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SCHOOL OF ALLIED HEALTH PROFESSIONS
DEPARTMENT OF HEALTH ADMINISTRATION
VIRGINIA COMMONWEALTH UNIVERSITY

This is to certify that the dissertation prepared by Herng-Chia Chiu, *The Linkage Between Hospitals and Nursing Homes: Alternative Approaches to Minimizing Transaction Costs*, has been approved by his committee as satisfactory completion of the dissertation requirement for the degree of Doctor of Philosophy.

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The Linkage between Hospitals and Nursing Homes: Alternative Approaches to Minimizing Transaction Costs

A dissertation submitted in partial fulfillment of the requirement
for the degree of Doctor of Philosophy
at Virginia Commonwealth University

By

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To the memory of my mother, who taught me that kindness is the greatest wisdom,
and to my father, who teaches me that diligence conquers any difficulty

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Abstract

THE LINKAGE BETWEEN HOSPITALS AND NURSING HOMES:
ALTERNATIVE APPROACHES TO MINIMIZING TRANSACTION COSTS

By Herng-Chia Chiu, Ph.D.

A dissertation submitted in partial fulfillment of the requirement for the degree of Doctor of Philosophy at Virginia Commonwealth University

Medical College of Virginia Campus, Virginia Commonwealth University, 1995

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Finding more efficient ways to organize and deliver medical care is a major policy and management concern in the United States. High levels of expenditures for administrative and coordinating functions are attributed to the fact that health care systems are not "seamless" and that excessive transaction or friction costs are incurred in the exchanges between providers and purchasers and among providers. Renewed interest in vertical integration as a means to addressed these problems is being explored in the empirical literature, but rigorous theory-based investigations are rare. This study is a theory-based exploration of how hospitals address the "make-or-buy" decision of acquiring nursing home services for patients requiring post-acute stay placement.

The purpose of the study is to investigate under what circumstances hospitals chose to undertake formal arrangements to acquire nursing home services for patients to be discharged, rather than simply arranging for each discharge in the "spot market." In some instances this may be long-term contracting or leasing of beds, while in other instances it may mean the hospital acquires or develops its own skill nursing facility--a form of vertical integration. The study adopts Oliver Williamson's transaction cost economics theory as the theoretical basis for the study. This framework argues that the most efficient mode of transacting is determined by analyzing three dimensions of the transaction: uncertainty, frequency, and asset specificity (supplier identity). At higher levels of each of these dimensions, organizations are more likely to observe that "markets fail" and that formal arrangements between buyers and sellers are preferable, with vertical integration representing the "make" versus "buy" option.

The study uses data from the American Hospital Association Survey and other sources to identify if and how hospitals have made formal arrangements for nursing home services. It tests ten hypotheses derived from the theory that focus on the three dimensions of transactions and interactions among them. The methodology uses several analytical approaches to establish the validity of the measures of the dimensions, and then tests the hypotheses using multivariate logistic regression to contrast various modes of transaction. The importance of transaction uncertainty and specificity are strongly supported in the findings, while transaction frequency is weakly correlated to higher degrees of integration. The results are consistent with both the theoretical arguments advanced by transaction cost

economics and with prior research, which is only available from non-health care applications.

The study makes an important, and perhaps unique, contribution to empirically operationalizing and testing a transaction cost economics-based interpretation of the decision to vertically integrate in health care. It also provides useful insight into the need for vertical integration to be selectively adopted as it may not be the most efficient mode of organization in all "make or buy" decision opportunities.

Chapter 1

Introduction

Acute care hospitals are facing a fundamental challenge - to reconstruct their boundaries by providing a variety of related services to their consumers. New reimbursement policies, the growth of managed care networks, and the development of medical technology and disease epidemiology all are changing hospitals' delivery patterns. Traditionally, hospitals provided care only to patients who needed acute care. They now have to provide an integrated care delivery system that includes preventive medicine, and services from acute care to long-term care.

The integrated hospital care delivery system will require hospitals to expand services either forward to ambulatory care or backward to subacute care, such as long-term care services for nursing home and home care. It has been the trend in the past decade for hospitals to vertically integrate various hospital-related services (Conrad, Mick, Madden, & Hoare, 1988; Robinson, 1994) in response to the pressure of environmental change. The trend raises several significant questions. Why have some hospitals recognized the trend and vertically integrated different technological services, while others have not? What are the major determinants that explain the differences? Most importantly, what degree of vertical integration have hospitals employed?

All these questions fit into the framework of transaction cost economics. Transaction cost economics proposes that the emergence of organizations is due to the failure of markets. The present study investigates hospitals' decisions to "make or buy" nursing home services, by using the approach of transaction cost economics. The study seeks to identify the most efficient design that a hospital may choose under certain circumstances, such as specific levels of environmental uncertainty, transaction frequency, and transaction specificity.

Background

The development of "seamless" or " boundaryless" delivery health care systems has become the expressed goal of health care reformers or strategists in the United States in recent years (Conrad & Jeppson, 1993; Gauthier, Rogal, Barrand, & Cohen, 1992; Hurley, 1993; Johnsson, 1992), after the efforts in the 1980s to control costs were unsuccessful. The failure of the efforts by the public and private sectors to contain health care costs is shown by the continuous growth of health care costs during the last decade at an annual rate of 8 to 16% (Levit & Cowan, 1991). National health expenditures in 1991 amounted to $751.8 billion (Letsch, 1993), equal to 13.2% of the nation's gross domestic product (GDP). This was a big jump from health care expenditures in the 1980s, which amounted to $250.1 billion. The expenditure's growth rate from 1980 to 1991 was over 300%. Much of that expenditure could be saved if health care could be successfully vertically integrated (Conrad & Jeppson, 1993).

A large portion of health care expenditures has been for transaction-related costs. Administrative cost is a typical example. The administrative costs of ids-integrated transactions accounted for 5.8%, or $38.6 billion, of U.S. health expenditures in 1990 (Gauthier, Rogal, Barrand, & Cohen, 1992). The interest in seamlessness arises from the likelihood that inattention to reducing the friction from imperfect linkages along the care continuum has impeded the efficiency of the system. Savings associated with the change to a single-payor system, for example, are estimated to exceed $100 billion (Gauthier, Rogal, Barrand, & Cohen, 1992). The ultimate goal of health care reform is to provide a full continuum of health services and maintenance to defined population groups within limited budgets. The goal is impossible to realize until all sectors providing health care are successfully vertically integrated (Conrad & Jeppson, 1993).

When considering the fast growth of health expenditures and the large amount of transaction-related costs, it is worth noting that substantial portions of these are for care of the elderly. The health care system for the elderly has been criticized as "fractionated" (Kane & Kane, 1987). Fractional care means that the different types of care for the elderly's various needs are provided independently of each other. The artificial distinction between acute and long-term care, for example, is actually causing dysfunction and raising costs (Kane & Kane, 1987). The situation of fractional care was made worse by the implementation of the prospective payment system (PPS). Since PPS began, the implications of exchanges between providers and between levels of care have been sharpened by purchasers' adoption of risk-based payment methods (Coburn,

Fortinsky, McGuire, & McDonald, 1993; Federal Register, 1984; Hu, Sullivan, & Scheffler, 1992; Weissert & Musliner, 1992). Methods such as prepayment per person or per case make care providers bear the financial consequences of inadequately managed transactions or patient dispositions. Delayed diagnostic tests, slippage in referral consultations, and poorly planned hospital discharges all contribute to potentially avoidable expenses that a prepaid provider would clearly not wish to incur.

