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ADMINISTERED PRICING AND VERTICAL INTEGRATION IN THE HOSPITAL INDUSTRY*

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ABSTRACT

This article investigates the influence of governmental payment mechanisms under the Medicare program on contractual relationships and vertical integration between hospitals and nursing homes. The "prospective payment system," implemented in 1983, created strong incentives for hospitals to reduce costs per admission by shortening the average length of patient stays, which in turn created a new dependency of hospitals on nursing homes. In contrast to the bilateral contract negotiations which resolve analogous problems in other industries, the price paid to the nursing home to accept a hospital patient cannot be negotiated between the hospital and the nursing home but is established unilaterally by Medicare. However, Medicare does not determine the implicit transfer price governing patient flows between the hospital and nursing home divisions of vertically integrated health care organizations. The impact of administered pricing on vertical integration is confirmed empirically using 1982–90 data on acute care hospitals and skilled nursing facilities.

I. INTRODUCTION

ALTERNATIVE contractual and organizational forms offer different possibilities for controlling the hazards of transacting in an uncertain world. Self-interested buyers and sellers will agree on the form of relationship that minimizes the cost of negotiating, monitoring, and enforcing their agreements. When a third party dictates one or more elements of the final agreement, however, the contractual relationship selected will reflect the interests of that party as well the cost-minimizing interests of the direct trading partners. Governmental entities at the national, state, and local levels frequently pay for services provided by private firms to individual citizens. Payment rates tend to be uniform in the sense of refusing to account fully for differences among particular providers and/or recipients in the cost of delivering the service, thereby limiting the ability of the providers and recipients to use pricing adjustments as one element in the overall contract for service. This constraint disadvantages some contractual forms more than others and shifts the final organizational outcome.

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This article investigates the influence of governmental payment mechanisms under the Medicare program on contractual relationships and vertical integration between acute care hospitals and nursing homes (skilled nursing facilities [SNFs]). In 1983 Medicare shifted its mechanism for paying acute care hospitals from retrospectively determined, hospital-specific rates to prospectively determined, uniform rates per patient admission. This "prospective payment system" (PPS) created strong incentives for hospitals to reduce costs per admission by shortening the average length of patient stay. In turn it created a new dependency of hospitals on nursing homes, the recipient of many discharged patients, analogous to the "temporal specificity" of buyer-seller relationships identified in the construction industry by Robert Eccles,[1] in shipbuilding by Scott Masten, James Meehan, and Edward Synder,[2] and in maritime shipping by Stephen Pirrong.[3]

It is now very important for the hospital to have a nursing home bed available precisely when each patient is suitable for discharge, since Medicare no longer pays higher rates to hospitals who are unsuccessful at speedily finding placements. Medicare has not, however, changed its method of paying nursing homes, continuing to reimburse them on a uniform rate per patient day. In contrast to the bilateral contract negotiations in construction, shipping, and most other industries, therefore, the price paid to the nursing home to accept a hospital patient cannot be negotiated between the hospital and the nursing home but is established unilaterally by Medicare. There is no guarantee that the Medicare rate will be sufficient to reimburse the nursing home for the cost of maintaining excess capacity. Moreover, the rates cannot be adjusted to compensate nursing homes for the prospect of receiving patients who are more expensive to treat after being discharged "quicker and sicker" from the hospital. The limitations on contractual negotiations between hospitals and nursing homes favor unified ownership, since Medicare does not determine the implicit transfer prices used to control patient flows between the hospital and nursing home divisions of vertically integrated health care organizations.

The article begins with a description of Medicare payment policies before and after the transition to prospective payment and the implications for relations between hospitals and nursing homes. I also discuss

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[1] Robert G. Eccles, The Quasifirm in the Construction Industry, 2 J. Econ. Behav. & Org. 335–57 (1981).

[2] Scott E. Masten, James W. Meehan, & Edward A. Snyder, The Costs of Organization, 7 J. L., Econ., & Org. 1–25 (1991).

[3] Stephen C. Pirrong, Contracting Practices in Bulk Shipping Markets: A Transactions Cost Explanation, 36 J. Law & Econ. 937–76 (1993).

the influence of scale and scope economies for acute and subacute care services within hospitals, which played a role in vertical integration during this period as demand for acute services fell and hospitals faced rapid declines in capacity utilization. Attention is also paid to differences between nonprofit and for-profit hospitals and between concentrated and competitive local markets. The third and fourth sections of the article present the econometric model and data to be used for testing the predictions of the analytic framework. Results for the 1982–86 and 1986–90 periods are presented in the fifth section. A concluding section summarizes the implications of governmental administered pricing for the boundaries of firms and markets in the health care industry and discusses the possible implications of current moves from administered pricing to negotiated rates under Medicare.

II. Contractual Relations and Organizational Boundaries

A. Pricing Mechanisms and Temporal Specificity

Prior to 1983 the federal Medicare program paid acute care hospitals retrospective, facility-specific rates based on an accounting of "reasonable costs" for each patient admission. Hospitals with longer lengths of patient stays received higher revenues. In this period, therefore, hospital acute care beds were partial substitutes for SNF beds, and hospitals themselves could absorb fluctuations in patient flow. Patients suitable for discharge to a nursing home could be retained in the acute care beds until a nursing home bed became available. There were informal relations between particular hospitals and particular nursing homes, but little by way of committed investments. Nursing homes received patients from multiple hospitals and were not dependent on any one referral source. Medicare effectively insured hospitals against the financial risk of not having adequate nursing home bed capacity available in their local areas to absorb unexpected increases in the volume of dischargeable patients. The state Medicaid programs effectively insured nursing homes against the financial risk of underutilized capacity by paying a fixed rate per day without limiting the number of days per patient stay; nursing homes maintained high occupancy rates by extending lengths of stay. Some geographic areas exhibited a low supply of nursing home beds relative to elderly population, sometimes in response to efforts by state Medicaid programs to restrain nursing home utilization by limiting new construction. In those areas hospital lengths of stay were longer.[4]

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[4] Genevieve Kenney & John Holahan, Nursing Home Transfers and Mean Length of Stay in the Prospective Payment Era, 29 Med. Care 589–609 (1991).

