The Impact of the Prospective Payment System for Skilled Nursing Facilities on Therapy Service Provision: A Transaction Cost Approach

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Objective. To examine skilled nursing facilities (SNFs) “make-or-buy” decisions with respect to rehabilitation therapy service provision in the 1990s, both before and after implementation of Medicare’s Prospective Payment System (PPS) for SNFs.

Data Sources. Longitudinal On-line Survey Certification and Reporting (OSCAR) data (1992–2001) on a sample of 10,241 freestanding urban SNFs.

Study Design. We estimated a longitudinal multinomial logistic regression model derived from transaction cost economic theory to predict the probability of the outcome in each of four service provision categories (all employed staff, all contract, mixed, and no services provided).

Principal Findings. Transaction frequency, uncertainty, and complexity result in greater control over therapy services through employment as opposed to outside contracting. For-profit status and chain affiliation were associated with greater control over therapy services. Following PPS, nursing homes acted to limit transaction costs by either exiting the rehabilitation market or exerting greater control over therapy services by managing rehabilitation services in-house.

Conclusions. The financial incentives associated with changes in reimbursement methodology have implications that extend beyond the boundaries of the health care industry segment directly affected. Unintended quality and access consequences need to be carefully monitored by the Medicare program.

Key Words. Transaction costs, skilled nursing facilities, rehabilitation services, prospective payment

In a typical skilled nursing facility (SNF), numerous parties exchange goods and services in the delivery of care. Resident care is rendered through a complex series of transactions among these parties, including, but not limited to: physicians, pharmacists, equipment distributors and manufacturers, rehabilitation therapists, laboratorians, and dietitians. Some of these transactions occur among the employees of the nursing home (intra-organizational exchange) while others involve contractual relationships

with outside parties (inter-organizational exchange). In this article, we focus on one particular transaction: the provision of rehabilitation therapy services.

Transaction cost economic (TCE) theory provides a theoretical framework for identifying the organizational and environmental circumstances governing the choice of inter- or intra-organizational transactional form (Williamson 1975, 1991). It has been used (although not extensively) in health services research to explain hospital vertical integration (Mick and Conrad 1988; Dansky, Milliron, and Gamm 1996), diversification (Robinson 1994), service innovation (Stiles, Mick, and Wise 2001), and quality control (Stiles and Mick 1997). Transaction cost economic theory argues that contractual relationships among and within firms arise from efficiency-seeking behavior in a world of limited information and incomplete enforcement possibilities (Oster 1990). A fundamental principle of TCE is that organizations incur costs as a result of planning, implementing, and enforcing exchanges with other organizations. Firms tend to structure exchanges in ways that will minimize the cost of using the transactional apparatus (Oster 1990). With respect to external supplier exchange relationships, transaction costs can include costs associated with contract negotiations, monitoring adherence to contractual terms, providing financial incentives or penalties, and losses resulting from supplier noncompliance.

Increases in environmental uncertainty requiring adaptation between exchange parties increase market or externally driven transaction costs (Williamson 1975, 1991). Historically, SNFs operated in a stable, if not particularly munificent environment, posing few competitive threats. However, events conspired to increase environmental uncertainty for SNFs throughout the 1990s. The implementation of Medicare's Diagnostic Related Groups (DRGs) for hospital reimbursement began to have a major case-mix impact on SNFs at the onset of that decade (Cornelius et al. 1994). Compounding the DRG effect, the growth of managed care to almost 30

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percent of the insured population by 1998 promoted reduced hospital length of stay, intensifying the medical care needs of patients discharged to SNFs. In addition, there was tremendous growth in viable institutionally based substitutes for SNF care at both the high end (hospital-based SNF units) and low end (assisted living) of the care continuum. Finally, concerns about nursing home quality resulted in a wave of new regulations that influenced virtually every aspect of nursing home operation (Harrington and Carillo 1999). Thus, SNFs exposed to increasing environmental uncertainty created by the escalating impact of these underlying forces throughout the 1990s may have experienced increased transaction costs in structuring relationships with outside suppliers.

In addition, the transaction cost implications of the 1998 change in the financing of SNF care may have promoted major alterations in the terms governing external exchange relationships. From its inception in 1964, the Medicare program reimbursed SNFs under a retrospective, reasonable cost based system. Outside contractors, paid on a fee for service basis, directly billed the Medicare program for services rendered onsite, allowing SNFs to avoid clinical and financial expenses associated with administering these services. According to 1998 data compiled by the Centers for Medicare and Medicaid Services (CMS), nearly 70 percent of nursing home facilities contracted with outside vendors for all physical or occupational therapy services.