The transfer of hospital patients to nursing homes is a particularly noteworthy transaction. It is relatively common (Kane, Matthias, & Sampson, 1983; U.S. Department of Health, 1994) especially among the elderly, who constitute the largest volume of patients in most community hospitals. The frequency of transactions is increasing (Gianfrancesco, 1990; Lewis, Leake, Leal-Sotelo, & Clark, 1987; Morrisey, Sloan, & Valvona, 1988b) because of the complicated consequences of the Medicare PPS. The PPS pays a hospital for each Medicare patient on a predetermined, diagnosis-specific basis. Before the implementation of PPS, hospitals were able to obtain third-party reimbursement for administratively necessary days (ANDs), the days of continued hospitalization while a patient waits for an available nursing home bed. Previously, Medicare reimbursed hospitals for ANDs of care at below-acute rates. Since PPS, prolonged stays have become costly to hospitals, since no revenue beyond the fixed Diagnosis Related Group (DRGs) payment is available. This motivates hospitals to discharge patients earlier to either the community or post-care agencies, for nursing home service. Yet, post-acute care services in the U.S. are widely acknowledged to be in short

supply. This fact makes it difficult for hospitals to discharge patients expeditiously when acute care services are no longer medically necessary. The situation is especially difficult for those hospitals located in areas with relatively fewer nursing home beds (Kenney & Holahan, 1991).

For both hospitals and nursing homes, the elderly are one of the most important consumer groups. It is critical for both sectors, facing similar financial constraints, to consider reshaping their linkage or boundaries. The linkage should take forms that best match provider organizational structures, and should benefit not only the elderly patients and the care providers, but also the entire health care system. However, under the pressures of third party payors, it is very difficult to have boundaries that meet the interest of all the providers. Hospitals have to search for the particular governance structure that will enable each institution to provide effective care and operate efficiently. A hospital's behavior may conflict with the interest of the nursing homes in the same area. This study will analyze how a hospital makes a decision in this conflict.

The balance of this chapter first examines the transactions between hospitals and nursing homes in the cost-containment era of the 1980s, discusses the factors that reshaped the relationship, and explores the changes in hospital utilization patterns. It then examines hospitals' use of vertical integration as a management strategy to overcome nursing homes' hold-up behaviors. The chapter concludes by presenting the significance of the study, and research questions that are formulated to guide the study then follow.

The Era of Transitional Care

This section focuses on the linkage between hospitals and nursing homes before and after the cost-containment era. The two-way channel distributing patients between acute care hospitals and nursing homes as well as the factors that affect the relationship are examined. Understanding how Medicare PPS and managed care networks have affected hospital behavior and hospital utilization patterns is critical to understanding the conflicts between hospitals and nursing homes and the consequent actions of both.

Transactions between Hospitals and Nursing Homes

The linkage between hospitals and nursing homes is a two-way traffic: the discharge of hospital patients to nursing homes and the hospitalization of nursing home patients. A close relationship between these two care sectors can create several advantages, including reducing hospitalizations (Zimmer, Eggert, Treat, & Brodows, 1988), improving quality of care, and reducing costs and the inappropriate use of health care resources (Kane & Kane, 1987; Shapiro & Roos, 1981). However, in the current system the linkage is not well-managed (Kane & Kane, 1987). With the advances in medical technology, changes in financial mechanisms, and regulations, the separation between these two sectors has grown wider, worsening the quality of care and increasing the costs of care.

The two-way patient flow can be referred to as upstream and downstream transfers. In this study, which views the flow from the hospital's standpoint, upstream transfer is from nursing homes to hospitals, and downstream is from hospitals to nursing

homes. Using marketing terms, in the process of discharging patients to post-care services, hospitals are buyers and nursing homes are sellers. Hospitals depend on discharging their patients to nursing homes, to reduce the risks of delayed discharges and maintain profitability. Nursing homes, on the other hand, depend on hospitals as their main source of patients. This heavily interdependent relationship and its transactions have been described by various concepts: "core technology" (Thompson, 1967), "reciprocal dependencies" (Powell, 1987), "asset specificity" (Williamson, 1975, 1991), or "countertrade relationship" (Hennart & Anderson, 1993).

The importance of each health care sector can be measured by the dollar amounts that individuals spend on it. Among all health care sectors, hospitals and nursing homes are ranked as the first and fourth, respectively, in terms of personal health expenditures. Of $660.2 billion in personal health spending in 1991, $288.6 billion (44%) was spent on hospitals and $59.9 billion (9%) on nursing homes. This distribution has been stable over the years. Because the two sectors together comprise a significantly large portion of health care expenditure, the establishment of a closer linkage may bring about favorable results in cost containment.

The strength and magnitude of each stream of the two-way patient flow can be measured by two elements. The first is the percentage of a facility's total number of patients transferred between the two sectors, i.e., the frequency of transactions. The second is the characteristics of these patients compared to all characteristics of the facility's patients. Upstream (a hospital admitting patients from a nursing home), the

percentage of hospitalization of nursing home residents ranges from 24.8% to 54% (California Center for Health Statistics, 1985; Lewis, Cretin, & Kane, 1985; Lewis, Kane, Cretin, & Clark, 1985; Meiners, 1984; Van Nostrand, 1986; Weissert & Scanlon, 1985). Lewis and associates (1985) reported that 54% of their study sample frequently transferred between nursing homes and hospitals. The trend of declining hospital occupancy makes the transfers from nursing homes to hospitals especially critical to hospital operation, since nursing home residents are an important source of patients.

In downstream transfers (a hospital discharging patients to a nursing home), hospitals become the buyers and nursing homes the sellers of nursing home services. Gorden (1973) reported that 3.7% of patients in New York hospitals stayed at extended care facilities three months after discharge. The proportion of individuals admitted to hospitals from the community and then discharged to nursing homes ranged from 5% to 37% (Davis, Shapiro, & Kane, 1984; Kane & Matthias, 1984; Kane, Matthias, & Sampson, 1983; Lamont, Sampson, Matthias, & Kane, 1983). In Massachusetts, Maryland, and South Carolina, 4.5% to 9.4% of hospital patients were estimated to be discharged to nursing homes (Densen, 1987). Analyzed in terms of admission source, 70.4% of nursing home admissions in Massachusetts and 74% in Maryland came from acute hospitals (Densen, 1987). The risk factors associated with discharge from hospitals to nursing homes varied among studies. Possible risk factors include activities of daily living (ADL) dependency, mental disorders, and age.

Several factors have changed the relationship between hospitals and nursing homes. These include the implementation of Medicare PPS, the growth of managed care organizations and the number of their enrollees, changes in medical technology and disease epidemiology, and providers' loss of bargaining power due to the increasing proportion of patients covered by third parties. Providers began to compete for those patients who could bring in the most profit. Providers also became reluctant to accept patients who could bring in only little revenue. The conflict of interest between hospitals and nursing homes became intensive in the cost containment era of the 1980s; the following paragraphs illustrate the effects caused by the above four factors.

Effective October 1, 1983, the Medicare program changed its method of paying for hospital care from a retrospectively determined, cost-based payment system to a prospective payment system (Federal Register, 1984; Hu, Sullivan, & Scheffler, 1992). The PPS pays hospitals a fixed, predetermined price for each patient's admission, based on one of the 474 DRGs into which the patient's conditions and treatment are classified. The payment is largely determined by the average expected cost of resources consumed by persons in a specific DRG, including an expected duration of inpatient stay. Because the DRG payment is fixed (except for extreme outliers), hospitals can anticipate the amount of payment and the standard length of stay for patients in each DRG category. During the first years of its implementation, reimbursement rates were weighted for hospital- and region-specific costs, with little weight given to cost nationally. Massachusetts, Maryland, New York, and New Jersey were exempted at first from the

DRG system, because they already had similar systems in place consistent with the intent of the legislation. Later on, New York and Massachusetts joined the Medicare PPS, in 1985 and 1986, respectively.