Beginning in 1983, Medicare paid hospitals prospective, uniform rates based on each patient's severity of illness, as measured by Diagnosis Related Group (DRG).[5] Payment rates per DRG varied across areas based on geographic wage differences; teaching hospitals also were accorded special differentials. Otherwise, however, rates did not vary among hospitals based on differences in patient length of stay, intensity of treatment, or other cost-related factors. Hospitals now faced clear incentives to reduce average length of stay by discharging patients "quicker and sicker" to nursing homes or to their domestic residence.[6] Follow-up studies found that average length of stay declined and that patients were more likely to be clinically unstable when discharged.[7]

These changes in Medicare payment policies for acute care hospitals did not create a commensurate and compatible change in incentives for nursing homes. Skilled nursing facilities continued to be paid on a uniform rate per patient day, regardless of diagnostic severity at admission and subsequent length of stay in the nursing home. The nursing homes' incentives were to maintain full-capacity utilization and long lengths of stay, since the average patient acuity and cost per day tended to decline over time while average revenue per patient day was constant. Nursing homes tended to take losses on patients early in the stay and make profits only later in the stay. They viewed with apprehension the potential for hospitals to increase the average severity of illness among patients discharged, for which the nursing homes would receive no additional compensation from Medicare, and were disinclined to discharge profitable long-stay nursing home patients to accept unprofitable short-stay hospital patients.

Skilled nursing facilities are a more cost-effective locale than are hospitals for the treatment of patients who no longer require acute medical care but are not capable of being discharged to their own homes. An efficient health care system would establish incentives for the transfer of these patients from acute to subacute facilities. This requires incentives both for the hospitals to discharge these patients and for nursing homes to admit them. The dependency of hospitals on nursing homes is a form of "temporal specificity" in contractual relationships, whereby the potential trading partners available to one party are severely limited by the imperative to complete the transaction in a very short period of time. Temporal

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[5] For a description of Medicare payment methods for hospitals before and after the implementation of the PPS, see Charles Helbing, Hospital Insurance and Short-Stay Hospital Benefits, 55 Health Care Fin. Rev. 55–96 (Ann. Suppl. 1992).

[6] Michael A. Morrisey, Frank A. Sloan, & Joseph Valvona, Medicare Prospective Payment and Posthospital Transfers to Subacute Care, 26 Med. Care 685–98 (1988).

[7] Jacqueline E. Kosecoff et al., Prospective Payment System and Impairment at Discharge: The "Quicker-and-Sicker" Story Revisited, 264 JAMA 1980–83 (1990).

specificities exert effects on contractual and organizational relationships analogous to nondeployable investments in specialized physical, human, or geographically located assets. Specialized assets are identified in the transactions cost literature as the prime determinants of departures from spot contracting, including long-term contracting, franchising, and vertical integration.[8] Temporal specificities have been identified as crucial to contract duration and vertical integration in construction, shipbuilding, and maritime transportation.[9]

Any payment mechanism that reimburses hospitals per patient admission and nursing homes per patient day potentially creates an incentive misalignment. One potential solution is for the hospital to build or acquire its own SNF, which would evaluate admissions and discharges from the perspective of the integrated organization rather than from that of the nursing home unit independently. Medicare allows hospitals to "unbundle" the total patient stay, being paid the DRG rate for time in the acute care ward and then a daily rate for time in the subacute care ward. The misalignment of incentives between hospitals and nursing homes can be solved contractually and not lead to vertical integration, however, if hospitals and independent nursing homes can negotiate over the rates paid to the nursing homes. The most obvious pricing solution for this problem would entail a two-part structure, analogous to the nonlinear pricing contracts identified by Victor Goldberg and John Erickson[10] in the petroleum coke industry, where capacity utilization and process flow considerations also are paramount. In principle, hospitals could pay nursing homes a fixed sum per year to maintain excess capacity dedicated to admissions from that hospital, plus a price per patient day that is adjusted for severity of illness.

Medicare's administered pricing system eliminates this option. All nursing homes are paid the same rate per patient day regardless of severity of illness and regardless of the nursing homes' maintenance of excess capacity. This constraint on the ability to vary price in response to variation in other characteristics of the transaction disproportionately disadvantages market contracting for posthospital nursing home services and thereby encourages unified ownership. Medicare's reimbursement poli-

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[8] Oliver E. Williamson, The Economic Institutions of Capitalism (1985); Benjamin Klein, Robert G. Crawford, & Armen A. Alchian, Vertical Integration, Appropriable Rents, and the Competitive Contracting Process, 21 J. Law & Econ. 297 (1978).

[9] Eccles supra note 1; Masten, Meehan, & Snyder, supra note 2; and Pirrong, supra note 3.

[10] Victor P. Goldberg & John R. Erickson, Quantity and Price Adjustment in Long-Term Contracts: A Case Study of Petroleum Coke, 30 J. Law & Econ. 369–98 (1987).

cies do not affect the implicit transfer prices used within organizations to decide when to move patients from one ward to another.[11]

All hospitals that treat Medicare patients are affected by the PPS. The incentive to integrate vertically into skilled nursing home care is not distributed equally, however, but is proportional to the percentage of patients who are covered by Medicare. This percentage, which varies widely among hospitals, will be used to identify the impact of administered pricing on vertical integration in the subsequent empirical analysis.

