Cost Stickiness and Core Competency: A Note*

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1. Introduction

Traditional models of cost behavior posit a linear relation between activities and costs. In the short run, total costs equal fixed costs plus unit variable costs × activity volume. Because of the model's ubiquity, it is of considerable interest to examine the validity of this simple specification. Researchers have studied how complexity (Anderson 1995; Banker, Datar, Kekre, and Mukopadhyay 1990) and congestion (Gupta, Randall, and Wu 2006) affect the shape of the cost curve. Anderson, Banker, and Janakiraman (2003 [ABJ]) suggest differential slopes that are based on whether activity is increasing or decreasing. Because the slope is smaller when activity decreases, costs are said to be "sticky" (ABJ, 48).[1]

In this note, we examine the behavior of short-term costs for hospitals in Ontario using the ABJ model of sticky costs. Unlike prior research that only examines costs at the organization level, our study involves department-level cost data. Therefore, we can examine within-organization variation in cost stickiness. We hypothesize that hospital administrators will be reluctant to trim costs in core activities related to direct patient care because of the critical nature of these services to the hospital's mission and because of the (larger) adjustment costs associated with altering this capacity. In contrast, it is much easier and less expensive to adjust capacity levels in outlying support services. Thus, we expect costs related to direct patient care to exhibit greater stickiness relative to costs in support departments.

Our analyses support these conjectures. First, we confirm extant research relating to stickiness of costs at the organization level albeit in a different setting — that is, acute care hospitals. Further, while extant research on cost stickiness has primarily focused on the behavior of selling and administrative expenses with respect to the sales volume of manufacturing firms, our results show that operating costs are sticky at the hospital level. Second, we document intra-firm variation in cost stickiness. We find reliable cost stickiness only in costs associated with direct patient care, a hospital's core service. Moreover, the estimated coefficient for this core service reliably exceeds that for ancillary and support services. Robustness tests that estimate the equations using hours worked (to focus on labor costs) yield similar inferences. Overall, our evidence is that the extent to which a function represents the organization's core competency influences the stickiness of associated costs.

* Accepted by Alan Webb. We thank Deepika Nath for providing access to the data used in this study. We gratefully acknowledge helpful comments from Naomi Soderstrom, Alan Webb (editor), and two anonymous reviewers.

Contemporary Accounting Research Vol. 25 No. 4 (Winter 2008) pp. 993–1006 © CAAA
doi:10.1506/car.25.4.2

The rest of this study is organized as follows. Section 2 describes the underlying theory and predictions. Section 3 presents the method and data. Section 4 summarizes results, and section 5 offers some concluding comments.

2. Theory and hypotheses

There is a rich literature on estimating cost structures of organizations. ABJ, who introduced the concept of a sticky cost, is most pertinent to our inquiry. They argue that selling, general, and administrative costs (SGA costs) respond differently to upward or downward changes in sales activity. In particular, the rate of increase in costs when revenues increase exceeds the rate of decline when revenues decline; that is, costs are sticky.

The sticky costs model recognizes that the costs incurred in a period depend to some degree on the costs incurred in the previous period. Both the level of activity in the current period and the level of costs and activity in the previous period affect the costs incurred in the current period. (In contrast, a fixed/variable model of cost behavior asserts that the amount of costs incurred depends on the volume of realized activity in the current period only.) The dependence arises because, unlike the traditional static model, the sticky cost model considers strategic behavior. In particular, sticky costs occur because of the managers' role in adjusting the resources committed to activities. ABJ discuss two influences on managers' decisions: adjustment costs and beliefs about future demand for resources. Adjustment costs include more than contracting costs such as severance pay. They also include the costs of searching for, hiring, and training employees, and the morale costs to the organization of terminating employees. Beliefs about demand also matter because they influence the cost–benefit trade-off between holding slack capacity versus incurring the cost to adjust available capacity.