The objective of the Medicare PPS is to change patterns of hospital management as well as to change physicians' behaviors indirectly through financial incentives (Muller, 1993). If a patient is not discharged when the expected period ends, no further revenue is forthcoming, and the costs of the continued stay are borne fully by the hospital, i.e., the hospital loses money. Thus, hospitals have become particularly intense about early and aggressive discharge planning since the implementation of the PPS (Morrisey, Sloan, & Valvona, 1988a; Morrisey, Sloan, & Valvona, 1988b). Hospitals now act oppositely to how they acted in the pre-PPS period (Hochstein, 1985; Jonsson & Lindgren, 1980; Markson, Steel, & Kane, 1983), because hospitals, especially those with lower occupancy rates, then had little incentive to discharge patients on ANDs. The goal of reducing inpatient days seems to have been achieved.

The 1986 Omnibus Budget Reconciliation Act requires the Department of Health and Human Services to investigate whether the PPS adversely affected hospitals located in areas with limited access to nursing homes, as compared to other hospitals. Congress was concerned that hospitals might bear the costs of unavoidable added days of care, or that quality of care might be deteriorating as hospitals discharge patients earlier (Holahan, 1990). Under the PPS, the frequency of transfers, the changes in utilization patterns of

hospitals and nursing homes, and the behavioral changes owing to reimbursement all have affected the relationship between hospitals and nursing homes.

Managed care networks are innovative organizations for health care financing and delivery. They are distinct from the traditional fee-for-service providers in that they deliver health care by selecting and packaging provider arrangements for covered benefits based on utilization and associated costs. HMOs (health maintenance organizations) and PPOs (preferred provider organizations) are the most important managed care networks in the 1990s. HMO-affiliated providers often receive a predetermined and prepaid fee regardless of how often beneficiaries use medical services; therefore, they accept the financial risk of providing a certain level of services. On the other hand, PPOs contract with providers to cover a range of services on a discounted fee-for-service basis.

The adoption of managed care, with risk-sharing, has changed utilization patterns and the linkage among health services. A randomized study comparing HMOs with fee-for-service sectors between 1950 and 1980 found that HMO patients used 30% fewer hospital days (Luft, 1980). Two studies reported a similar result, with fee-for-service plans having around 40% more hospitalization than HMOs did (Greenfield, 1992; Newhouse, 1985).

The third factor that changes utilization patterns is the development of medical technology and changes in disease epidemiology. Advances in diagnostic and therapeutic technologies permit more procedures to be performed noninvasively and thus reduce postoperative days in acute care beds. With the advances, the length of stay in an acute

care unit can be reduced by moving patients to a subacute care unit; subacute care is still reimbursed by third party payors. The instances of such care are increasing (Gianfrancesco, 1990). The interest in using subacute care is augmented by recent changes in disease epidemiology, which continues to shift from acute care episodes toward chronic conditions.

Another influence on the hospital-nursing home relationship is health care providers' loss of bargaining power. The health care system has changed from being a market dominated by providers to one dominated by third-party purchasers. Medicare and Medicaid demonstrate monopsony power, since one is the major acute-care purchaser, while the other is the major long-term care purchaser. Rather than pay the market price, the government establishes a rate schedule to reimburse eligible institutions. In this situation, health care providers tend to accept the stipulated rates and have to compete for those patients who can bring in higher revenues.

The proportion of health care paid by third parties was 51% in 1960, 66% in 1970, 76% in 1980, and 81% (37% private and 44% public) in 1991. Governmental insurance, Medicare, covers health services for almost all persons age 65 and older and for certain disabled individuals under age 65. The market domination by Medicare has given the government strong bargaining power. The coverage includes most acute care, mainly hospital and physician services. Medicare paid $102 billion in 1991 for benefits to 34.9 million enrollees. For 13% of Medicare enrollees, Medicare is their only third-payor source for health services. The state-based government program, Medicaid, is the

primary purchaser of nursing home services. In 1991, Medicaid paid 47.4% of total nursing home expenditures ($59.9 billion). The 14% of Medicare enrollees who qualified for Medicaid incurred 6.6% of nursing home cost, i.e., almost $4 billion is paid directly by Medicare (Letsch, 1993). The states' Medicaid policies on eligibility for nursing home care and on reimbursement rates heavily affect the transactions between hospitals and nursing homes (Bishop & Dubay, 1991; Dubay, 1990). Policy changes in either Medicare or Medicaid can also greatly influence the linkage between acute care and subacute care. In short, because of purchaser pooling, health care providers have gradually lost bargaining power. The transactions between hospitals and nursing homes then become intensified, as an increasing proportion of health care dollars is controlled by major purchasers.

The environmental changes such as reimbursement policy, new technology, the growth of managed care systems, and the increasing percentage of hospital and nursing home revenue coming from third parties all reshape the relationship between the two sectors. Knowledge of these significant changes is essential to understanding the conflicts that face the two kinds of organizations.

Conflicts between Hospitals and Nursing Homes

The changes in financing mechanisms, especially the Medicare PPS and the prepayment system adopted by HMO/PPOs in recent years, have changed hospital behaviors in many ways, which in turn have altered nursing homes' behaviors and the

linkage between the two providers. Hospitals are motivated to reduce the length of stay (LOS) of patients whose needs can be met by long-term care (Kenney, 1991; Lewis, Leake, Leal-Sotelo, & Clark, 1987; Meiners & Coffey, 1985; Morrisey, Sloan, & Valvona, 1988b). As a result of hospitals' determination to discharge patients quickly, a portion of hospital LOS days is transferred to the nursing home stay (Morrisey, Sloan, & Valvona, 1988b; Neu & Harrison, 1988), and consequently nursing home use increases (Hing, 1989; Morrisey, Sloan, & Valvona, 1988a). Because inpatient services are replaced by nursing home care (Gianfrancesco, 1990; Morrisey, Sloan, & Valvona, 1988b), hospitals become more dependent on nursing homes when discharging patients.

Hospitals try to discharge patients quickly to avoid the cost of delayed discharge. The average LOS in 46 states for Medicare patients was 9.33 days before the PPS, and dropped to 7.89 in 1984, the lowest LOS since PPS began, possibly because 1984 was the transition year of the PPS implementation. However, the hospital LOS days actually were transferred to subacute care, sometimes as many as 4 or 5 days per patient (Neu & Harrison, 1988). The Rand Corporation found that during 1981, 1984, and 1985, skilled nursing care was used by 2.5% to 3.2% of Medicare patients discharged from hospitals, and LOS declined from 9.9 to 7.8 days (Neu & Harrison, 1988). An issue associated with this situation is that the risk of malpractice liability is bound to occur if hospitals discharge patients prematurely under the pressure of the PPS. To avoid accusation of malpractice, hospitals tend to transfer patients to nursing homes or to home care agencies

rather than discharge them to the community, i.e., simply send them home (Long, Chesney, & Ament, 1987).

This change in hospital behavior has a great impact on the next level of care: earlier hospital discharges force nursing homes to accept sicker patients needing greater post-acute care (Kosecoff, Kahn, Rogers, et al., 1990; Morrisey, Sloan, & Valvona, 1988b). Such patients usually need only short-term, post-operative care rather than long-term custodial care (Pfeiffer & Christian, 1987; Tellis-Nayak & Tellis-Nayak, 1986). Nursing homes, reacting as hospitals shift the burden to them, are reluctant to accept such patients, since post-operative care requires higher levels of skill than nursing homes traditionally provide. The nursing homes certainly prefer admitting either private-pay patients (to gain more revenue) or light-care public-payment patients (to contain costs). This conflict of interests between hospitals and nursing homes should be alleviated, especially if hospitals suffer from "information asymmetry," that is, if nursing homes are likely to take advantage of information to maximize their profits by price discrimination.

In addition, each state's financial condition and reimbursement policy for nursing homes also affect nursing home behavior. The number of states that pay their Medicaid providers prospectively instead of per service cost is increasing. The change in reimbursement method has shifted the burden of controlling costs to the nursing homes. Consequently, nursing homes now prefer to admit those patients who are more profitable (Shapiro & Roos, 1981).