B. Economies of Scale and Capacity Utilization

Economies of capacity utilization are potentially important for understanding vertical integration during the 1980s because the PPS and other efforts to reduce hospital admissions and length of stay led to a dramatic decline in hospital acute care patient days. Medicare's efforts in this regard were complemented by the rapid growth in enrollment among HMOs and the establishment of hospital utilization review ("managed care") by traditional health insurers. Declining utilization of acute care services freed up space, management, and personnel that could be reallocated to compatible services. Hospital administrators with declining acute care utilization became interested in developing on-site skilled nursing units, compared to administrators in hospitals who were more successful in maintaining traditional acute care utilization patterns.[12] Integrating into

[11] There is one additional feature of Medicare's PPS that influenced decisions to integrate vertically into skilled nursing care. The PPS establishes prospective rates for hospital payment, but leaves untouched the retrospective, fee-for-service payment mechanism for physicians. Physicians continue to be paid more for doing more. Keeping sick patients in the hospital economizes on physician time and allows physicians to shift the overhead expense (administration, nursing care) to the hospital and away from the physician's private practice. This misalignment of incentives between hospitals and physicians is crucial because only physicians have the authority to discharge patients from hospitals and therefore exert direct control over length of stay. Creation of skilled nursing units within the hospital facility reduced physician opposition to early discharge of patients under prospective payment. Physicians could continue to minimize travel time (that is, compared to visiting patients in both hospitals and in freestanding nursing homes) while cooperating with the hospital's desire for short lengths of stay in the acute care wards. They can also monitor more closely the quality of care administered to discharged patients than would be the case if those patients were transferred to freestanding facilities.

[12] Technological economies of scope are not a sufficient explanation for organizational diversification since it is conceptually possible for the firm to lease out the excess capacity to an independent firm. See David J. Teece, Economies of Scope and the Scope of the Enterprise, 1 J. Econ. Behav. & Org. 223–47 (1980). Some hospitals did hire nursing home management companies to help them set up skilled nursing facilities. The decision by the hospitals to own the subacute facilities themselves, rather than lease them to independent nursing home chains, was probably due to the fact that the common assets underlying the scope economies included human assets (nurses, nursing aides, orderlies) as well as physical space. Product diversification permitted hospitals to avoid extensive staff layoffs. Contractual reasons explain why the skilled nursing unit of one hospital is unlikely to receive

nursing home services permitted the hospital to employ its nursing staff and managerial expertise more fully than would the leasing of redundant space to nonmedical users. The subsequent empirical analysis captures the influences of capacity utilization by measuring the acute care bed vacancy rate.

Scale economies exist in hospital-based nursing home units because subacute care and acute care beds are not perfect substitutes. If hospital skilled nursing units will receive few patients from sources other than the hospital that owns them, nursing units in small hospitals will suffer from diseconomies of scale. The econometric analysis will examine the role of economies of scale for nursing home units by including the number of acute care beds as an independent determinant of the decision to establish a subacute unit. Direct evidence on optimal scale for hospital-affiliated SNFs will be obtained by examining whether hospitals with fewer acute beds establish nursing home units with fewer subacute beds, compared to hospitals with large numbers of acute beds. If large hospitals draw patients from a wider geographic scope than small hospitals, and are hence under greater pressure to discharge to a facility in the patient's community rather than to the hospital's own SNF, the optimal number of beds in a hospital-based SNF will be unrelated to the number of acute care beds in the hospital.

C. Nonprofit Hospitals and the Nondistribution Constraint

Medicare reimburses nonprofit and for-profit hospitals similarly under the PPS. This does not imply, however, that ownership type is irrelevant to the decision to integrate vertically into nursing home facilities. Indeed, the transition from cost-based to prospective payment potentially strengthens the importance of ownership form for understanding hospital behavior.

The best established economic model of the nonprofit hospital[13] interprets management as maximizing output subject to a budgetary break-even constraint. Hospitals trade off one type of output against other types and quantity against quality based on the managers' preferences. This model was developed during the period of cost-based hospital reimbursement but was in fact mismatched to the payment realities of that time.

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significant referrals from the acute care wards of competing hospitals. Williamson, *supra* note 8, provides a general discussion of why contractual rather than technological reasons explain the correlation between scale economies and firm size.

[13] Joseph P. Newhouse, Toward a Theory of Nonprofit Institutions: An Economic Model of the Hospital, 60 Am. Econ. Rev. 64–74 (1970); Martin S. Feldstein, Hospital Cost Inflation: A Study of Nonprofit Price Dynamics, 61 Am. Econ. Rev. 853–72 (1971).

Prior to the prospective payment system, hospitals did not labor under a budget constraint. Institutions that increased output quantity and/or quality increased their Medicare revenues by a proportional amount. Conversely, hospitals that reduced output in one dimension, such as by reducing length of stay for acute care patients, were not able to redirect the saved resources to another type of output, such as subacute care. Medicare cut hospital revenues dollar for dollar if the hospital cut its costs.

Under prospective payment, by way of contrast, hospitals that reduce expenditures per admission for acute care patients are permitted to keep the savings. Now, for the first time, hospitals work under a fixed budget constraint (conditional on volume and DRG-mix of patients). For-profit hospitals which successfully reduce length of stay and costs can pass the profits on to their stockholders. Nonprofit hospitals cannot distribute profits from treating Medicare beneficiaries but must reinvest in the hospital organization itself. This "nondistribution constraint"[14] limits the choice facing nonprofit hospital administrators to one of trading off the quantity/quality of one output (that is, acute care) against the quantity/quality of other outputs (that is, subacute care). Nonprofit hospitals have many competing uses for Medicare net revenues aside from constructing SNFs, as evidenced by the literature on technology diffusion in this industry.[15] Other things being equal, however, nonprofit hospitals will be more inclined to pursue vertical integration and less inclined to develop contractual relations for nursing home services (and other desired services) than their for-profit counterparts. The subsequent empirical analysis compares the behavior of nonprofit hospitals with that of for-profit hospitals.