Several papers build on the basic model in ABJ, while mostly focusing on selling expenses.[2] Anderson, Banker, Chen, and Janakiraman (2004) examine variations in service sector firms induced by variations in labor intensity and competitive environment. Banker and Chen (2006a) and Steliaros, Thomas, and Calleja (2006) examine cross-country differences in cost stickiness and relate it to variations in the operations of labor markets and governance structures.[3] Banker and Chen (2006b) consider how sticky costs affect firm value. Anderson, Banker, Huang and Janakiraman (2007) consider whether capital markets recognize the stickiness of SGA costs and the possibility of earning excess returns using a model of sticky cost.

However, few studies have examined intra-firm variation in the behavior of sticky costs. In the context of therapy clinics, Balakrishnan, Peterson, and Soderstrom (2004) examine how the clinics' current capacity utilization affects the stickiness of costs. They find costs exhibit greater stickiness as the firm operates closer to capacity thresholds, suggesting use as a moderating variable. By examining interdepartmental variations in cost stickiness, we add to this stream of research that exploits institutional detail to examine cost behavior and management.

Variations in adjustment costs

Of the two factors that ABJ describe, adjustment costs are more likely to play a dominant role in determining intra-firm variations in stickiness. After all, demand realizations are likely to be highly correlated across the different departments of the same firm. The correlation is likely even greater in the hospital context with considerable interdepartmental dependence for providing patient care. However, adjustment costs likely vary across departments. These costs, while not directly observable, are implicit in the core positioning of a business. We expect that adjustment costs are highest for the central activities of a business because this is where the business itself is defined.

Wernerfelt (1997) posits that the magnitude of the adjustment cost drives the form of the organization. His model shows that firms enter into long-term employment contracts when the nature of the service is frequent and uncertain (e.g., a manager or a physician). A short-term price-list-based contract might be suitable when the list of services is small and well defined (e.g., tax preparation, cafeteria, and laundry services).[4] This theory is consistent with our argument that direct patient care, the core service in a hospital, is likely to face greater adjustment costs because the nature of patient service is frequent and uncertain.

In addition, the nature of the labor market likely affects adjustment costs. Examining implications for human resource practices in health care, Smith and Preker (2001) argue that adjustment costs for hiring and training specialized medical personnel is significantly greater than the costs for support personnel. Labor-related costs are particularly relevant in our analysis of yearly data. Caballero, Engel, and Haltiwanger (1995, 5) argue that adjustment costs differ for labor and capital. The costs seem to affect labor supply at a quarterly frequency but equipment and structures (e.g., buildings) less frequently. The effect of labor-related adjustment costs also is likely magnified in our setting because capital expenditures (which subsequently affect operating costs) require approval (and funding) from the province as part of the overall budgeting process.

Variation in adjustment costs across the departments of an organization is wholly consistent with the resource-based view of the firm, the dominant paradigm in strategic management research for the past 15 years (Hoopes, Madsen, and Walker 2003). This theory proposes that organizations vary with regard to both the tangible (physical facilities, working capital, etc.) and intangible (knowledge, experience, relationships, etc.) resources used to provide value to customers and other stakeholders. However, not all resources are equally important. Those value-creating resources, which are rare and inimitable, are more critical than those that may be obtained through market transactions (Barney 1991). One key characteristic of inimitability is the presence of time compression diseconomies of scale (Dierickx and Cool 1989). Such resources cannot be rapidly built up, or rebuilt, by the organization due to scarcity, organizational learning, and other process-oriented effects (e.g., emergent teamwork). Consequently, resources that are central to the continuing success of an organization are unlikely to be easily acquired or readily abandoned.

In sum, we propose that adjustment costs likely exhibit considerable intra-firm variation and that these costs are higher for functions that form the core of the business and involve specialized assets. This argument is the basis for the hypotheses that we develop.