The reimbursement policy together with the short supply of nursing home beds accrues advantage to nursing homes in selecting patients. If there is a shortage of nursing home beds, hospitals become more dependent on nursing homes to take their patients, and so nursing homes are in a superior position. They are free to select the patients they consider able to bring higher profits. Furthermore, nursing homes may take advantage of hospitals' lack of information about the availability of nursing home beds. Hospitals try to combat price discrimination in nursing home behavior by delaying their discharge of patients, which increases the hospitals' operational costs. Some hospitals successfully use nursing homes or home health services for patients when all their own beds are occupied (Conner & Greene, 1983; Feder & Scanlon, 1985). However, the nursing home market still fails to provide prompt care for patients who are medically ready for discharge, which increases hospital operational costs through delayed discharges (Welch & Dubay, 1989).

The situation described above is reflected in two studies. Weissert and Cready (1988) examined the effect of delayed discharge to nursing homes and found that within twelve months 3,500 unnecessary patient days cost the hospital about half a million dollars that could have been taken in if the beds had been filled by new patients. Welch and Dubay (1989) investigated the impact that administratively necessary days had on hospital costs. Their results show that as the nursing home market loosens up, hospital costs fall, presumably because discharging patients to nursing homes becomes easier.

About 50% of the studied hospitals' ANDs appeared to increase costs, from 1.9% to 4.5%.

Vertical Integration as A Management Strategy

The impact of the external environment on the behaviors of health care organizations is unquestionable (Pfeffer & Salancik, 1978; Philips, 1967; Provan, 1987; Thompson, 1967). As the government becomes more actively involved in financing and regulating health services and more intent on accountability and cost containment, health care providers become more affected by the environment (Fottler, Schermerhorn, Wong, & Money, 1982; Gay, Kronenfeld, Baker, & Amidon, 1989).

Vertical integration has been asserted to be a sensible strategic reaction to environmental forces that restrict reimbursement (Brown & McCool, 1986; Coddington & Moore, 1987; Murphy, 1985). Over the past decade, hospitals have made attempts to integrate activities at various stages of production (Conrad, Mick, Madden, & Hoare, 1988; Robinson, 1994). For two reasons, vertical integration is considered an appropriate management strategy for hospitals. First, due to the nature of transactions of care in the downstream-upstream relationship, a hospital can cross that boundary with relatively low risk of failure. Second, hospitals have found they can reduce costs by acquiring skilled nursing facility (SNF) beds or home health agencies; the reduced LOS resulting from such acquisitions will eventually either produce more revenues or reduce costs (Newald, 1986a; Newald, 1986b; Moore, 1985). Although empirical assessments are lacking, vertical integration has occurred frequently (Mick & Conrad, 1988; Robinson, 1994).

Transaction Cost Economics (TCE) Perspective

Transaction cost economics provides a plausible theoretical framework within which to explore the topic of vertical integration. The transaction cost economics theory, developed by Williamson, represents organizational economics (Williamson, 1975, 1985). The theory incorporates concepts of economic and contract law into a broader mode to explain how organizations respond to "market failure" and to provide the most efficient model of exchange (Williamson, 1975, 1985, 1991). Williamson has proposed that measurement in TCE should focus on the performance or attribute ambiguities associated with the supply of a good or service. The theory focuses on the transaction -- the exchange between buyer and supplier -- as the unit of importance, and suggests that the dimensions and attributes of transactions determine the preferred transacting framework.

These frameworks may include 1) "**spot market**" exchanges, in which buyers and sellers may have no prior established relationships; 2) contracting of mid- or long-term duration (via contract or joint venture arrangement) where a transacting setting has been developed to guide exchanges, called a "**hybrid**" mode of governance; and 3) vertical integration, wherein the buyer ultimately gains permanent control over the supplier. Vertical integration is termed as "**hierarchy**." Overall, transaction cost theory suggests that the design of organizations may be the result of the continuing calculation of "make or buy" decisions by exchange partners.

That hospitals can consider providing post-acute care either through facilities they own or through formal long-term contracting (including joint ventures) reflects imperfection in the nursing home market. The situation is better explained by Williamson's transaction cost economics concept that the failure of market function gives rise to the emergence of organizations. Market failure in this context refers to the situation where long-term care providers are few, and information is impacted. "Impacted" information arises from uncertainty about the supply of long-term care, and nursing home opportunistic behaviors that keep hospitals from having perfect information about the availability of nursing home beds. Nursing homes, out of self-interest, tend to select patients who can provide the most possible profits. Consequently, hospitals encounter difficulty in placing their readily dischargeable patients in nursing homes. In market terms, to overcome the imperfections of the nursing home market, hospitals should adopt different modes of governance, according to the three dimensions suggested by Williamson -- transaction uncertainty, transaction frequency, and transaction asset specificity (Williamson, 1975, 1985).

Research Questions

In evaluating the reasons for and conditions under which a hospital vertically integrates into nursing home care, this study addresses the following research questions:

1. To what degree do hospitals choose vertical integration to solve the delayed discharge problem that may be caused by environmental uncertainty and other conditions?

2. What are the major determinants that affect hospitals' different modes of control (ranging from market, to hybrid, and to vertical integration) over nursing home care services, i.e., what factors determine hospitals' make-or-buy decisions?
3. Can Williamson's transaction cost economics be applied in the health care sector, especially to acute care hospitals and nursing homes? More specifically, can transaction uncertainty, transaction specificity, and transaction frequency explain hospital behavior in choosing an efficient governance form?

Significance of the Present Study

As competition in the health care market becomes increasingly intensive and the scarcity of related resources becomes more severe, operational efficiency of health care organizations has become a major concern of management. The efforts of health care reform to restructure the current health care system reflect the society's concerns about the system's deficiencies. With the population rapidly aging and with the change in reimbursement policy, more and more patients are expected to be transferred from acute care to extended care sites (i.e., from higher-cost to lower-cost sites). Providers of acute care, under such pressures, may strive to reduce costs by adopting such strategies as vertical integration with up- or down-stream providers. This study may provide information about the relative benefits of different degrees of vertical integration.

Despite the widespread recognition that transaction cost economics is potentially applicable to a number of health service research questions (Conrad & Dowling, 1990; Conrad, Mick, Madden, & Hoare, 1988; Hurley & Fennel, 1990; Mick & Conrad, 1988),

little empirical evidence has been gathered in this area. The growing interest in promoting vertically integrated delivery systems in health care, either implicitly or explicitly, to reduce transaction-related friction suggests that this model should be revisited and operationalized. This study reviews literature on hospital management strategies for remedying market failure and examines whether transaction cost economics is applicable to health care.

The assumption of this study is that hospitals can use vertical integration to expand hospital boundaries and thus minimize deficiencies in the nursing home market. In seeking the most efficient governance form, a hospital should select the one that is the best for its own situation. The transaction cost economics framework will provide hospitals with a theoretical foundation for such "make or buy" decisions.

Outlines of Remaining Chapters

Chapter 2 first reviews the demand for and supply of nursing home beds and the factors associated with delayed discharges from hospitals. Particular attention is directed toward nursing homes' behaviors related to the short supply of beds. The definition of vertical integration, and different approaches to interpreting vertical integration are presented. The motivations and risks for hospitals employing vertical integration as a management strategy are examined. Some examples of vertical integration in the health care industry are described.

Chapter 3 lays out the theoretical framework that guides the study. The core concept and the three dimensions of transaction cost economics are presented. The

chapter reviews articles in the health care field that use TCE to interpret the emergence of health care organizations due to market failure. Empirical studies in other disciplines that test or explain the transaction cost economic theory are reviewed as well. Finally, hypotheses based upon the three-dimensional conceptual model are derived.

Chapter 4 begins with a statement of the study design and description of the sample. This is followed by descriptions of the data sources, model specification and measurement variables. The section on the analytic plan includes a discussion of model-building analyses and multivariate logistic regression analysis.