However, as of July 1, 1998, SNF reimbursement changed to case-mix adjusted payments under the Medicare Prospective Payment System (PPS) for the costs of all SNF care provided to Medicare recipients (Health Care Financing Administration 1998). Medicare beneficiaries served under the SNF benefit are now classified into one of 44 resource utilization groups (RUGs), and Medicare payments for services furnished from all sources are bundled into a single RUG payment received by the SNF. The SNF in turn reimburses outside service vendors out of this RUG payment. Prior to PPS, SNFs were not accountable for the consequences of poorly negotiated contracts with external suppliers, as these costs were passed on to the Medicare program. Under PPS, nursing homes receive a flat per diem charge per RUG regardless of the cost of services rendered. Poorly negotiated contracts with outside vendors could result in diminished profitability. Thus, under PPS, facilities face increased transaction costs associated with outsourcing. To reduce or eliminate externally or market-driven costs, the facility may opt to provide all, or most, of these services through in-house employees. Control over rehabilitation services would have high priority because to qualify for the SNF benefit, Medicare

beneficiaries must have documented rehabilitation potential entailing the provision of a minimum number of therapy hours per week.

Using TCE theory as a conceptual framework, this study has two objectives. The first is to determine if transactional characteristics affected SNF "make-or-buy" decisions with respect to rehabilitation services in response to increased environmental uncertainty during the turbulent decade of the 1990s. Thus, this study extends the existing literature by demonstrating the applicability of the TCE framework to long-term care service. The second is to examine whether a specific environmental shock that increased transaction costs associated with outsourcing, the implementation of PPS for SNFs in 1998, was associated with an increased likelihood that facilities would choose to make rather than buy rehabilitation services. From a policy perspective, this study demonstrates how efforts directed at increasing efficiency in one health care sector can have unintended, far-reaching consequences for other market participants.

THEORY AND HYPOTHESES

Transactional Characteristics Affecting SNF "Make or Buy" Decisions

From a theoretical perspective, transaction costs increase under conditions of environmental uncertainty requiring adaptation between the exchange parties. Gilley and Rasheed (2000) hypothesized that many benefits offered by outsourcing activities are offset by environmental uncertainty, and the more uncertain the environment, the fewer benefits realized.

Although environmental uncertainty during the 1990s influenced the exchange relationships of all nursing homes, the impact on transaction costs is not uniform. For example, environmental uncertainty is more likely to increase externally or market-driven transaction costs when transactions between exchange partners occur frequently (Williamson 1975). Much of the volatility in the SNF industry during the 1990s was attributed to reforms in the public sector, particularly in the Medicare program. Thus, the frequency of transactions involving Medicare reimbursement is particularly relevant. There is considerable variation in the number of Medicare beneficiaries in the total patient census of individual skilled nursing facilities. Some admit a high volume of Medicare beneficiaries in an effort to achieve the economies of scale necessary for Medicare participation to be financially feasible (Dor 1989). In a study of the information services industry, Poppo and Zenger (1998) found that when the output volume of a component manufactured

in-house is sufficient to produce economies of scale, firms are less likely to outsource. These considerations provide the rationale for our first hypothesis:

- H1.** Facilities with a higher proportion of Medicare residents in total census will be more likely to attempt to reduce externally or market-driven transaction costs by bringing therapy services in-house.

Walker and Weber (1984) found that output (demand) uncertainty led automobile manufacturers to produce components in-house rather than purchase from outside suppliers. They suggest the “make” response takes precedence as managers attempt to avoid transaction costs associated with renegotiating contracts with suppliers in order to accommodate fluctuations in demand. In the SNF setting, demand uncertainty with the potential to increase transaction costs associated with outside therapy contracts would be manifested in wide variations in the number of Medicare referrals admitted from one year to the next.

- H2.** Facilities with greater fluctuation in the annual number of Medicare admissions will be more likely to attempt to reduce externally or market-driven transaction costs by bringing therapy services in-house.

Exchange relationships may also differ in terms of the underlying complexity of the transaction (Williamson 1975). Complex transactions have many components or sequential decision points, and resist standardized approaches. The greater the complexity of the transaction, the greater the need for contractual control to ensure that tasks are appropriately carried out. In the nursing facility context, transactional complexity varies with the care requirements of the residents.

- H3.** Facilities characterized by greater case-mix complexity will be more likely to attempt to reduce externally or market-driven transaction costs by bringing therapy services in-house.

A final characteristic distinguishing transactions reflects how well the transaction itself is understood by all the parties involved. Theoretically, even if frequent or complex, transaction costs may not increase if the transaction is well understood by the buyer (Williamson 1975). On the other hand, if the transaction entails the application of knowledge and skills beyond the buyer’s expertise, terms must be more formally and explicitly articulated to ensure

successful fulfillment of the contract, increasing transaction costs. Under these circumstances, it may be more efficient to bring the transaction in-house. However, if the firm possesses the expertise to monitor compliance with contractual terms, outsourcing may be the preferred option. In the nursing facility context, transaction-specific uncertainty is mitigated by the expertise reflected in the qualifications of professional staff.

- H4. Facilities characterized by higher levels of professional staffing will be less likely to bring therapy services in-house.