Hypotheses

We begin by investigating whether cost stickiness is present in the operating costs of hospitals, an important sector of the economy.[5] We also consider operating costs rather than selling, general, and administrative costs. We expect to find cost stickiness because hospital administrators are managing complex entities and face incentives similar to those faced by managers of manufacturing firms. Specifically, when volumes increase, it is easy to justify, economically and psychologically, the need for additional resources. In contrast, when volume decreases, managers face a choice between decreasing the expenditure of resources and delaying cutbacks. Delaying cutbacks might be appealing because the action avoids adjustment costs that would be incurred if activity levels increase in the future and because of the psychological reasons for avoiding painful decisions. (See ABJ 2003, 49–50 for a detailed discussion of the potential reasons for cost stickiness.) The economic reason is particularly relevant if managers view the decline in activity levels as temporary. Collecting these arguments, we have (in alternative form):

HYPOTHESIS 1. *Hospital operating costs are sticky. The rate of increase in costs exceeds the rate of decline in costs as activity volumes change.*

Our main contribution is to examine intra-firm variations in cost stickiness. Data requirements are one reason why extant research on cost stickiness has not focused on intra-firm variations. Such studies are difficult to execute because they require more detailed data than are available in public databases such as COMPUSTAT. We employ departmental-level data from Ontario hospitals to examine whether an activity's relation to the organization's core competency moderates the stickiness of its cost.

For this research, we group the hospital's departments into nested concentric circles centered on a core mission of providing patient care (see also Cook, Shortell, Conrad, and Morrissey 1983). At the outermost edge are support services such as administration, laundry, and dietetics. The inner ring contains ancillary services such as the pharmacy and therapy departments. At the core are direct patient services such as surgical suites. This grouping of hospital services ranks departments by their "distance to the patient" and follows the structure used by Balakrishnan, Gruca and Nath 1996, who examine the effect of hospital complexity on departmental cost structure.[6]

Our grouping of hospital departments is one way to rank departments in terms of their contributions to a hospital's core competency (Hamel and Prahalad 1990). Departments such as surgical suites and in-patient wards (maternity, pediatrics, etc.) are central to a hospital's mission of delivering quality medical care. All other services exist to support the activities of these core departments. Ancillary services

such as pharmacy and therapy immediately support the mission of direct patient care. Moreover, demand for ancillary services is a derived demand.

Support services comprise the outer ring of activities. We identify two distinct groupings of support departments. The first comprises departments that are effectively stand-alone entities (e.g., laundry and dietetics). For these departments, it is relatively easy to scale the volume of activity up or down with the changes in the activity of the hospital. Indeed, these activities could be outsourced with minimal impact on hospital capacity or mission. In addition, there is minimal investment in costly technological expertise associated with these activities. The second set includes departments such as hospital administration and building maintenance. These costs are likely fixed in the short run and therefore would exhibit little variation in relation to patient volume.

Hospital managers likely face different incentives for scaling capacity in direct patient services versus support services such as the cafeteria. Personnel providing direct patient care represent the core of a hospital's human assets with specialized skills (e.g., nurses, physicians, technicians), making it difficult to staff these positions and to adjust staffing levels quickly.[7] In addition, these functions use some of the more sophisticated equipment (e.g., operating rooms, intensive care units) in the hospital, for which capacity is hard to change in the short run. Thus, associated operating costs are likely to exhibit considerable stickiness. In contrast, we expect the least stickiness in the costs of support departments such as laundry and dietetics. These departments, while providing useful services, are not critical to a hospital's mission. Their services can be outsourced, and many employees in these departments are relatively low skilled, meaning that it is less expensive to adjust the capacity of these activities.

We conjecture that costs in patient care exhibit the most stickiness followed by costs in ancillary services. Relative to costs in direct patient care, costs in an ancillary department incur lower adjustment costs in terms of correcting capacity levels. It is easier to expand or contract a pharmacy than to increase (or decrease) the level of emergency room care available. We do not expect costs to be sticky in support departments (e.g., laundry) because of low adjustments costs. Summarizing, we have (in alternative form):

HYPOTHESIS 2. *The stickiness of hospital costs differs by department. Costs are stickier in services deemed more central to the hospital's mission.*

3. Method, data, and descriptive statistics

We follow the standard methodology (see ABJ) to investigate our hypothesis. In particular, we estimate the following model:

$$Log(\Delta Operating\ cost) = \alpha + \beta_1 log(\Delta activity) + \beta_2 Dummy{*}log(\Delta activity) + Year + error \quad (1),$$

where:

Operating cost is the deflated operating expense and Δ is the percentage change operator (year t value divided by year $t - 1$ value). Raw operating expense is deflated by a general price level index to control for inflation.