D.   The Structure of Nursing Home Markets

It has been evident for years that the aging of the American population is expanding the market for nursing home services. The prospective payment system for hospitals only accelerated that trend. Trends in aging do not affect all hospitals equally, however, since the elderly disproportion-

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[14] Henry Hansmann, The Role of Nonprofit Enterprise, 89 Yale L. J. 835–901 (1980); Burton A. Weisbrod, The Nonprofit Economy (1988).

[15] Maw-Lin Lee, A Conspicuous Production Theory of Hospital Behavior, 38 S. Econ. J. 48–58 (1971); Gerard Anderson & Earl Steinberg, To Buy or Not to Buy: Technology Acquisition under Prospective Payment, 311 New Eng. J. Med. 182 (1984); Harold S. Luft et al., The Role of Specialized Clinical Services in Competition among Hospitals, 23 Inquiry 83 (1986); James C. Robinson, Deborah W. Garnick, & Stephen J. McPhee, Market and Regulatory Influences on the Availability of Coronary Angioplasty and Bypass Surgery in U.S. Hospitals, 317 New Eng. J. Med. 85–90 (1987).

ately retire in some communities rather than others. The empirical analysis measures potential demand for nursing home services in terms of the number of persons aged 65 or over residing in the local market.

The supply and distribution of nursing home beds in the local market should influence decisions by hospitals contemplating expansion into subacute services. Most economic theories would predict that hospitals in areas with many competitors would be less likely than hospitals in thinner markets to integrate vertically into nursing home services. George Stigler[16] emphasizes the importance of scale economies in creating a life cycle of vertical integration, disintegration, and reintegration as the market for a particular service begins small, grows large enough to support multiple independent firms that exhaust scale economies, and then shrinks as consumer demand shifts to other services. Paul Joskow[17] emphasizes contractual rather than scale factors in his analysis of the role of "site specificity" on contract duration and vertical integration. Electric utilities that construct power plants adjacent to coal mines to economize on transportation costs face an extremely limited (monopsonistic) input market for coal and protect themselves from opportunistic behavior through long-term contracts or vertical integration. Pirrong[18] highlights the importance of volume of trade (market thickness) for specific commodities between specific ports in his explanation of observed patterns of spot contracting, long-term contracting, and vertical integration between maritime shippers and carriers.

These models cannot be imported uncritically into the hospital and nursing home industry because of the nature of the rivalry that occurs among firms there. Under administered pricing, whether of a cost-based or prospective type, hospital-based and freestanding SNFs cannot compete for patient admissions on the basis of price. Medicare refuses to allow those facilities to pass any savings from lower costs on to patients through lower prices. Freestanding nursing homes can compete with hospital-based units in nonprice dimensions, of course, but potentially suffer from a strong disadvantage. Selection of nursing home placement for hospital patients is usually done by discharge planners on the staff of the hospital, after consultation with the patient and the physician in charge. Given the lack of price considerations, patient preferences are heavily weighted by perceived quality. Both the hospital discharge planner and

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[16] George J. Stigler, The Division of Labor Is Limited by the Extent of the Market, 59 J. Pol. Econ. 185–93 (1951).

[17] Paul L. Joskow, Vertical Integration and Long-Term Contracts: The Case of Coal-Burning Electric Generating Plants, 1 J. L., Econ., & Org. 33–80 (1985).

[18] Pirrong, *supra* note 3.

the attending physician are likely to argue that the hospital's own nursing facility provides the best quality of care. Consequently, the presence of many nursing homes in the local market need not discourage hospitals from integrating vertically into subacute care. The empirical analysis will include the Herfindahl-Hirschman index (HHI) of share distributions in the local nursing home market to examine whether hospitals in areas with more nursing home options were less inclined to integrate vertically than hospitals in areas with fewer SNF options.

The relevant market for hospital-SNF services potentially could be defined in terms of competing hospitals rather than competing nursing homes. Prior to 1982, cost-based reimbursement by Medicare and private insurers precluded price competition among hospitals in local geographic markets. Hospitals competed in nonprice dimensions, including greater excess capacity, higher staffing and skill levels, and more elaborate medical technologies.[19] With the shift to price-based contracting by private insurers, HMOs, and some state Medicaid programs in the early 1980s, however, hospitals began to compete aggressively on price as well as nonprice dimensions. Econometric studies for the period after 1983 report rates of hospital cost inflation in structurally competitive markets lower than in concentrated markets.[20] To the extent vertical integration increases hospital flexibility to move patients from acute to subacute care beds, it can enhance the hospital's availability to new acute care admissions. Joskow highlights this maintenance of potential capacity as a key feature of hospital nonprice competition.[21] However, during the 1980s most hospitals experienced high excess capacity in acute care beds due to declining demand, and it is unlikely that further flexibility in this regard was perceived as a competitive advantage. Of greater importance was the widespread perception that the successful hospital organizations of the future will cover the whole continuum of health care from outpatient diagnostic and therapeutic services to acute inpatient care, home health care, and subacute facilities. The empirical analysis will include the HHI of share distributions in the local hospital markets in addition to the HHI

[19] See Paul L. Joskow, The Effects of Competition and Regulation on Hospital Bed Supply and the Reservation Quality of the Hospital, 11 Bell J. Econ. 421 (1980); James C. Robinson, Market Structure, Employment, and Skill Mix in the Hospital Industry, 55 S. Econ. J. 315 (1988); Luft et al., supra note 15.