The Impact of PPS for SNFs on the Provision of Rehabilitation Services

By increasing environmental uncertainty, the implementation of PPS increased transaction costs in SNF/rehabilitation vendor relationships. For nursing homes to maximize reimbursement by qualifying the resident for the highest possible RUG payment category, rehabilitation therapy services must be ordered and provided promptly after admission. Thus, under PPS, among the most compelling externally driven transaction costs are the losses incurred if suppliers fail to provide appropriate services in a timely and cost-effective manner. This may provide the impetus to move from the provision of services through external contract to the hiring of in-house staff.

- H5. In response to PPS implementation, facilities will attempt to reduce externally or market-driven transaction costs by bringing therapy services in-house.

Finally, although not specified by TCE theory, there are organizational characteristics that could increase the propensity of a facility to exercise greater control over services provided by rehabilitation therapists in response to PPS implementation. For-profit facilities presumably are the most market-oriented providers and, all other things being equal, may be quicker to recognize changes in financial incentives that signal the need to reconsider the “make-or-buy” decision with respect to therapy services. On the other hand, perhaps because of the availability of centralized contracting capability and other facilitating administrative resources, facilities operated by chains may be more effective at negotiating with outside contractors (Zinn et al. 1999). These considerations lead to the following exploratory hypotheses:

- H6. In response to PPS implementation, for-profit facilities will be more likely to increase control over therapy services by bringing services in house.

- H7. In response to PPS implementation, chain-affiliated facilities will be less likely to increase control over therapy services by bringing services in house.

METHODOLOGY

Data Sources and Sample

The primary source of data for this analysis is the On-line Survey Certification and Reporting (OSCAR) system, which we compiled into a longitudinal data file spanning from 1991 to 2001. The OSCAR data contain organizational and aggregated resident data routinely collected as part of the annual licensure and certification process. The longitudinal OSCAR data contained 167,600 surveys from 18,613 hospital-based and freestanding nursing facilities in urban and rural counties nationwide. The Area Resource File (ARF) provided market(county)-level data that were matched to the facility surveys in OSCAR.

We restricted our analysis to a subsample of urban, freestanding nursing facilities surveyed between 1992 and 2001 (CMS overwrites OSCAR data so earlier years are not available), excluding facilities that changed either from or to hospital-based status over that time period ($N = 335$, about 2 percent of total facilities). Thus, study findings are generalizable to this population only. We further excluded facilities represented by only one survey in the data file in order to allow information obtained from a previous survey to predict the outcome (the manner in which the SNF provides therapy services) at the current survey. Accordingly, each observation in the final dataset links the current outcome with information from the previous survey. We further excluded counties where no Medicare residents were reported in any facilities in a given year. Altogether, ten counties (27 facilities) were dropped from the final analysis. Following these rules, the final dataset contains 68,114 outcome surveys from 10,241 freestanding nursing facilities located in 815 urban counties. Of these surveys, 67,524 with complete data were available for multivariate analysis. Relatively few facilities exited the Medicare program over the study period (approximately 1 percent per year). Additional analysis controlling for exiting facility did not change any results reported here.

Variable Specification

The dependent variable is the arrangement the facility has to provide rehabilitation services at the time of the current survey. This is classified into four categories: “No PT/OT,” “All contract,” “Mixed,” and “All staff.” These

categories are based on the availability of physical or occupational therapy (PT/OT) and whether some of or all of these services are provided through contract with outside vendors. If no PT/OT full-time equivalents (FTEs) are recorded, a facility is classified as "*No PT/OT.*" A facility is considered "*All contract*" if all PT/OT FTEs are reported under a contract basis, and "*Mixed*" if some PT/OT FTEs are reported to be staff and others under contract. A facility is classified as "*All staff*" if all PT/OT FTEs are hired employees. Our data indicate that the "mixed" model is one in which supervision over the quality and quantity of therapy is based in-house, but some services are provided by an outside contractor. Thus, a facility that is either all staff or mixed staff has increased internal control over the provision of therapy services, relative to an all contract arrangement. We treat these as categorical not ordinal options.

A facility is determined to have a high proportion of Medicare residents (H1) if the proportion of Medicare residents in the total resident census exceeds 12 percent (the upper quartile), as indicated by a dummy variable (1,0). We dichotomized this variable (and others as well) rather than used it in its continuous form because the effect may not be linear. Also, a dichotomous variable facilitates interpretation of its effect as an odds ratio on a multinomial outcome.

We used the annual fluctuation in Medicare admissions to create an indicator variable for demand uncertainty (H2). Specifically, we calculated the absolute change in the number of Medicare residents between the previous and current surveys. The SNFs in the upper quartile of the distribution of all absolute changes (i.e., more than five residents) were categorized as high-fluctuation facilities. On average, this amounts to approximately 63 percent of the previous year's total Medicare volume.

We selected three measures of case-mix complexity (H3). The first identifies facilities providing a high volume of rehabilitation services, defined as either (a) having 35 or more rehabilitation residents and 30 percent or more residents receiving rehabilitation services, or (b) having 20 or more rehabilitation residents and 50 percent or more residents receiving rehabilitation services (Berg, Intrator, and Lemon 2001). These definitions account for both the absolute number of residents receiving services and the impact on the facility. The second measure indicates whether a facility has residents receiving intravenous (IV) therapy, and the third whether there are any residents receiving tracheotomy care. Each of these measures reflects a different dimension of resident case mix (e.g., rehabilitation versus subacute care).