Activity is the number of equivalent patient days. We follow Lave, Jacobs, and Markal 1992 and use conversion rates to measure equivalent in-patient days for outpatient procedures.

Dummy a dummy variable that takes the value of 1 if the activity level represents a decline relative to the activity level the prior year.

Year a dummy variable that takes the value of 1 for observations corresponding to the year 1988. We employ this dummy to eliminate any time-related effects unaccounted for by the deflation of expenses.

We estimate the above model both for the hospital as a whole and separately for each grouping of departments. In general, we expect $\beta_1 > 0$ because we expect costs to have a significant variable component. If a cost is sticky, then we expect $\beta_2 < 0$. That is, relative to an increase, there is a smaller change in the dependent variable if the independent variable changes downward by a like amount. We expect $\beta_1 > 0$ and $\beta_2 < 0$ for the overall hospital.

At the departmental level, we expect $\beta_1 > 0$ for the direct patient and ancillary cost pools. We also make this prediction for costs in variable (volume-related) support departments such as laundry and dietetics. However, the volume of patient care should not affect the costs of fixed support services (e.g., administration, plant operations, etc.) because these costs are likely fixed and do not vary in the short run.

More importantly, we expect costs to exhibit greater stickiness in departments central to a hospital's mission. In particular, we expect stickiness for direct patient services but not for support services. The prediction for ancillary services is ambiguous, which results in $|\beta_2|$ (direct patient services) $> |\beta_2|$ (ancillary services) $\geq |\beta_2|$ (support services) $= 0$.

To test the variations across departments, we "stack" the data and estimate a single regression. This approach yields the same coefficients as those obtained from estimating the separate regressions but permits an F-test to examine differences in coefficients. In all tests, we employ White t-statistics, which adjust for heteroscedasticity. We also test and control for influential observations.[8]

Data and descriptive statistics

As in most areas of Canada, health care in Ontario is publicly funded, mainly through direct taxation. Funds from the Ontario Ministry of Health account for almost 90 percent of all spending on hospital care (Lave et al. 1992). Although funding of hospital care is concentrated in a single government ministry, the delivery of hospital care is the responsibility of nonprofit institutions, most of them private (nongovernmental). At the time of our study, there were more than 200 hospitals of all types in Ontario including acute care, long-term care, and specialty institutions

(Inglehart 1986). Our data relate to 189 general hospitals from Ontario from 1986 to 1989.

The primary source of data for this study is the *Annual Return of Health Care Facilities — Hospitals* submitted annually to the Ontario Ministry of Health. Hospitals provide these data at the departmental level. These reports are significant inputs into the performance evaluation process as well as future budget appropriations, meaning that totals (at the hospital and departmental levels) exhibit high reliability.

As indicated in the data reported in panel A of Table 1, sample hospitals exhibit considerable diversity. Such diversity is not surprising because sample hospitals range from Victoria Hospital, a large tertiary care center in London to small, rural hospitals with fewer than 20 beds.

TABLE 1
Descriptive statistics (1986 operating year)

Panel A: Hospital characteristics (n = 189)

Item	Mean	Median	25th percentile	75th percentile
Number of beds	255	154	71	363
Equivalent patient days	108,852	54,044	26,166	160,100
Number of employees	627	304	140	814

Panel B: Levels of cost pools (thousands of Canadian dollars) (n = 189)

Item	Mean	Median	25th percentile	75th percentile
Average level for hospitals				
Costs (overall)	20,692	9,686	4,447	27,503
Patient care	9,358	4,411	1,960	13,003
Ancillary services	3,779	1,655	649	4,623
Support services (variable)	3,278	1,765	813	4,458
Support services (fixed)	4,277	2,003	884	5,441