[20] Jack Zwanziger & Glenn Melnick, The Effects of Hospital Competition and the Medicare PPS Program on Hospital Cost Behavior in California, 7 J. Health Econ. 301–20 (1988); David Dranove, Mark Shanley, & William D. White, Price and Concentration in Hospital Markets: The Switch from Patient-Driven to Payer-Driven Competition, 36 J. Law & Econ. 179–204 (1993); James C. Robinson & Ciaran S. Phibbs, An Evaluation of Medicaid Selective Contracting in California, 8 J. Health Econ. 437–55 (1989).

[21] Joskow, supra note 19.

for local nursing home markets. In general, one would expect hospitals in more competitive markets to be more likely to develop a nursing home facility and thereby offer a full range of services than hospitals in less competitive markets. However, firm hypotheses are impossible for this period of rapid change in competitive dynamics, and the analysis of market structure and performance should be considered exploratory.

III. Econometric Model

The foregoing discussion suggests the following econometric specification for the determinants of a hospital's decision to maintain a nursing facility:

$$N_{it} = \alpha_0 + Y_t\beta_0 + P_{it}\beta_{1t} + O_{it}\beta_{2t} + V_{it}\beta_{3t} + S_{it}\beta_{4t} + M_{it}\beta_{5t} + U_{it}. \quad (1)$$

Here N is a dichotomous variable indicating whether or not hospital i has a nursing home unit in time t, Y is a variable indicating the year t, P is the percentage of hospital patients covered by Medicare, O is a dichotomous variable indicating ownership type (nonprofit vs. for-profit), V measures capacity utilization (acute care bed vacancy rate), S represents hospital scale (acute care beds), M is a vector of variables that measure demand and the structure of the local market, and U is a stochastic error term.

The switch from retrospective, hospital-specific pricing to prospective, uniform pricing by Medicare caused a change in the value of the parameters in (1). In 1982, prior to the PPS, there is no reason to assume a significant association between percentage Medicare, nonprofit ownership, vacancy rate, or market structure and the likelihood of owning a nursing unit ($B_1 = B_2 = B_3 = B_5 = 0$). The parameter on size (B_4) would be expected to be positive in 1982, since scale economies in the provision of nursing home services would be relevant even then. The vast majority of patients in a hospital-based nursing home facility are admitted from the hospital's acute care facility; hospitals with few acute care beds do not generate sufficient patient flow to maintain a nursing home unit at the minimum efficient scale. After the imposition of prospective payment, we expect a positive relationship between percentage Medicare, nonprofit ownership, and vacancy rate and the probability of maintaining a nursing facility. The relationship between market competitiveness and vertical integration is ambiguous, given the dominance of nonprice over price competition among nursing homes and hospitals for Medicare beneficiaries. Schematically, the expected parameter signs are given in Table 1.

The econometric specification for the probability of vertical integration (that is, add an SNF) between time t and time $t + 1$ therefore must account for both changes in the values of the variables and changes in

TABLE 1

HYPOTHESIZED PARAMETER SIGNS FOR EQUATION
DETERMINING PROBABILITY THAT $N_{it} = 1$

	$t = 1982$	$t = 1990$
Percent Medicare (P)	0	+
Nonprofit ownership (O)	0	+
Vacancy rate (V)	0	+
Scale (S)	+	+
Market competition (M)	0	+

the values of the parameters. Subtracting equation (1) measured at time t from equation (1) measured at time $t + 1$, one obtains the varying parameters vertical integration model:

$$(N_{it+1} - N_{it}) = \beta_0 + (P_{it+1} - P_{it})\beta_{1t} + P_{it}(\beta_{1t+1} - \beta_{1t})$$
$$+ O_{it}(\beta_{2t+1} - \beta_{2t}) + V_{it}(\beta_{3t+1} - \beta_{3t}) \qquad (2)$$
$$+ S_{it}(\beta_{4t+1} - \beta_{4t}) + M_{it}(\beta_{5t+1} - \beta_{5t}) + (U_{it+1} - U_{it}).$$

In (2) the time invariant intercept term from equation (1) has been differenced away. The year effect ($Y_{t+1} - Y_t$) takes the same value for all hospitals i and thus acts as a constant, the intercept term B_0 in the vertical integration equation. I exclude ($O_{it+1} - O_{it}$) since there is no change in ownership status (that is, from nonprofit to for-profit) during this period. I exclude the change in bed size ($S_{it+1} - S_{it}$) and vacancy rate ($V_{it+1} - V_{it}$) since they are endogenous. The decision to open an SNF is usually also a decision to reduce the number of acute care beds and thereby reduce the acute care bed vacancy rate. The levels of these variables (V_{it}, S_{it}), as distinct from the changes, are included because the value of V or S in time t is not determined by the subsequent change in the value of N between time t and time $t + 1$. Hospitals which already own an SNF at time t are excluded from equation (2), since they cannot add a facility between t and $t + 1$.

In the empirical analysis, I estimate the parameters of (2) for the 1982–86 and 1986–90 periods separately. Medicare's PPS was phased in over the 1983–85 period, with an increasing fraction of Medicare payments to each hospital being based on the prospective, uniform rates in each quarter until total conversion to prospective payment was achieved in 1985. It is thus to be expected that the influence of administered pricing on vertical integration would be stronger after 1986 than before. If the long-term impact of prospective payment could be fully anticipated by

hospital administrators, however, the move to vertical integration could be stronger in the first period than in the second.