To measure the availability of professional expertise (H4), we included a dummy variable indicating whether a physician-extender (nurse practitioner or physician assistant) is available in a facility. To test the PPS effect (H5), we included a variable indicating whether the predicted outcome occurred after PPS implementation (July 1, 1998). Dummy variables indicated whether a facility is run for-profit (H6), or is part of a chain (H7).

A number of control variables that could influence the manner in which SNFs provide therapy services were also included. To control for calendar time trend, we included a variable that measured the number of years from January 1, 1992, up to the current survey date. Since prior commitment to a staffing arrangement may constrain the ability to change, we included three dummy variables indicating whether the facility was “*All staff*,” “*Mixed*,” or “*No PT/OT*,” at the time of the previous survey, with “*All contract*” as the omitted category.

Large facilities may be able to achieve economies of scale with respect to in-house rehabilitation service provision, so we included the total number of beds (centered at 118, the aggregate mean, with steps of 10 beds). Higher occupancy could signify a more traditional long-term-stay resident population with less need for rehabilitation services, so facility occupancy rate (centered at 88 percent, with steps of 5 percent) was also included. Facilities with more private pay residents are in a more favorable financial position, allowing them to hire more in-house staff or absorb external transaction costs associated with contracting. Therefore, the percent of private pay residents (centered at 26 percent, with steps of 5 percent) was included. In addition, a dummy variable was created to indicate whether a facility first became a Medicare/Medicaid provider after 1995. These providers had to accept the fixed federal rate without having their own experience taken into account, placing them at a disadvantage. Finally, to control for market supply and demand conditions, we included the annual unemployment rate (centered at 4 percent) and the proportion of population aged 75 and older (centered at 5 percent) in 1990.

Statistical Methods

Given the multinomial form of the dependent variable, we used a longitudinal multinomial logistic regression model (Hosmer and Lemeshow 1989) to predict the probability of the current outcome in each of the four categories, with “*All contract*” as the reference category.

Because we are modeling multiple observations for the same facility over the survey time period, the conventional assumption of independence

between observations may not hold. If the correlation between observations within-facility is not adjusted for properly, the standard errors for parameter estimates tend to be downward biased (Goldstein 1995). To correct for this, we apply the Huber/White (Huber 1967; White 1980) robust variance estimates procedure available in *STATA*, which estimates standard errors adjusted for clustering within facility.

RESULTS

Descriptive statistics for the independent and control variables based on a cross-section of facilities operating in 1998 are provided in Table 1. Grand descriptive statistics and those from other years are available on request, as is the correlation matrix for covariates included in the model. We did not see any indications of even moderate collinearity between the covariates that might compromise our model results.

Table 2 presents the transition matrix for PT/OT provision arrangements, from the previous to current surveys across all years. The dominant pattern in Table 2 is stability over time, as facilities tend to maintain the same

Table 1: Sources and Descriptive Statistics of Variables Based on Cross-Section of Facilities Operating in 1998 (N = 7,554 in 815 Urban Counties)

<i>Variable</i>	<i>Source</i>	<i>Mean</i>	<i>SD</i>
High proportion of Medicare residents (> 12%)	OSCAR ^a	.232	.422
High fluctuation of annual Medicare admissions	OSCAR	.228	.420
Case-mix complexity:			
High rehabilitation intensity	OSCAR	.044	.205
IV therapy available	OSCAR	.358	.480
Tracheotomy care available	OSCAR	.282	.450
Physician-extender available	OSCAR	.186	.389
Facility is run for-profit	OSCAR	.736	.441
Facility is part of a chain	OSCAR	.569	.495
Total number of beds in facility	OSCAR	119	72
Occupancy rate (%)	OSCAR	87.1	14.1
Percent (%) of private payers	OSCAR	25.5	21.3
Annual unemployment rate (%) in county	ARF ^b	4.2	1.8
Percent (%) of population aged 75+ in county, 1990	ARF	5.3	1.7

^aOn-line Survey Certification and Reporting System (Centers for Medicare and Medicaid Services); ^bArea Resource File (Bureau of Health Professionals, HRSA).

Table 2: Aggregate (across All Years) Transitions in Facility PT/OT Staffing Arrangements (%) from the Previous to Current Survey

<i>Previous PT/PT Arrangement</i>	<i>Current PT/OT Arrangement</i>				<i>Total Surveys</i>
	<i>All Staff</i>	<i>Mixed</i>	<i>All Contract</i>	<i>None</i>	
All staff	66.7	10.4	20.5	2.4	100.0 (10,839)
Mixed	27.1	51.4	20.5	1.0	100.0 (6,355)
All contract	7.7	3.7	83.1	5.5	100.0 (44,071)
None	4.8	1.2	40.1	53.9	100.0 (6,814)

therapy arrangement over successive surveys. However, 27 percent of facilities using a mixed employee/contract arrangement changed to an “all-staff” employment method by the time of their next survey. Furthermore, 8 percent of facilities using an “all contract” arrangement switched to an “all-staff” arrangement by their next survey. (However, 20.5 percent of “all-staff” and “mixed” facilities transitioned to “all contract.”) Table 3 presents the results from the longitudinal multinomial logistic regression model predicting “all-staff,” “mixed,” and “no PT/OT” therapy arrangements, in contrast to “all contract.”