Panel C: Change in cost pools (thousands of Canadian dollars) and activities (equivalent patient days) (n = 378 hospital years)

Item	Mean	Median	25th percentile	75th percentile
Costs (overall)	1,649	662	275	2,070
Patient care	770	324	113	985
Ancillary services	293	104	38	323
Support services (variable)	223	116	49	274
Support services (fixed)	363	137	49	382
Equivalent patient days	156	262	−1,459	2,515

The activities of a hospital fall into two categories of in-patient care and out-patient treatments. Following the method used by the Ontario Ministry of Health, we converted various types of out-patient care into "equivalent patient days".[9] In particular, routine emergency and ambulatory clinic visits were considered equivalent to one-third of a patient day. Medical (e.g., dialysis, chemotherapy) or surgical (out-patient surgery) day care were considered the equivalent of two in-patient days (Lave et al. 1992). The average hospital had 108,852 equivalent patient days, with the mean exceeding the median (54,044).

Panel B of Table 1 provides data on hospital costs. Our measure of operating costs includes all costs associated with patient care and general facility operations. Thus, in addition to labor costs, these costs include direct nonmedical supplies and purchased services. We excluded depreciation and teaching costs from our measures of operating costs because they are funded through mechanisms other than the general budget. In addition, spending on medical supplies, pharmaceuticals, and employee benefits is reported as hospital level pools rather than being allocated across lower levels of activity (e.g., direct patient care, ancillary care).

The costs of direct patient services include all labor and other costs (e.g., nonmedical supplies) for all in-patient care units including general medical, surgical, pediatrics, and obstetrics departments. In addition, we pool the same types of costs for all out-patient departments including the emergency room and general and specialty clinics, as well as day/night care (e.g. dialysis treatments). Departments included in "ancillary care" include laboratory, radiology, physical therapy, occupational therapy, and pharmacy.

The cost of support departments include all costs not classified as being a part of direct patient care or ancillary departments. Thus, support costs include costs accumulated at the hospital level (by type of cost) and not allocated to individual departments. We separate support costs into two pools on the basis of their expected variation with volume. We place the costs of departments such as medical records, laundry, dietetics, and housekeeping into one pool. We designate this pool as variable support costs because we expect costs in these pools to be volume-driven. We place the costs of other support departments such as administration, general maintenance, central supply, and facility operations into a fixed support pool. We do not expect a short-run relation between costs and activities in this pool. Panels B and C of Table 1 provide sample descriptions of these cost pools.

4. Results

We report results in panels A and B of Table 2. For overall costs we find a significant positive coefficient for change in activity volume, consistent with equivalent patient days being a driver of operating costs. This result is as expected because patient volumes, after all, are a central input into the budgeting process, which in turn governs spending. Consistent with prior research, we also find costs to be reliably sticky. The sum of β_1 and β_2 is very close to zero, indicating virtually no reduction in costs when activity volumes decrease; our data support Hypothesis 1. This finding is consistent with the hospital's budgeting process, which rarely

TABLE 2
Model estimates

$Log(\Delta Operating\ cost) = \alpha + \beta_1 log(\Delta activity) + \beta_2 Dummy^* log(\Delta activity) + Year + error$

Panel A: Coefficient estimates

	Predicted sign	(1) Overall	(2) Patient care only	(3) Ancillary services	(4) Support services (variable)	(5) Support services (fixed)
Intercept	?	0.031*	0.029*	0.034*	0.032*	0.033*
		(0.001)	(0.001)	(0.003)	(0.002)	(0.003)
Log (patient days)	+	0.210*	0.369*	0.060	0.109†	0.120
	(0 for fixed support)	(0.032)	(0.035)	(0.066)	(0.044)	(0.070)
Dummy × log (patient days)	−	−0.183*	−0.271*	−0.053	−0.106	−0.149
	(0 for all support)	(0.056)	(0.061)	(0.114)	(0.077)	(0.122)
Year	?	−0.005*	0.002	−0.010*	−0.007*	−0.003
		(0.002)	(0.002)	(0.004)	(0.002)	(0.004)
n		377	377	377	377	377
F-value		23.01*	48.28*	3.80†	7.18*	1.40
Adjusted R^2		0.149	0.273	0.022	0.047	0.003

(The table is continued on the next page.)