IV. DATA ON HOSPITALS AND HOSPITAL MARKETS

Data on hospitals and hospital markets for 1982, 1986, and 1990 were obtained from the mandatory reporting system of the California Office of Statewide Health Planning and Development (OSHPD). The OSHPD Annual Report of Hospitals was used to obtain information on whether or not the hospital maintained a skilled nursing unit (N), ownership type (O), acute bed vacancy rate (V), and number of acute care beds (S). The OSHPD patient discharge abstract data files were used to obtain the percentage of acute care patients covered by Medicare (P). The OSHPD Long-Term Care Facility Annual Utilization Report was used to obtain data on freestanding, nonhospital SNFs. Number of elderly (aged 65 or greater) was obtained from census sources.

Market demand was measured in terms of the number of elderly persons in the hospital's geographic area. Market structure was measured in terms of the HHI (the sum of squared firm shares) in the local nursing home and hospital markets. Market shares were measured in terms of staffed beds in the firm as a fraction of staffed beds in the market. Skilled nursing beds include both hospital SNF units and freestanding (nonhospital) SNFs and were obtained by summing for each market the hospital-based SNF beds from the OSHPD hospital file and the freestanding SNF beds from the OSHPD Long-Term Care Facility file. Separate measures of market structures for independent and hospital-affiliated SNFs were also calculated for purposes of comparison. Hospital acute care beds in the market were obtained by aggregating beds from the OSHPD hospital file. The upstream (hospital) and downstream (nursing home) market HHI measures are quite different because most hospitals do not maintain nursing home units, and most nursing homes are not owned by hospitals.[22] The market demand and market structure vector (M) thus contains three variables: elderly population, HHI of SNF beds, and HHI of acute care hospital beds.

There has been considerable research on the geographic scope of local hospital markets but no comparable research on the geographic scope of local nursing home markets. Genevieve Kenney and John Holahan[23] use the Metropolitan Statistical Area for urban areas and three-digit zip code

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[22] In 1990 in California 26 percent of hospitals maintained skilled nursing units, and 11 percent of skilled nursing facilities were hospital-based.

[23] Kenney & Holahan, *supra* note 4.

area for rural areas. This results in very large geographic markets in urban areas such as Los Angeles and San Francisco. I use the aggregates of three-digit zip codes developed by the U.S. Postal Service to define major residential communities in California as the measure of SNF markets. This approach creates 25 local markets in California. These vary widely in geographic scope and number of SNFs. The north coast around Eureka is considered one market with six SNFs, while the Los Angeles area is considered eight markets with 60, 54, 62, 71, 45, 44, 42, and 48 SNFs, respectively.

I apply the log odds transformation $\ln(N/(1 - N))$ to the dichotomous dependent variable and estimate the parameters of (2) using maximum likelihood logit. The hospital size variable S is measured in logarithmic units to capture nonlinearities in the scale-integration relationship. Hospitals with less than 50 acute care beds were excluded, since they are permitted by Medicare to convert patients administratively to SNF status, thereby receiving payment beyond the DRG rate, without constructing a distinct nursing home unit.[24] I also exclude public hospitals. As providers of last resort for the uninsured in California, their decisions concerning nursing home units are based on different considerations than are private (nonprofit and for-profit) hospitals. In particular, public hospitals receive relatively few Medicare patients and are heavily supported by tax revenues that are independent of patient volume and mix.

V. RESULTS

Table 2 presents descriptive statistics for hospitals and hospital markets in the 1982–86 and 1986–90 periods. Consistent with the hypothesis that the influence of prospective payment on vertical integration increased over time as the PPS system was phased in, 7.4 percent of hospitals added nursing home units in the early period, and 17.6 percent added them in the later period. Capacity utilization declined, with the acute bed vacancy rate growing from 38.8 percent in 1982 to 46.7 percent in 1986, despite the closure of multiple hospitals. California experienced considerable growth in the elderly population during these years, outstripping the growth in number of nursing home beds. The percentage of patients covered by Medicare remained relatively constant for the hospital industry as a whole during these years, although some individual facilities experi-

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[24] Medicare permits hospitals with less than 50 beds to designate "swing beds," that is, beds that can be used for either acute or skilled nursing care, obviating the need to establish formally a nursing home unit. The determinants of swing bed utilization in small rural hospitals are very different from the determinants of vertical integration in large hospitals and would require separate analysis.

TABLE 2

SUMMARY STATISTICS

	1982–86		1986–90	
	M	SD	M	SD
Probability of vertical integration	.074	.262	.176	.381
Percentage of patients covered by Medicare	.334	.127	.317	.125
Change in percentage covered by Medicare	− .008	.058	− .014	.077
Nonprofit ownership	.662	.474	.645	.479
Log of acute care beds	5.056	.636	5.111	.623
Acute bed vacancy rate	.388	.162	.467	.154
Number of elderly in local market (1,000s)	132.75	60.21	146.61	62.96
Nursing home market structure (HHI)	.037	.043	.056	.047
Hospital market structure (HHI)	.061	.033	.066	.040
N	325		279	

NOTE.—HHI = Herfindahl-Hirschman index.

enced significant changes. Throughout this decade approximately two-thirds of private hospitals in California were nonprofit, with the remainder being investor-owned.

Table 3 presents logistic parameter estimates from equation (2) for both the 1982–86 and 1986–90 periods. Hospitals with larger fractions of their patients covered by Medicare were significantly more likely to integrate vertically into nursing home services in both periods than were hospitals with proportionately fewer Medicare patients, and the effect grew over time as the administered pricing system was fully phased in. The economic importance of the effect can be evaluated by comparing the likelihood of integration for hospitals with 20 percent Medicare patients (approximately 1 standard deviation below the mean) to the likelihood for hospitals with 45 percent Medicare patients (approximately 1 standard deviation above the mean). During the 1982–86 period, a hospital with a relatively high Medicare patient mix would be 8.7 percentage points more likely to integrate than an otherwise comparable hospital with a relatively low Medicare patient mix.[25] During the 1986–90 period, a high-Medicare hospital would be 16.8 percentage points more likely to integrate into

[25] This number is calculated by multiplying the approximately 2 standard deviation difference in percentage Medicare (0.25) by the derivative of the vertical integration variable with respect to percentage Medicare in Table 3. This derivative is obtained from the logistic equation as $dN/dP = B_1 N(1 - N)$, where B_1 is the logistic parameter estimate on percentage Medicare in Table 3, and N is evaluated at the sample average. The incremental impact of additional Medicare patients on probability of vertical integration is larger in the 1986–90 period than in the 1982–86 period, due to a larger $N(1 - N)$ despite a smaller logistic parameter estimate B_1 in Table 3.