Transactional Characteristics Affecting SNF “Make or Buy” Decisions

Results support most of the hypotheses derived from the predictions of TCE theory. Facilities with a higher Medicare census had a 57 percent increase in the odds of transitioning to either a mixed PT/OT arrangement or an all-staff arrangement ($p < .001$). Thus, more frequent transactions are associated with greater control over therapy services in nursing home settings, supporting the first hypothesis.

Uncertainty with respect to unanticipated changes in Medicare SNF demand is also associated with greater control over therapy services supply (H2). Facilities with high fluctuations in Medicare use had a 22 percent increase in the odds of transitioning to a mixed arrangement and a 24 percent increase in the odds of transitioning to an all-staff arrangement relative to an all-contract arrangement ($p < .001$).

As predicted by Hypothesis 3, complexity is associated with greater control over the provision of therapy services. Facilities providing high levels of rehabilitation had a 27 percent and 28 percent increase in the odds of transitioning to a mixed and all-staff arrangement, respectively ($p < .001$). In

Table 3: Likelihood of Adopting Various PT/OT Therapy Arrangements: Longitudinal Multinomial Logistic Regression Model Results

<i>Independent/Control Variables</i>	<i>All Staff (vs. All Contract)</i>				<i>Mixed (vs. All Contract)</i>				<i>No PT/OT (vs. All Contract)</i>			
	β	SE^a	P	OR	β	SE^a	P	OR	β	SE^a	P	OR
Independent:												
1. High percent of Medicare residents (> 12%)	0.448***	0.033	0.000	1.565	0.448***	0.042	0.000	1.565	-0.761***	0.067	0.000	0.467
2. High fluctuation of annual Medicare admissions (± 5)	0.218***	0.032	0.000	1.244	0.202***	0.041	0.000	1.224	-0.513***	0.061	0.000	0.599
3. Case-mix complexity:												
High rehab intensity	0.248***	0.051	0.000	1.281	0.236***	0.058	0.000	1.266	0.007	0.076	0.924	1.007
IV therapy available	0.176***	0.030	0.000	1.192	0.122**	0.039	0.002	1.130	-0.197***	0.049	0.000	0.821
Tracheotomy care available	0.113***	0.031	0.000	1.120	0.121**	0.038	0.002	1.129	-0.263***	0.049	0.000	0.769
4. Physician-extender available	0.142***	0.037	0.000	1.153	0.115*	0.051	0.023	1.122	-0.316***	0.066	0.000	0.729
5. Post-PPS (current survey date after 7/1/98)	0.367***	0.064	0.000	1.443	0.404***	0.081	0.000	1.498	0.236***	0.077	0.002	1.266
6. Facility is run for-profit	0.255***	0.048	0.000	1.290	0.090	0.051	0.078	1.094	0.176***	0.050	0.000	1.192
7. Facility is part of a chain	0.550***	0.039	0.000	1.733	0.348***	0.042	0.000	1.416	-0.359***	0.042	0.000	0.698
Interaction: Post-PPS * Profit	-0.189**	0.060	0.002	0.828	-0.258**	0.081	0.002	0.773	0.073	0.074	0.324	1.076
Interaction: Post-PPS * Chain	-0.161**	0.055	0.003	0.851	-0.791***	0.077	0.000	0.453	0.064	0.066	0.329	1.066

Control:	0.094***	0.010	0.000	1.099	-0.044***	0.012	0.000	0.957	-0.038***	0.012	0.001	0.963
Calendar time (years 1/1/1992–current survey)												
Outcome at previous survey (Ref.: All contract):												
All staff	3.300***	0.037	0.000	27.113	2.358***	0.046	0.000	10.570	0.791***	0.071	0.000	2.206
Mixed	2.568***	0.044	0.000	13.040	3.853***	0.048	0.000	47.134	-0.086	0.133	0.517	0.918
None PT/OT	0.500***	0.063	0.000	1.649	-0.256*	0.117	0.028	0.774	2.709***	0.044	0.000	15.014
Bed size (centered at 118, step 10)	0.025***	0.002	0.000	1.025	0.029***	0.003	0.000	1.029	-0.064***	0.005	0.000	0.938
Occupancy rate (centered at 88%, step 5%)	0.006	0.005	0.267	1.006	0.009	0.007	0.193	1.009	-0.007	0.006	0.290	0.993
Percent private pay (centered at 26%, step 5%)	0.019***	0.003	0.000	1.019	0.014***	0.004	0.002	1.014	-0.029***	0.004	0.000	0.971
Late Medicare/Medicaid adopter (after 1995)	0.211*	0.092	0.021	1.235	0.186	0.132	0.159	1.204	-0.456**	0.170	0.007	0.634
Environment/Market:												
County unemployment rate (centered at 4%)	-0.049***	0.008	0.000	0.952	0.025***	0.008	0.001	1.025	0.011	0.008	0.196	1.011
1990 county percent pop. aged 75+ (centered at 5%)	0.027***	0.007	0.000	1.027	0.009	0.009	0.344	1.009	-0.026*	0.011	0.023	0.974
Intercept	-3.697***	0.067	0.000	—	-3.395***	0.072	0.000	—	-2.414***	0.073	0.000	—
Model LR χ^2 /DF/N					44878.344/63/67524							