TABLE 2 (Continued)

Panel B: Tests of equality

Groups compared	*F*-statistic
Core services versus ancillary	3.08‡ ($p < 0.040$)
Core services versus variable support	4.20‡ ($p < 0.020$)
Ancillary versus variable support	0.16 ($p < 0.343$)

Notes:

Cell entries in panel A are the coefficients and standard errors (in brackets) based on individual regressions. The tests of equality are based on stacked regressions where we estimated all four equations simultaneously and compare the coefficients for β_2.

All tests of coefficients are one-tailed where we predict a sign.

* Significant at $p < 0.001$.

† Significant at $p < 0.01$.

‡ Significant at $p < 0.05$.

reduces budgeted amounts. The "use it or lose it" feature of most governmental budgets also likely contributes to the absence of a decline in costs.[10]

Columns 2–5 of panel A, Table 2 report results from estimating the same equation using department-level data. Results for direct patient care (column 2) are similar to those for the total hospital. Volume significantly affects costs, which are reliably sticky ($p < 0.001$). We begin to see differences from extant research when we consider ancillary services (column 3). Although volume again reliably influences these costs, the rate of decrease in costs is not statistically significant. That is, operating costs in these departments are not sticky. We also find this behavior in variable support departments (column 4). There is a significant effect for volume but no evidence of stickiness. Finally, results for the fixed support departments (column 5) confirm the conjecture that these costs are unrelated to volume. We find low explanatory power overall, and the coefficient for volume is not reliably positive.

Panel B of Table 2 reports the results of comparing coefficients for β_2 across the four groupings of costs. Results are broadly consistent with Hypothesis 2. We find the expected ordering of coefficients. More importantly, the stickiness of costs in direct patient services reliably exceeds that for ancillary and support departments. However, our data do not evidence the expected difference in the stickiness of costs in ancillary and volume-driven support departments.[11]

As a robustness check and to gain insight into the primary cost element driving the results, we replicated the analysis using the number of hours worked as the dependent variable. This substitution lets us focus on labor-related costs alone, which are the dominant cost in most departments. Results show a virtually identical pattern. We find stickiness for the hospital as a whole and for direct patient services

but not for ancillary or volume-driven support services. Moreover, the coefficient for sticky costs is reliably higher for direct patient care relative to the coefficient for volume-driven support services. However, the other test (direct patient services versus ancillary care) only approaches significance at the 10 percent level.

5. Conclusion

This study investigates intra-firm variation in cost behavior. We argue that costs are likely to exhibit greater stickiness in functions making greater contributions to an organization's core competency. In the context of hospitals, we expect sticky costs in direct patient services to exceed those in ancillary and support services, both because of the differential in the costs of adjusting capacity and because of the higher visibility of patient care related expenses. Data from Ontario hospitals support our arguments.

Our study makes at least two distinct contributions. First, it demonstrates the existence of sticky costs to a new setting (hospitals) and to a different class of costs (operating costs versus SGA costs). Second, and more importantly, it is the first to examine intra-firm variations in cost stickiness. In particular, the study delves deeper into the nature of adjustment costs, thereby adding to the literature that examines across-firm variations in these costs.

Our study has several limitations. First, our data are over 20 years old. Although this fact, by itself, does not limit the generalizability of our results, we note that changes in hospital management structures and general competitive pressures moderate their application to today's environment. Second, all hospitals in our study are funded by the same entity (the Ontario government). Moreover, they are funded by means of a budget based on predicted activities rather than being reimbursed on the basis of actual activity levels. This feature creates incentives to be strategic when requesting budgets (Eldenburg and Soderstrom 1996). It also creates incentives to "use it or lose it", which affects intra-year spending patterns (Balakrishnan et al. 2007). Because of data limitations, our study does not account for either cross-sectional or time-series variation in these incentives.