Chapter 5 presents the results of data management and statistical analysis, including descriptive statistics, model building, and multivariate logistic regression analysis.

Chapter 6 presents the results of individual hypothesis testing of the three constructs. A discussion of whether the study has successfully answered the research questions follows. Then the application of the transaction cost theory to the health care field is assessed by using Bacharach's (1989) criteria. This chapter concludes with a discussion of the limitations of the study.

Finally, Chapter 7 presents several important implications of the findings from this study that are useful for hospital administrators, policy makers, and researchers in the areas of health service organizations and long-term care. Suggestions for future research are also presented.

Chapter 2

Literature Review

Several areas that are important to the study are reviewed in this chapter. The first section is about the demand for and supply of nursing home beds; the second section covers factors associated with delayed hospital discharges. The third section presents the definition and different interpretations of vertical integration given by researchers from both health care and non-health-care fields. The last section presents the motivation, risks, and determinants of success that are associated with vertical integration, and offers some examples of vertical integration in health care industry.

Demand and Supply of Nursing Home Beds

The basic economic concept, the contrast of demand and supply, is used to review the nursing home market, since this study is concerned with organizations' behaviors related to demand and supply. On the demand side, factors that increase the demand for nursing home beds, such as changes in population and technology, are explored first. On the supply side, the oligopoly features of the nursing home market, such as certificate-of-need (CON), price regulation, and bed supply associated with delays and costs for hospital patients are discussed.

Demand for Nursing Home Beds

Several factors have increased the demand for nursing home care. The aging of the population, the changes in the most prevalent types of illness, and the advancement of medical technology are the main reasons.

The over thirty million older persons (age 65 or older) as of 1990 (U.S. Census Bureau, 1990) represent the largest consumer group for nursing home services. Total annual population growth was 1% between 1965 and 1990, and a 0.6% growth rate is projected for the years 1990 to 2030, along with dramatic changes in the population's composition. Currently, persons age 65 and over comprise 12.4% of the entire population, and persons age 75 and over comprise 5.3%. By 2015, these two groups will increase to 14.6% and 6.0%, respectively, of the total population. The aging trend will continue as the baby boomers enter their seventies and eighties, and these proportions will increase to 20.1% and 9.0% by 2030.

The population age 65 and older faces higher risks of institutionalization, and that is especially true of the group age 75 and over, even though only 5% of them reside in nursing homes. It is estimated that 25-35% (Ingram & Barry, 1977; Liang & Tu, 1986; Palmore, 1976) or an even higher percentage (Cohen, Tell, & Wallack, 1986; McConnell, 1984; Vicente, Wiley, & Carrington, 1979) of the current cohorts of older adults will become institutionalized at some point in their lives. Provided the current pattern continues, the number of elderly who need nursing home care will increase from 1.8 million in 1990 to 3-3.4 million in 2010, and to as high as 4.3-5.3 million, tripling today's

demand, in 2030. Health care providers, hospitals and nursing homes must stay alert to the demographic trend, because it will bring about changes in the utilization patterns for different levels of care (Zedlewski & McBride, 1992).

In addition to the aging population, the changing morbidity pattern is another factor increasing the demand for post-acute care. Despite declining mortality rates since 1957 (Tellis-Nayak & Tellis-Nayak, 1986), chronic diseases that increase with longevity are becoming more prevalent. Cerebrovascular disorders, hip and femur procedures, pneumonia and pleurisy, heart failure and shock, and major joint replacement are the five most frequent DRGs among the hospitalized Medicare patients discharged to post-acute care (Kenney & Holahan, 1990). The elderly are more vulnerable to chronic diseases and more likely to require nursing home care for them.

Advances in treatment also have fueled the growth of post-acute care. Between 1980 and 1987, the number of hip replacements, one of the most common procedures of modern medicine, increased by over 90%, while total hospital discharges decreased by 10% (Friedman & Elixhauser, 1993). Hospitals that have more patients with hip replacements are likely to need more nursing care beds, since nursing home care is typically transitional care for patients with joint replacement (Morrisey, Sloan, & Valvona, 1988b).

Supply of Nursing Home Beds

The growth of nursing home beds, unfortunately, has not responded to the increased demand. The supply of nursing home beds grew quickly after the

implementation of Medicare and Medicaid in 1965, but in the 1980s it did not match the growth rate of the aged population. During the 11 years from 1978 to 1989, the total number of nursing home beds increased by 24%. However, in 1989 the ratio of nursing home beds to the elderly population had dropped 2% below that of 1978. The average nursing home occupancy rate was 89.54% in 1978, 91.18% in 1989 (Harrington, Preston, Grant, & Swan, 1992), and as high as 95.4% in 1992 (Marion Merrel Dow, 1993). Among the many reasons that the growth of nursing home beds has not responded to market demand are certificate-of-need (CON), control mechanisms to limit access, and reimbursement policies.

The nursing home industry is quite complex, because its development is heavily influenced by changes in regulations and policies. By 1970, several states had implemented CON regulations requiring state approval of the establishment or expansion of health facilities, usually including nursing homes. By 1979, almost all states had enacted CON, differing only in the degree of stringency. The 1982 Social Security Act was intended to reduce the variation by requiring all nursing homes with capital expenditure over $100,000, located in over 30 states, to undergo review by the state CON administrator (Feder & Scanlon, 1980). It has been argued that the CON laws and construction moratoria limited the growth of nursing home beds (Ettner, 1993; Feder & Scanlon, 1980; Nyman, 1993; Zinn, Aaronson, & Rosko, 1992), which led to an excess demand (Nyman, 1993). CON stringency is also used by regulators to control Medicaid health expenditures: Feder and Scanlon (1980) studied CON in eight states and

speculated that the government may have restricted the growth of nursing home capacity in order to cut the costs of providing nursing home services for Medicaid recipients.

State Medicaid reimbursement policies certainly have considerable impact on the supply of nursing homes. Medicaid pays for about half of all nursing home patient days, representing its near-monopsony power. Of nursing home expenditures ($59.9 billion) in 1991, Medicaid paid 47.4%, private or out-of-pocket payments paid 43.1%, Medicare paid only 6.6%, and the rest was paid by private insurance, philanthropy, and others (Letsch, 1993). Should reimbursement rates be increased, more firms are likely to enter the market, assuming that CON permits expansion of existing services and that incentives to admit and care for Medicaid patients are in place. The impact of Medicaid reimbursement on nursing home supply will be further discussed in the next section.

Another factor constraining the increase in nursing home beds is preadmission screening. In the 1980s, at least thirty states adopted more stringent eligibility and preadmission screening policies for Medicaid SNFs, as a strategy to reduce demand. In 1987, moreover, the Omnibus Budget Reconciliation Act (OBRA) made preadmission screening mandatory as a part of legislation on nursing home reform. This regulation managed only to curb the growth in the number of Medicaid's nursing home care recipients, but not to reduce Medicaid's share of costs, which rose from 45.1% in 1990 to 47.4% in 1991 (Zedlewski & Melnick, 1988).

The extent of the supply shortage can be measured by hospitals' delayed discharges. Patients in this situation are generally referred to as "hold-over patients" or

"long-stay patients," and the situation as "blocked bed" or "back-up." The "blocked bed" problems had been noted as early as in the 1950s (Philips, 1967). The principal patient group associated with "blocked beds" are the geriatric patients who no longer need acute care, yet are not immediately discharged to nursing homes or rehabilitation/chronic care institutions (Shapiro & Roos, 1981). Hospital utilization review teams often put such patients on "administrative necessary days," since the patients, though still needing care, have recovered from the acute stage of illness.