Note. * $p < .05$; ** $p < .01$; *** $p < .001$.

^aStandard errors adjusted for clustering within facility.

addition, facilities providing IV and tracheotomy services were more likely to transition to a mixed or all-staff arrangement relative to contracting for all therapy services.

It was also hypothesized that the presence of in-house staff expertise would decrease transaction costs through more effective contract monitoring (H4). We found that the variable chosen to represent in-house expertise, the presence of a physician-extender, was associated with higher, rather than lower, odds of transitioning to an all-staff (OR = 1.15) or mixed (OR = 1.12) arrangement. Thus, Hypothesis 4 was not supported.

The Impact of PPS for SNFs on the Provision of Rehabilitation Services

With respect to Hypothesis 5, the odds of nonprofit independent (not chain-affiliated) facilities transitioning to a mixed model increased by 50 percent, and of transitioning to an all-staff model 44 percent, after PPS implementation. (The effect of PPS implementation on for-profit and chain-affiliated facilities is captured in the interaction effects used to test Hypotheses 6 and 7, as discussed below.) The odds of independent nonprofits transitioning to the discontinuation of physical and occupational therapy services relative to an all-contract arrangement increased 27 percent after PPS implementation ($p < .001$). Thus, it appears that SNFs responded to increased environmental uncertainty prompted by PPS implementation by either maximizing control by bringing services in-house, or by discontinuing therapy services to avoid any assumption of risk.

Hypotheses 6 and 7 tested whether the effect of PPS was moderated by either for-profit or chain affiliation status, respectively. Both for-profit and chain status increased the likelihood of transitioning to all-staff and mixed arrangements over the study time period. However, the odds of for-profit facilities transitioning to an all-staff model declined 17 percent compared to nonprofit facilities, and the odds of transitioning to a mixed model declined 23 percent compared to nonprofit facilities post-PPS. Thus, Hypothesis 6, predicting that for-profits would have a stronger reaction to PPS implementation, was not supported. In addition, as the "no PT/OT" model result indicates, for-profit and nonprofit facilities were equally as likely to discontinue therapy services after PPS implementation. Post-PPS implementation, chain affiliates were 15 percent less likely to transition to an all-staff model than were nonchain members, and were 55 percent less likely to transition to a mixed model. Thus, Hypothesis 7, predicting that chain affiliates would react less to PPS implementation, was supported.

The findings with respect to several of the control variables merit comment. The result with respect to the variable controlling for time indicates that from 1992 until PPS implementation in mid-1998, facilities were more likely to switch to an all-staff arrangement relative to switching to an all-contract arrangement, at an increased annual odds of 10 percent. Post-PPS implementation, this trend accelerated by 44 percent, so by 1999 the OR for using an all-staff model was 2.79 ($OR = \exp\{0.094 \times 7 \text{ yrs} + 0.367\} = \exp\{1.025\} = 2.79$). Mixed arrangements were less likely by 4.3 percent every year prior to PPS implementation. Post-PPS implementation, this trend changed, so that in 1999 facilities were more likely to transition to mixed by 10 percent ($OR = \exp\{-0.044 \times 7 \text{ yrs} + 0.404\} = \exp\{0.096\} = 1.10$).

Larger facilities, and those with a higher proportion of private pay were associated with a greater likelihood of using either mixed or all-staff arrangements relative to an all-contract arrangement. Facilities in markets with higher unemployment rates were more likely to contract for therapy staff, or at most use a mixed model. Finally, facilities in markets with a higher proportion of population over age 75, a measure of local market demand, were more likely to adopt all-staff employment of therapists.

DISCUSSION

Even in the time period preceding PPS when external billing was the rule, some SNFs, due to the nature of their interactions with outside therapy providers, experienced higher externally driven transaction costs than others. Thus, as predicted by TCE theory, transaction characteristics increase the likelihood of assuming greater control over therapy services by bringing some or all of these services in-house, in particular with respect to frequency, demand uncertainty, and complexity. Frequent or complex transactions were more likely to be subject to greater control through intra-, rather than inter-organizational exchange, although less fluctuation in demand, as represented by the stability of the Medicare census from one year to another, obviates the need for tighter control. Thus, with the exception of on-site expertise, the hypotheses generated from TCE theory were supported. One explanation for this one counter-theoretical result may be that the availability of on-site expertise with respect to contract management was inadequately operationalized in the model. That is, the availability of a physician-extender may not appropriately capture the administrative expertise required to negotiate and monitor contracts effectively. Indeed, it may be a proxy for

organizational resources and thus correlated with facility case mix or size, both of which increase the likelihood of in-house provision of therapy services.