TABLE 3

LOGISTIC PARAMETER ESTIMATES OF THE DETERMINANTS OF HOSPITAL VERTICAL
INTEGRATION INTO NURSING HOME SERVICES

	1982–86	1986–90
Percentage of patients covered by Medicare	5.0739***	4.6412***
	(1.7907)	(1.5251)
Change in percentage covered by Medicare	3.1534	4.0849*
	(4.0619)	(2.1913)
Nonprofit ownership	1.3337*	1.6786***
	(.6994)	(.4990)
Log of acute care beds	.7105*	.9720***
	(.3982)	(.3235)
Acute bed vacancy rate	.6502	2.9792*
	(1.6313)	(1.3784)
Number of elderly in local market (1,000s)	.0018	.0019
	(.0056)	(.0040)
Nursing home market structure (HHI)	− 6.3127	1.2417
	(14.0931)	(6.1370)
Hospital market structure (HHI)	3.4769	− 10.8582
	(14.2448)	(8.1589)
Intercept	− 9.5458	− 10.4466
	(2.7036)	(2.4200)
− 2 log likelihood	171.3	259.3
N	325	279

NOTE.—HHI = Herfindahl-Hirschman index. Values in parentheses are standard deviations.
    * Significant at $p < .10$.
    *** Significant at $p < .01$.

nursing home services than a low-Medicare hospital. Hospitals who received an increasing percentage of patients covered by Medicare over these 2 periods, and hence whose dependency on administered pricing grew relative to their competitors, were also more likely to add nursing home units. A 2 standard deviation difference in the change in Medicare patient mix was associated with a 2.5 percentage point increase in the probability of integrating into nursing home services in 1982–86 (not statistically significant) and a 9.1 percentage point increase in 1986–90.

The influence of scale and capacity utilization is evident in the parameters on number of acute care beds and the bed vacancy rate. Compared to small hospitals (with log beds 1 standard deviation below the mean), large hospitals (1 standard deviation above the mean) were 6.2 percentage points more likely to integrate into SNF services in 1982–86 and 17.6 percentage points more likely to integrate in 1986–90. This highlights the importance of scale economies in the provision of nursing home services

within acute care hospitals. It is consistent with the view that hospital SNF units receive most of their admissions from patients discharged from the hospital's own acute care beds. The optimal scale for hospital-affiliated SNFs is relatively independent of the size of the hospital, consistent with the evidence that number of acute care beds strongly influences the decision to establish a nursing home unit but only weakly influences the subsidiary decision of how many subacute beds to place in the nursing home unit. The mean number of SNF beds in hospitals which choose to establish SNF units is 48 for hospitals with 50–99 acute care beds, 45 for hospitals with 100–199 acute care beds, 53 for hospitals with 200–299 acute care beds, and 36 for hospitals with 300–399 acute care beds, but rises to 65 for hospitals with 400 or more acute care beds. This weak association between hospital size and SNF size is possibly attributable to larger hospitals drawing from a large geographic radius than smaller hospitals. Patients and their families are willing to travel farther for a short acute hospital treatment than for a more extended nursing home recovery period. Hospitals drawing from distant communities are under pressure to discharge to SNFs closer to the patient's home.

Capacity utilization was less important than scale economies in influencing vertical integration, as evidenced by the weak association between the acute bed vacancy rate and the likelihood of developing a nursing home unit. Only in the later period were hospitals with high vacancy rates significantly more likely to integrate into nursing home services than otherwise comparable hospitals with low vacancy rates.

Nonprofit hospitals were significantly more likely to integrate into nursing home services than were for-profit hospitals, with the effect growing over time. Nonprofit hospitals were 9.2 percentage points more likely than for-profit hospitals to add nursing home services between 1982 and 1986 and were 24.3 percentage points more likely to add nursing home services between 1986 and 1990.

Hospitals in geographic areas with large numbers of elderly residents were more likely to integrate into nursing home services in both periods than were hospitals in smaller cities, but the effect is not statistically significant. There is no association between the structure of the local nursing home and hospital markets, as measured by the two HHIs, and the hospital's decision to integrate into nursing home services. The effect of market structure on vertical integration requires further research using other measures of vertical integration, other measures of local market structure, and data from other states. Susan Lehrman reported a negative association between the SNF beds to elderly population ratio and vertical integration using national data from the American Hospital Association

from 1985–88.[26] However, she found a small positive but insignificant association for the California subset. Many states (but not California) tried to constrain the nursing home expenditures of their Medicaid programs during the 1980s by imposing entry barriers to new nursing home construction (Certificate of Need legislation). These entry barriers encouraged hospitals to open their own nursing home facilities (which were not subject to entry barriers). In these states, we should expect that areas with constrained supplies of freestanding SNFs relative to population would exhibit a higher rate of hospital vertical integration than areas with less constrained supplies of nursing home beds relative to population.