In order to use resources efficiently, a method has been developed to assess the misutilization of hospital resources and detect unnecessary hospital stays (Gertman & Restuccia, 1981; Selker, Beshansky, Pauker, & Kassirer, 1989). Many studies have identified the days waiting for discharge to nursing homes, along with the nursing home bed supply (Gruenberg & Willemain, 1982; Hing, 1989; Kenney & Holahan, 1990; Restuccia & Holloway, 1976; Shapiro & Roos, 1980). In general, hospitals located in areas of proportionately more SNF bed supply tend to have fewer discharge delays, because high numbers of hospital transfers may be offset by fewer transfers from intermediate care facilities (ICFs) (Kenney & Holahan, 1990). Hospitals in areas with lower nursing home bed supply have fewer transfers to nursing homes and slower discharges (Hing, 1989).

To summarize this section, the growing elderly population, changing disease patterns, and advances in treatments have spurred an escalating demand for post-acute care. However, the constrained supply of nursing home beds due to CON stringency and

reimbursement policies has intensified the delayed discharge problem, to varying degrees in different states.

Factors for Hospital Delayed Discharges

The medical process involves not only patients but also their families, the support system, the physicians, the care provider, and the entire environment (Donabedian, 1973). Discharge delays happen through a complex process. Several factors may be involved, including hospital characteristics (Falcone, Bolda, & Leak, 1991; Markson, Steel, & Kane, 1983; Weissert & Cready, 1988), patient and family characteristics (Shaughnessy, Kramer, Schlenker, & Polesovsky, 1985), poor coordination of acute and long-term care sectors (Baker, Williams, Zimmer, Van Buren, Vincent, & Pickrel, 1985; Restuccia & Holloway, 1976), the nursing home market (Hing, 1989; Holahan, 1990; Kenney & Holahan, 1990), and nursing home behaviors (Payne, 1987; Selker, Beshansky, Pauker, & Kassirer, 1989). This section examines the impacts of hospital characteristics and nursing home behaviors.

Hospital Characteristics

In the past, under the retrospective payment system, hospitals tended to keep patients (Hochstein, 1985; Holahan, 1990). In the pre-DRG era, the main concern was the backup of geriatric patients in acute hospitals who had recovered from acute illness but were not immediately transferred to extended care facilities (Shapiro & Roos, 1981). Third party payors still covered the hospital's costs. The implementation of the PPS motivated hospitals to discharge patients sooner (Holahan, 1990; Kenney & Holahan,

1990; Weissert & Cready, 1988). Given the competition for nursing home beds, it is difficult for most hospitals to avoid discharged delays. Those hospitals with long-term-care units or swing beds, or with close affiliations with nursing homes are the winners in a tight nursing home market. They usually have more transfers to nursing homes (Hing, 1989), fewer discharge delays (Hing, 1989; Kenney & Holahan, 1990), and lower acute care costs (Welch & Dubay, 1989). On the other hand, hospitals with higher occupancies (Falcone, Bolda, & Leak, 1991; Gruenberg & Willemain, 1982; Markson, Steel, & Kane, 1983), larger proportions of patients aged 60 and over (Markson, Steel, & Kane, 1983), larger size (Falcone, Bolda, & Leak, 1991), and inadequate discharge planning (Baker, Williams, Zimmer, Van Buren, Vincent, & Pickrel, 1985; Restuccia & Holloway, 1976) are found to have more delayed discharges.

Hospital-based long-term-care units or swing beds make it possible for patients who need long-term care to be transferred promptly, avoiding delayed discharges. Providing two levels of care in one facility makes patient transitions smoother and more natural. Most importantly, the integrated arrangements can fill the gap between the relatively intense medical needs of post-acute patients and the limited capacity of the current nursing home system to meet those needs (Shaughnessy & Schlenker, 1986). Another important factor affect the hospital delayed discharge is nursing homes' price discrimination behavior. This regard will be discussed next.

Price Discrimination by Nursing Homes

Price discrimination does not observe first-come-first-served as a guide to admissions policy. Rather, to maximize profit, nursing homes give preference to private patients over Medicaid or Medicare patients. Nursing homes' price discrimination supports the assumption that people are self-interested, and that this applies to organizational behavior, because an organization is a collective of people. Such opportunism is more likely when suppliers are few. Hospitals need nursing home beds to discharge their patients to, while nursing homes, the suppliers, if left free to pursue self-interest and opportunism, will prefer self-pay patients or those with relatively less severe conditions. This preference introduces so-called **hold-up behavior**.

Since Medicaid or Medicare reimbursement rates and the marginal revenue from caring for Medicaid patients are lower than those from private payors (Dor, 1989), nursing homes tend to first calculate the optimal number of private or light-care admissions, then limit the beds for public-pay patients to the number remaining. Therefore, Medicare and Medicaid patient access largely depends on private patients' demand and nursing home bed supply. The existence of price discrimination behavior by nursing homes is demonstrated in several studies (Dubay & Cohen, 1990; Massachusetts Hospital Association, 1979; Scanlon, 1980; Shapiro & Roos, 1981).

Medicaid reimbursement and nursing home hold-up behavior. Medicaid reimbursement policies are an important influence on the operation of nursing homes, since Medicaid pays almost half of all nursing home costs. Medicaid reimbursement for

SNFs varies among states. Researchers have found a pattern in the interaction between rate setting systems and the supply of SNF care for Medicaid patients. When nursing homes are located in states where Medicaid reimbursement policies and private nursing home markets support high-intensity care, nursing homes are motivated to admit more Medicaid patients. With higher levels of Medicaid reimbursement, nursing homes can afford staffing for patients with greater needs and put Medicaid patients into the appropriate patient mix under Medicaid full-cost reimbursement. Facilities in states that have flat rates (a fixed rate per diem for each resident) or strong prospective reimbursement are less willing to serve Medicaid patients (Bishop & Dubay, 1991). In other words, the willingness of nursing homes to take Medicaid patients becomes less when public payment for them is comparatively low and they are relatively sicker (Bishop & Dubay, 1991; Dor, 1989; Dubay & Cohen, 1990; Shaughnessy, Kramer, Schlenker, & Polesovsky, 1985).

The nursing home market is dominated by prospective payment, which gives nursing homes an incentive to admit lighter-care patients, since their care costs are below average. The number of Medicaid beneficiaries' admissions increased the most in states where Medicaid fee-for-service reimbursement was used (Dubay, 1990). As a result, hospital discharges of heavy-care patients in those states were delayed, particularly in areas with low bed supply or excess demand for nursing home care.

Several studies have revealed unmet demand for nursing home beds for Medicaid patients, but not for private patients. With all else held constant, being a Medicaid

beneficiary has been found to be the most restrictive factor for access to long-term care beds, especially in areas where beds are relatively limited and demand is relatively higher (Coburn, Fortinsky, McGuire, & McDonald, 1993; Ettner, 1993; Nyman, 1989; Nyman, 1993; Weissert & Musliner, 1992).

Medicare reimbursement and nursing home hold-up behavior. Most of Medicare beneficiaries are either aged or disabled and therefore are more likely to use medical services. Medicare beneficiaries are eligible for nursing home admissions within 30 days of hospital discharge after at least three consecutive days of hospitalization. The benefits cover up to 100 days of nursing care, including daily skilled nursing or rehabilitation services. Beneficiaries do not have to pay for the first 20 days, but some amount of copayment for the 21st to 100th days is required. As of 1992, Medicare paid all but $81.50 per day from the 21st day to 100th day (Government Printing Office, 1992). Significant differences exist between Medicare and non-Medicare SNF patients (Shaughnessy, Kramer, Schlenker, & Polesovsky, 1985). Medicare patients are by definition at a post-acute care stage and consequently tend to need more medical and nursing care than non-Medicare patients do. Non-Medicare patients, for example, have more incontinence problems; they receive more traditional, custodial nursing home care. In short, Medicare enrollees have greater than average needs for care, yet certified nursing homes are more reluctant to admit them because their care has higher marginal and average costs as well as lower reimbursement (Bishop & Dubay, 1991; Coburn, Fortinsky, McGuire, & McDonald, 1993; Dor, 1989; Shaughnessy, Kramer, Schlenker, &

Polesovsky, 1985). Dor (1989) studied the costs and behaviors of SNFs and found that the average cost per Medicare patient day is $122, compared with $53 for Medicaid and $66 for private patients. These figures explain why nursing homes resist admitting Medicare patients.