This study provides evidence that in the relatively short time since its implementation, policy changes reflected in the PPS for SNFs have begun to transform SNF-supplier relationships. In effect, PPS introduced elements of managed care to the nursing facility setting. As in managed care, a critical factor determining how well the facility will fare financially under PPS is control over the use of diagnostic and therapeutic services. In an effort to avoid or reduce costs for which they are now at risk, nursing facilities appear to be pursuing two different strategic options with respect to the provision of therapy services.

The first brings services in-house that were formerly provided through contractual relationships. As a result, RUG-based reimbursement may send depressing ripple effects through the long-term care vendor community. For example, NovaCare, Inc., a Pennsylvania-based company that provides contract rehabilitation services, was forced to restructure and divest all operating businesses after sustained losses attributed to PPS implementation. Although the financial fortunes of other SNF vendors are not as closely tied to the industry, the incentives for increased efficiency are likely to have an impact on them as well. In some markets vendors are offering a package of ancillary services at a fixed per diem price, in effect, transferring some risk from the facility to the supplier in an effort to maintain contractual relationships.

It could be argued that the additional institutional control over the performance of therapists and other providers could result in improvements in the coordination and quality of resident care. However, bringing services in-house does not necessarily imply an equivalent level of staffing. The Prospective Payment System also provides an incentive to employ fewer or less-expensive staff. A recent survey by the American Physical Therapy Association reports that unemployment and underemployment among physical therapists steadily increased between 1998 and 2000, with those working in skilled nursing facilities reporting the greatest decrease in hours (Goldstein 2001). A recent study found a decrease in professional nurse staffing in the years following PPS implementation (Roper and Kilpatrick 2002). Since staffing reductions could have adverse consequences for patient care, the potential impact on access and quality, particularly in underserved and marginally served areas, merits close monitoring by the Medicare program.

Not all facilities are positioned to achieve efficiencies needed for viable Medicare participation under PPS. Thus, the second strategic option is to discontinue rehabilitation services entirely. Results of a main effects only

model (not reported here) indicated that after PPS was implemented, SNFs were on average 37 percent more likely to discontinue provision of physical and occupational therapy. One of the most controversial aspects of PPS has been the adequacy of the rates set for the 44 RUG categories, particularly for medically complex patients. Average Medicare reimbursement rates dropped dramatically after PPS implementation (Beverly Enterprises 2002). The Office of the Inspector General for Health and Human Services found that medically complex patients are more difficult to place in SNFs now than they were before PPS, as facilities actively manage their case mix to maximize reimbursement. As a last resort, facilities faced with increased transactions costs associated with outside contracts and reimbursement that is inadequate for in-house therapy provision may respond by leaving the Medicare program. However, our database did not contain a measure of average PPS reimbursement, so this implication is largely conjectural.

For-profit facilities, presumably more responsive to market constraints and incentives, were hypothesized to be more likely to bring services in-house in response to PPS. Instead, we found that although they were more likely to change to an all-staff or mixed arrangement over the study time period, they were less likely to do so after PPS implementation. The same pattern held true for chain-affiliated facilities, which were less likely to bring services in-house post-PPS, as predicted, although they were more likely to do so over the course of the study period. This suggests that for these facilities, the “make-or-buy” decision is not a response to a single, albeit highly significant event, but rather a commitment based on a broader set of considerations.

While these results provide some support for the predictions of TCE, it should be noted that production and transaction cost data availability poses limitations on our ability to directly test this theory. A full accounting of transaction costs in any “make or buy” decision requires comparison of inter-organizational (market) with intra-organizational transaction costs. The additional costs of coordinating and controlling internal exchanges in organizations made more complex by bringing services in-house could be substantial (Mick 1990; Perrow 1986). Furthermore, cost-minimizing firms seek to operate at the least-cost combination of transaction and production costs. In the absence of cost data, our hypotheses assume that the combination of internal production and transaction costs is less than the price paid to outside vendors combined with the transaction costs associated with contracting under the conditions specified. In addition, the absence of a PPS reimbursement measure at the facility level represents a study limitation, as does the inability to operationalize relevant in-house expertise.

In summary, environmental uncertainty caused by the confluence of market and regulatory developments during the 1990s, including the implementation of PPS, may have prompted facilities to decrease external or market-driven transaction costs by increasing control over the provision of therapy services or by eliminating them completely. The implementation of PPS for hospitals in the mid-1980s proved to have major implications for other sectors of the health care system, including SNF and home health care. Similarly, skilled nursing facility PPS implementation represents a major environmental shock with ripple effects that may extend beyond the boundaries of the nursing facility industry, particularly for outside suppliers of ancillary services. In that respect, PPS exemplifies how sweeping payment reforms in a given health care sector can have both intra- and inter-organizational consequences that bear on the effectiveness of patient care. The results of this study, despite some limitations, provide the first evidence of a major shift in how SNFs conduct business in response to PPS. Additional research is needed to establish if this shift can avoid unintended adverse consequences within and between organizations.