VI. Conclusion

Two explanations for vertical integration dominate the transactions cost literature. Benjamin Klein, Robert Crawford, and Armen Alchian and Oliver Williamson[27] emphasize the role of nonredeployable investments in specialized physical, human, or geographic assets as the necessary condition for departure from spot contracting and move toward organizational consolidation. Ronald Coase[28] highlights difficulties in writing and enforcing complex contracts as a sufficient condition for vertical integration, arguing that specialized assets alone do not necessitate abandoning the attractive incentive features of markets. Neither of these two sets of explanations adequately fits the vertical integration of hospitals into nursing home services. Hospitals and other health care organizations use generalized rather than firm-specific equipment and skills.[29] Hospitals face no exceptional uncertainties and difficulties in writing contracts to obtain committed nursing home beds, as evidenced by the successful use of capacity leasing and nonlinear pricing formulas in other process industries.

This article has emphasized a third factor in explaining the choice of vertical integration over contractual solutions in the hospital and nursing home industries. The governmental uniform pricing system prevented hospitals and nursing homes from developing flexible pricing rules to align the incentives of the buyers and sellers of skilled nursing capacity.

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[26] Susan E. Lehrman, Hospitals' Vertical Integration and Related Diversification Behaviors between 1985 and 1988: An Exploration of Two Specific Services (unpublished Ph.D. dissertation, Univ. California, Berkeley 1993).

[27] Klein, Crawford, & Alchian, *supra* note 8; Williamson, *supra* note 8.

[28] Ronald H. Coase, The Nature of the Firm: Origin, Meaning, Influence, 4 J. L., Econ., & Org. 3–47 (1988).

[29] See James C. Robinson, The Changing Boundaries of the American Hospital, 72 Milbank Q. 259–75 (1994).

The administered pricing system disadvantaged market contracting and encouraged vertical integration, since it did not constrain the implicit transfer prices used to allocate resources and reward performance between the acute and subacute care divisions of integrated health care organizations. The "temporal specificity" of economic decisions in the hospital and nursing home sector was dramatically strengthened by enactment of prospective payment in 1983 and served as a necessary condition for the abandonment of informal relations and spot contracting between hospitals and nursing homes. The uniform and nonnegotiable nature of the Medicare rates discouraged contractual solutions and served as a sufficient condition for the shift to vertical integration.

The dependence of hospitals on nursing homes for the efficient transfer of patients is a consequence of the process technology in health care. Large efficiency gains accrue to organizations and health care systems which succeed in aligning the incentives of both parties to the transaction. Medicare's PPS took an important step in the right direction, compared to the earlier system of cost-plus reimbursement, by encouraging hospitals to discharge patients as soon as medically possible. However, it made no commensurate change in the nursing homes' incentives to maintain dedicated capacity and accept the risk of a more variable and complex patient flow. This halfway move encouraged vertical integration in many cases when contractual solutions would have been adequate. Hospitals are a high-cost provider of subacute care, compared to freestanding nursing homes. Hospital-based SNFs are smaller, suffering from diseconomies of scale (compared to freestanding SNFs), and operate with lower rates of capacity utilization (due to receiving patients from only one hospital). They pay higher wages and use a more labor-intensive style of treatment. Average costs per patient day in hospital-based units are twice those in freestanding facilities. Abandoning the logic of prospective payment and reverting to the logic of cost-based payment, Medicare agreed to higher rates for hospital-based SNF units (compared to freestanding SNFs). The hospital differential is only half the difference between average costs per day in hospital-based and freestanding SNFs, however.[30]

[30] Health Care Financing Administration, Medicare Program: Schedule of Limits for Skilled Nursing Facility Inpatient Routine Service Costs, 58 Fed. Reg. 13317–30 (1991). In part, vertical integration was a conscious objective of the Medicare program. Medicare was concerned about the ability of the freestanding nursing home industry to expand fast enough to cover the increased demand for subacute care services. More important, perhaps, was Medicare's historical antipathy to the for-profit freestanding nursing home industry, which emerged in response to the Medicaid nursing home entitlement program in the 1960s. Medicaid programs have been viewed historically by the states as welfare programs and therefore have paid low prices. Freestanding nursing homes have responded by providing low quality. In contrast, Medicare views itself as part of the Social Security system and not as connected to welfare services. It seeks high quality and historically has been willing

The Medicare program is now moving toward a method that pays health care organizations a rate per patient per year for all acute and subacute care (as well as physician and other related services). This contrasts with the current method, which pays health care organizations separate rates per hospital admission and per nursing home day. "Risk contracting" by Medicare has been slow to spread in many areas but has accelerated in California and other regions with high penetration by HMOs. It permits flexible pricing mechanisms to be used by HMOs for reimbursing hospitals, nursing homes, and other health care providers. Health maintenance organizations are paid a fixed sum per enrollee per month by Medicare and can use any mix of vertical integration and contract to guarantee provision of physician, hospital, nursing home, and other covered services.

The effect of Medicare risk contracting is likely to vary according to the structure of local health care markets. In small cities and rural areas, a nursing home that expanded capacity to accommodate the needs of an acute care hospital would expose itself to the risk that the hospital would renegotiate the rates at which it leased beds or reimbursed patient days. In some other industries, reciprocal trading is used to limit opportunistic exploitation of dedicated capacity, but nursing homes do not control patient flows to hospitals. Vertical integration may be the efficient solution in these contexts. In competitive urban areas, however, nursing homes admit patients from multiple hospitals, and less need exists for the dedication of excess capacity to accommodate the needs of any one institution. Here contractual solutions are likely to dominate. Ultimately, Medicare risk contracting may create a pattern where the division of labor between hospitals and nursing homes is limited only by the extent of the market.[31]

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to pay high (cost-based) rates for services. See Bruce C. Vladeck, Unloving Care: The Nursing Home Tragedy (1980).

[31] Stigler, supra note 16.

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