One of the indicators of nursing homes' unwillingness to admit Medicare patients is the small proportion of Medicare patient days in SNFs. While approximately two-thirds of all SNFs are certified by Medicare, the vast majority of SNFs provide very few Medicare days. In a recent GAO survey of hospital discharge planners, 97 % of those sampled reported that they had difficulty placing Medicare patients in nursing homes (GAO, 1987). Unless Medicare reimbursement policy is based on actual costs of Medicare inpatients, the vast majority of nursing homes will continue to prefer non-Medicare patients, thus restricting the access of Medicare beneficiaries to nursing home care.

Factors associated with hospital delayed discharges can be briefly summarized. The hospital characteristics of hospital occupancy, affiliation with long-term-care facilities, and proportion of elderly patients are associated with delayed discharges. The incidence of nursing homes' hold-up behaviors depends on Medicare and Medicaid reimbursement policies.

Vertical Integration

Since this study examines how hospitals choose different degrees of vertical integration to manage discharges to nursing homes, a clear definition of vertical

integration is essential. For that purpose, examining the term's meaning across different disciplines will be useful.

Definitions of Vertical Integration

Vertical integration can be defined in terms of organizational boundaries, types, and production stages. Thompson (1967) defined vertical integration as an "expansion of the organization's domain that incorporates functions on which the core technology depends (backward integration) or for which the core technology is an input (forward integration)." The central notion underlying vertical integration control is the value chain (Porter, 1980), which describes the flow of inputs and outputs involved in producing a particular good or service. The value chain suggests a vertical ordering from "upstream" stages of production (inputs) to "downstream" (final outputs) stages.

Williamson (1985) proposes two broad types of integration, mundane integration and vertical integration. He specifies that the mundane integrates successive **stages** within the core technology, whereas the vertical integration involves integrating peripheral or off-site activities 1) backward into basic material, 2) laterally into components, and 3) forward into distribution. Williamson (1985, 1991) argues that, regardless of stage, vertical integration is a continuum anchored by the options of market and hierarchy. Movement along the continuum from market, to long-term contracting (hybrid), to vertical integration (hierarchy) is accompanied by higher levels of resource commitment (capital, labor, land) and risk.

Among definitions and interpretations of vertical integration of health care organizations, Harrigan's interpretation (1984) is the most frequently cited by health care researchers (Conrad & Dowling, 1990; Conrad, Mick, Madden, & Hoare, 1988; Mick & Conrad, 1988). Harrigan proposes four dimensions: 1) the successive stages of integration in the production process; 2) the degree of internal transfers at a given stage of production; 3) the breadth of integrated activities undertaken at any one productive stage; and 4) the form of ownership. Among these four dimensions, the concept of successive stages of integration in the production process is most frequently adopted by health care researchers in developing frameworks of vertical integration (Clement, 1988; Conrad, 1993; Conrad & Dowling, 1990; Conrad, Mick, Madden, & Hoare, 1988; Gillies, Shortell, & Anderson, 1993).

Clement (1988) argues that the production process involves four stages: raw materials, intermediate products, production chain, and distribution. Conrad and colleagues (1988), combining Hornbrook's and Harrigan's concepts, suggest a six-part vertical ordering in their Health Service Value Chain model. The six stages are raw material input, intermediate inputs/outputs to services, service outputs, episodic-patient-care service lines, chronic-patient-care service lines, and payment for health services.

According to Clement (1988), vertical integration refers to "owning more than one link in a linear chain extending from insurance through ambulatory care, secondary inpatient care, and tertiary care to nursing home care and home care." As Conrad and Dowling (1990) put it, vertical integration is the coordination or linkage of businesses

(service lines) that are at different stages in the production process of health care. An example is when an acute-care provider owns facilities providing various other types of care such as long-term care. Mick and Conrad (1988) also have taken the hospital inpatient as a strategic business unit for which backward integration (upstream) can range from urgent to primary care, to wellness programs; and forward integration (downstream) can take the forms of skilled nursing facilities or rehabilitation units.

Conrad (1993) argues that vertical integration in health care requires integration of both the clinical and the administrative dimensions intra- and inter-organizationally, and that the clinical integration of patient care is central to achieving vertically integrated regional systems of health care. Clinical integration refers to the "coordination of services across the continuum of various forms of acute inpatient care to secondary specialty care, tertiary subspecialty care, long-term care, rehabilitation services, primary care to health promotion and disease prevention" (Conrad, 1993).

Recognizing that there are several approaches to interpreting vertical integration, this study focuses on the definition proposed by Williamson's transaction cost economics perspective. Comparison of Harrigan's (1984) concept with Williamson's (1985) reveals that Harrigan's breadth and stage of vertical integration is conceptually the same as Williamson's "efficient boundary," and Harrigan's ownership of vertical integration is Williamson's "efficient governance."

Different Interpretations of Vertical Integration

Each discipline interprets vertical integration according to its own perspective and purposes. Management, marketing analysts, and organization theorists all interpret vertical integration differently. Rangan et al. (1993) proposed that, assuming two dimensions of integration: production/distribution economics and governance, vertical integration can be classified into four models. The managerial model lays out product-market factors relevant to various levels of vertical integration, but identifies no underlying causes (Miracle, 1965). Monopoly models (Coughlan & Wernerfelt, 1989; Moorthy, 1988) focus on production and distribution economies. The third model, a market power model that considers governance costs, theoretically explains how vertical integration is affected by product-market competition and firm profitability. The transaction cost model accommodates both production/distribution economies and governance considerations (Williamson, 1975, 1985).

Organizational theorists who have interpreted the concept of vertical integration fall into three general groups: institutional theorists, resource dependency theorists, and transaction cost theorists. **Institutional** theorists argue that structural change is driven more by imitation pressures for organizations to resemble each other than by market forces (DiMaggio & Powell, 1983). Another line of reasoning maintains that the early adopters of vertical integration mainly seek efficiency and market advantages, but the late adopters seek legitimacy (Arndt & Bigelow, 1992).

Resource dependency theory offers insight into interorganizational relationships. Interdependency can be controlled by joining or participating in industry associations and coordinating councils, or establishing favorable linkages with external entities through boundary spanning, or forming joint ventures or coalitions with other organizations (Fottler, Schermerhorn, Wong, & Money, 1982). According to resource dependency theorists, interdependency can also be managed through organizational design, by adding separate functional units for each major source of external dependency, by centralizing or decentralizing production, or by performing activities of either horizontal or vertical integration (Lawrence & Lorsch, 1967; Thompson, 1967).

In recent years, the **transaction cost economics** perspective of Williamson (Williamson, 1975, 1985, 1991) has been adopted by organization theorists as one way of explaining vertical relations between organizations (Barney & Ouchi, 1986; Hill, 1990; Hurley & Fennel, 1990). Their argument is that vertical integration can overcome market imperfection and suppliers' opportunism.

Non-market governance is viewed similarly by resource dependency theorists and transaction cost theorists, as a strategic response to dependency and environmental uncertainty (Pfeffer & Salancik, 1978). The major difference between these two theories is that resource dependency theory limits its treatment of performance to effectiveness considerations, while transaction cost theory explicitly spells out efficiency implications of organizational relationships (Heide, 1994). Dependency results from asset specificity,

which makes it difficult to substitute a partner in the exchange at similar cost (Barney & Ouchi, 1986).

Vertical Integration in Health Care

Vertical integration has been put forward as a sensible strategic reaction to environmental forces in health care. The following section explains the motivation, risks, and determinants of success for vertical integration in the health care industry. Some examples of vertical integration are provided.