REFERENCES

- Berg, K., O. Intrator, and S. Lemon. 2001. "Classification of Post-Acute Care in Skilled Nursing Facilities." *Gerontologist* 41 (Special Issue I): 270–270.
- Beverly Enterprises. 2002. *Annual Report*. Available at <http://www.beverlyenterprises.com>.
- Cornelius, E. J., Feldman, J. A. Marsteller, and K. Liu. 1994. "Creating a MEDPAR (Medicare Provider Analysis and Review) Analog to the RUG-III (Resource Utilization Groups, Version III) Classification System." *Health Care Financing Review* 16 (2): 101–26.
- Dansky, K. H., M. Milliron, and L. Gamm. 1996. "Understanding Hospital Referrals to Home Health Agencies." *Hospital and Health Services Administration* 41 (3): 331–5.
- Dor, A. 1989. "The Costs of Medicare Patients in Nursing Homes in the United States: Multiple Output Analysis." *Journal of Health Economics* 8 (3): 253–70.
- Health Care Financing Administration. 1998. "Medicare Program: Prospective Payment System and Consolidated Billing for Skilled Nursing Facilities (Final Rule)." *Federal Register* (Rules and Regulations) 63, no. 91 (May 12 1998): 26251–316.
- Gilley, K., and A. Rasheed. 2000. "Making More by Doing Less: An Analysis of Outsourcing and Its Effects on Firm Performance." *Journal of Management* 26 (4): 763–90.
- Goldstein, H. 1995. *Multilevel Statistical Models*, 2d ed. London: Edward Arnold.

- Goldstein, M. 2001. "Positive Employment Trends in Physical Therapy." *Physical Therapy* 9 (7): 24-6.
- Harrington, C., and H. Carillo. 1999. "The Regulation and Enforcement of Federal Nursing Home Standards 1991-1997." *Medical Care Research and Review* 56 (4): 471-94.
- Hosmer, D. W., and S. Lemeshow. 1989. *Applied Logistic Regression*. New York: Wiley.
- Huber, P. J. 1967. "The Behavior of Maximum Likelihood Estimates under Non-Standard Conditions." *Proceedings of the Fifth Berkeley Symposium on Mathematical Statistics and Probability* 1: 221-33.
- Mick, S. S. 1990. "Explaining Vertical Integration in Health Care: An Analysis and Synthesis of Transaction Cost Economics and Strategic Management Theory." In *Innovations in Health Care Delivery: Insights for Organization Theory*, edited by S. S. Mick and Associates, chap. 8, pp. 207-40. San Francisco: Jossey-Bass.
- Mick, S. S., and D. A. Conrad. 1988. "The Decision to Vertically Integrate in Health Care Organizations." *Hospital and Health Services Administration* 33 (3): 345-60.
- Oster, S. M. 1990. *Modern Competitive Analysis*, pp. 172-75; 177-81. New York: Oxford University Press.
- Perrow, C. 1986. *Complex Organizations: A Critical Essay*, 3d ed. New York: Random House.
- Poppo, L., and T. Zenger. 1998. "Testing Alternative Theories of the Firm: Transaction Cost, Knowledge-Based, and Measurement Explanations for Make-Or-Buy Decisions in Information Services." *Strategic Management Journal* 19 (9): 853-77.
- Robinson, J. C. 1994. "The Changing Boundaries of the American Hospital." *Milbank Quarterly* 72 (2): 259-89.
- Roper, W., and K. Kilpatrick. 2002. "Medicare Cuts for SNFs May Jeopardize Quality of Care." Manuscript. University of North Carolina.
- Stiles, R. A., and S. Mick. 1997. "Components of the Cost of Controlling Quality: A Transactions-Cost Economics Approach." *Hospital and Health Services Administration* 2 (42): 205-27.
- Stiles, R. A., S. Mick, and G. G. Wise. 2001. "The Logic of Transactions Costs Economics in Health Care Organizational Theory." *Health Care Management Review* 26 (2): 85-92.
- Walker, G., and D. Weber. 1984. "A Transaction Cost Approach to Make-Or-Buy Decisions." *Administrative Science Quarterly* 29 (3): 373-91.
- White, H. 1980. "A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity." *Econometrica* 48 (4): 817-38.
- Williamson, O. A. 1975. *Markets and Hierarchies: Analysis and Antitrust Implications*. New York: Free Press.
- . 1991. *The Nature of the Firm: Origins, Evolution, and Development*. New York: Oxford University Press.
- Zinn, J. S., V. Mor, N. Castle, O. Intrator, and D. Brannon. 1999. "Organizational and Environmental Factors Associated with Nursing Home Participation in Managed Care." *Health Services Research* 33 (6): 1753-67.