The results reported in this study underscore the importance of considering organizational characteristics when understanding cost behavior. We expect that core competency is but one factor that influences the extent of cost stickiness. For example, it would be instructive to examine how changes in cost stickiness relate to changes in the regulatory environment or to increasing perceptions of ratcheting in budgets. Moreover, institutional theory suggests variations in stickiness due to variations in ownership. Thus, research that examines how managerial incentive and compensation arrangements influence decisions concerning which capacity to protect as they react to lower activity volumes seems promising.

Endnotes

1. In the long run, models such as activity-based costing posit that we can estimate fixed costs as the product of an overhead rate and activity volume. Studies examining this assertion include Foster and Gupta 1990; Banker, Potter, and Schroeder 1995; and Noreen and Soderstrom 1994. Recent research (e.g., Kallapur and Eldenburg 2005) has

begun to focus on how managerial incentives affect the trade-off between fixed and variable costs.

2. Subramaniam and Weidenmier (2003) examine cost of goods sold and find stickiness in that expense as well.
3. There is considerable evidence about cross-sectional variation in adjustment costs. For example, Benoit and Ng (1992) report significant differences in the speed and the costs of adjustment of investment in Canadian industries. This economics literature, however, does not consider cost stickiness.
4. Negotiated outcomes occur when the adjustment is uncertain and infrequent (e.g., altering the job required of a building contractor).
5. In Ontario, hospitals account for more than 40 percent of all health-care spending.
6. Of course, distance to the patient is an imperfect proxy for the criticality of a department or service to a hospital's mission. However, it is the best metric available to us.
7. In a U.S. context, Gaynor and Anderson (1991) estimate the annual cost of an empty bed at $38,000 (in 1987 dollars). Coupled with the 60 percent occupancy rate in their sample, this estimate speaks to the magnitude of adjustment costs in core services.
8. Unfortunately, we have access to only three years of data, although hospitals continue to submit detailed reports to date. Moreover, because we employ changes, any one hospital appears, at most, twice in the data set. Because of this feature and the limited number of observations, we employ the standard White *t*-statistics rather than the cluster-adjusted Huber-White *t*-statistics.
9. Research on U.S. hospitals employs adjusted patient days instead of equivalent patient days. Adjusted patient days account for out-patient services by adjusting the number of in-patient days by the ratio of total revenue to in-patient revenue. Such an adjustment is not possible in our setting because hospitals receive revenue as a lump-sum budget from the government and there is no billing for individual patient services.
10. In the context of U.S. army hospitals, Balakrishnan, Soderstrom, and West (2007) demonstrate that budget lapsing leads to significant increase in spending at year-end, which pattern is consistent with managerial incentives to expend the entire budget. Balakrishnan et al. (2007) advance budget ratcheting as one rationale for such incentives.
11. We conjecture that the latter relation also might become statistically significant if we are able to increase sample size considerably. In contrast to our 377 observations, ABJ's data set contains nearly 65,000 firm-year observations.

References

Anderson, M., R. Banker, L. Chen, and S. Janakiraman. 2004. Sticky costs at service firms. Working paper, University of Texas at Dallas.

Anderson, M., R. Banker, R. Huang, and S. Janakiraman. 2007. Cost behavior and fundamental analysis of SG&A costs. *Journal of Accounting, Auditing and Finance* 22 (1): 1–28.

Anderson, M., R. D. Banker, and S. Janakiraman. 2003. Are selling, general and administrative costs "sticky"? *Journal of Accounting Research* 41 (1): 47–64.

Anderson, S. 1995. Measuring the impact of product mix heterogeneity on manufacturing overhead costs. *The Accounting Review* 70 (3): 363–87.

Balakrishnan, R., T. Gruca, and D. Nath. 1996. The effect of service capability on operating costs. *Contemporary Accounting Research* 13 (1): 177–208.

Balakrishnan, R., M. Peterson, and N. Soderstrom. 2004. Does capacity utilization affect the "stickiness" of cost? *Journal of Accounting, Auditing and Finance* 19 (3): 283–99.

