ed. For-profit enterprise in health care. Washington DC, National Academy Press, 1986:260–90.
6. Herzlinger R, Krasker W. Who profits from non-profits? Harvard business review, 1987, 65(1):93–105.
7. Fitzgerald J, Jacobson B. Study fails to prove for-profits superiority. Health progress, 1987, 32–7.
8. Haddock C, Arrington B, Skelton A. Who profits from not-for-profits: a reconsideration. Health services management research, 1989, 2(2):82–104.
9. Arrington B, Haddock CC. Who really profits from not-for-profits? Health services research, 1990, 25(2):291–304.
10. Sloan FA, Vraciu RA. Investor-owned and not-for-profit hospitals: addressing some issues. Health affairs, 1983, 2(1):25–37.
11. Forgione DA. Incentives and performance of the health care industry: the case of for/

non-profit multihospital systems [thesis]. Amherst, Massachusetts, University of Massachusetts Amherst, 1987.

12. Kane NM, Magnus SA. The Medicare Cost Report and the limits of hospital accountability: improving financial accounting data. Journal of health politics, policy and law, 2001, 26(1):81–105.

13. White H. A heteroscedasticity-consistent covariance matrix estimator and a direct test for heteroscedasticity. Econometrica, 1980, 48:817–38.

14. Younis MZ. Length of hospital stay of Medicare patients in the post-prospective-payment-system era. Journal of health care finance, 2004, 31(1):23–30.

15. Needleman J, Chollet D, Lamphere J. Hospital conversion trends. Health affairs, 1997, 16(2):187–95.

Correction

Rate of hepatitis B seropositivity following mass vaccination in the Islamic Republic of Iran. M-R. Zali, K. Mohammad, A-A. Noorbala, B. Noorimayer and S. Sahraz. *Eastern Mediterranean Health Journal*, 2005, Vol. 11 Nos 1/2, pages 62–67.

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