Balakrishnan, R., N. Soderstrom, and T. West. 2007. Spending patterns with lapsing budgets: Evidence from US army hospitals. *Journal of Management Accounting Research* 19: 1–24.

Banker, R., and L. Chen. 2006a. Labor market characteristics and cross-country differences in cost stickiness. Working paper, Georgia State University.

Banker, R., and L. Chen. 2006b. Predicting earning using a model of cost variability and cost stickiness. *The Accounting Review* 81 (1): 285–307.

Banker, R., S. Datar, S. Kekre, and T. Mukopadhyay. 1990. Costs of product and process complexity. In *Measures of Manufacturing Performance*, R. Kaplan, ed., 269–90. Boston: HBS Press.

Banker, R., G. Potter, and G. Schroeder. 1995. An empirical analysis of manufacturing overhead costs. *Journal of Accounting and Economics* 11 (1): 115–34.

Barney, J. 1991. Firm resources and sustained competitive advantage. *Journal of Management* 17 (1): 99–120.

Benoit, C., and S. Ng. 1992. Adjustment costs and factor demands in Canadian manufacturing industries. *Applied Economics* 24: 845–57.

Caballero, R., E. Engel, and J. Haltiwanger. 1995. Plant-level adjustment and aggregate investment dynamics. *Brookings Papers on Economic Activity*, no. 2, Macroeconomics, 1–54.

Cook, K., S. M. Shortell, D. A. Conrad, and M. A, Morrissey. 1983. A theory of organizational response to regulation: The case of hospitals. *Academy of Management Review* 8 (1): 193–205.

Dierickx, I., and K. Cool. 1989. Asset stock accumulation and sustainability of competitive advantage. *Management Science* 35 (12): 1504–11.

Eldenburg, L., and N. Soderstrom. 1996. Accounting system management by hospitals operating in a changing regulatory environment. *The Accounting Review* 71 (1): 23–42.

Foster, G., and M. Gupta. 1990. Manufacturing overhead cost driver analysis. *Journal of Accounting and Economics* 12 (1–3): 309–37.

Gaynor, M. S., and G. Anderson. 1991. Hospital costs and the cost of empty hospital beds. NBER Working Paper no. W3872. Cambridge, MA: National Bureau of Economic Research.

Gupta, M., T. Randall, and A. Wu. 2006. The economic impact of congestion and capacity utilization. Working paper, Washington University in St. Louis.

Hamel, G., and C. K. Prahalad. 1990. The core competence of a corporation. *Harvard Business Review* 68 (3): 78–90.

Hoopes, D. G., T. Madsen, and G. Walker. 2003. Why is there a resource-based view? Toward a theory of competitive heterogeneity. *Strategic Management Journal* 24 (10): 889–902.

Inglehart, J. H. 1986. Canada's health care system. *New England Journal of Medicine* 315 (13): 778–84.

Kallapur, S., and L. Eldenburg, 2005. Uncertainty, real options and cost behavior: Evidence from Washington State hospitals. *Journal of Accounting Research* 43 (5): 734–49.

Lave, J. R., P. Jacobs, and F. Markal. 1992. Transitional funding: Changing Ontario's global budgeting system. *Health Care Financing Review* 13 (3): 77–84.

Noreen, E., and N. Soderstrom. 1994. Are overhead costs strictly proportional to activity volume? *Journal of Accounting and Economics* 17 (1–2): 255–78.

Smith, D., and A. Preker. 2001. Labour market adjustment in health systems. Mimeograph World Health Organization, Geneva.

Steliaros, M., D. Thomas, and K. Calleja. 2006. A note on cost stickiness: Some international comparisons. *Management Accounting Research* 17 (1): 127–40.

Subramaniam, C., and M. Weidenmier. 2003. Additional evidence on the behavior of sticky costs. Working paper, Texas Christian University.

Wernerfelt, B. 1997. On the nature and scope of the firm: An adjustment-cost theory. *Journal of Business* 80 (4): 489–514.