Motivation for Vertical Integration

Health care providers may be motivated to vertically integrate for various reasons, but most often for the following: to reduce transaction costs (Conrad & Dowling, 1990; Conrad, Mick, Madden, & Hoare, 1988; Mick & Conrad, 1988; Williamson, 1975, 1985), to reduce production costs (Conrad, Mick, Madden, & Hoare, 1988; Mick & Conrad, 1988; Williamson, 1975, 1985), to maintain viability (Wheller, Wickizer, & Shortell, 1986), to increase market share (Brown & McCool, 1986; Starkweather & Carman, 1987; Wheller, Wickizer, & Shortell, 1986), and to enhance market forces (Conrad, Mick, Madden, & Hoare, 1988; Harrigan, 1984; Williamson, 1975). These reasons correspond to the premise of economic theories that "firms react to changes in their economic environment in ways that maximize their position in the new setting" (Conrad, Mick, Madden, & Hoare, 1988). The following discussion explains the motivation of vertical integration in terms of efficiency, market share, and effectiveness.

The concept of transaction cost emphasizes efficiency (Arnould, Pollard, & VanVorst, 1988; Conrad, Mick, Madden, & Hoare, 1988). Several researchers even identify efficiency as the major motive driving health care organizations to adopt vertical integration (Conrad & Dowling, 1990; Conrad, Mick, Madden, & Hoare, 1988; Hurley & Fennel, 1990; Williamson, 1975, 1985). When one investigates the possible advantage (efficiency) of vertical integration for hospital operation, a major financial benefit is seen to be economies of scale, that is, achieving operating economies and improving utilization of existing resources. With an expanded scale of operation, a hospital can spread fixed costs over more patient days or services, thus immediately reducing the average unit cost with little impact on its revenue (Giardina, Fottler, Shewchuk, & Hill, 1990; Whitman, DeAngelis, & Knapp, 1986).

Several studies suggest that organizations should work on finding synergy between different levels of the care process, by fully using the resources available in one part of a facility. Relatively short inpatient stays at acute-care hospitals are thought to be attributable to the hospitals' close affiliations with extended-care facilities (Tresch, Simpson, & Burton, 1985). Patients discharged to a hospital-affiliated nursing home usually have fewer delayed discharges than do those discharged elsewhere (Weissert & Cready, 1988). In this sense, vertical integration of nursing homes into hospitals may lead to financial or economic success, either increasing revenue through expanded market share or decreasing expense by fully using the existing personnel, equipment and beds

(i.e., economies of scale). This analysis indicates that hospitals with certain degrees of vertical integration could hasten discharges.

It is not appropriate to attain efficiency unless effectiveness is also safeguarded. As with the situation of hospitals and nursing home care, the advantages of hospital-based SNFs cannot be evaluated only on how much cost is contained; how well patient care is coordinated is equally essential. Hospital-based SNFs allow hospitals to coordinate the care provided beyond the acute-care phase, thereby improving overall continuity. Cost savings are justified only if the process also improves quality, for example by giving physicians better access to facilities and to patients' medical records, and by allowing patients better access to physicians and nursing personnel (Whitman, DeAngelis, & Knapp, 1986).

Risks of Vertical Integration

It is important to note that vertical integration does not guarantee improved financial performance (Clement, 1987; Smith, Piland, & Phillipp, 1991). Many of the new service lines (such as wellness programs and emergency services) in some system hospitals are not profitable (Shortell, Morrison, & Hughes, 1989). How much hospitals should be involved in directly providing long-term care is controversial. Several studies have found that costs are higher at hospital-based SNFs than at freestanding SNFs (Shaughnessy, Kramer, Schlenker, & Polesovsky, 1985; Sulvetta & Holahan, 1986; Wiener, Liu, & Schieber, 1986). Another study found that expanded services, such as

swing bed, long-term care, and home care, in rural New Mexico hospitals are not positively related with hospitals' overall gross revenue (Smith, Piland, & Phillipp, 1991).

Theoretically, firms prefer producing ("making") key supplies and services over buying those key supplies and services, because "making" maintains autonomy over certain resources critical to survival. Therefore, managers may sometimes operate on the fallacious premise that more integration is always preferable. In fact, vertical integration does not guarantee success, especially when adopted inappropriately for the circumstances (Harrigan, 1984). According to some practitioners, it is difficult for vertically integrated organizations to operate in areas where management is shared by different owners (Ross, Williams, & Schafer, 1984). Some multi-system organizations in health care have been reported as pursuing "de-integration," divesting themselves of subsidiaries that have not met expectations or that are difficult to run (Graham, 1982; Shahoda, 1986). Managers need to understand the key dimensions of vertical integration better in order to avoid errors and gain the most benefit from joining dissimilar entities.

Determinants of Vertical Integration

Successfully designed vertical integration can help a hospital in several ways, including firming up the referral channels from providers of primary and secondary care, forestalling competitive physician activities, attracting more ambulatory business, and feeding more patients into the inpatient unit. The next question to be asked, then, is "what determines the success of vertical integration?"

The success of vertical integration is determined by complex factors: environmental conditions, competition, bargaining power, organization goals and culture, and managerial factors (Conrad & Dowling, 1990; Harrigan, 1984). Among all these, environmental conditions are the most extensive factors. They include demand or supply uncertainty, regulatory or technological change, and the relationships among different stages of a product.

As an example, the Medicare PPS, probably the single most significant environmental force in recent years, has dramatically changed the interdependencies among economic units at many levels in health care systems, and the interdependencies among informational intermediaries and payor parties. Reimbursement has shifted from specialists toward primary care physicians and so has motivated specialists to adopt risk- and gain-sharing arrangements with primary care physicians (Christensen, 1992; Fahey, 1992). The key to success for health care providers who adopt vertical integration is the ability to coordinate different levels of care efficiently.

Several articles have examined the factors that affect whether health care organizations can achieve the goal of vertical integration. Conrad (1990, 1993) argued that the success of vertically linked strategies is influenced by integrative instrumentalities. The instrumentalities can be categorized as 1) inter-organizational administrative coordination mechanisms; and 2) intra-organizational administrative coordination and patient care coordination. To fully coordinate units within a health care organization, patient care has to be managed first, through such mechanisms as case

management and discharge planning. Intra-organizational coordination closely links different units or stages in the production of health services, for example, through the use of a program coordinator. Inter-organizational coordination ranges from tapping the benefits of single ownership to utilizing the advantages of proximity among different organizational units (Conrad & Dowling, 1990).

Shortell, Morrison, and Hughes (1989) identified four factors leading to successful operation in eight hospital systems. The factors included strategies for working effectively with physicians, learning to combine centralized and decentralized strategic planning approaches, understanding diversification, and applying an early adopters' experience curve. Because hospitals rely on physicians to bring in patients, strong hospital-physician relationships are a crucial factor for hospitals implementing integration strategies or responding to various diversification requirements.

In sum, the success of vertical integration is determined by complex factors: environmental conditions, integrative instrumentalities, organizational experience, and managerial factors. The time, place, type of service or good, and a hospital's ability should all be evaluated when considering vertical integration.

Examples of Vertical Integration

Health care organizations today are adopting vertical integration in "a tidal wave" (Bisbee, 1986; Robinson, 1994). Vertical integration is emerging among them in different forms, degrees, breadths, and stages. Managed care networks, regional health

systems, local health care systems, and hospital-based integrated systems are some examples.

The experiences of vertical integration in health-care delivery systems range from macro levels (multi-stage, inter-organizational) to micro levels (single stage or intra-organizational). The macro levels include regional hospital systems, HMOs, PPOs, physician-hospital organizations (PHOs), and local health-care organizations (Brown, Clement, Hill, Retchin, & Bergeron, 1993; Gillies, Shortell, & Anderson, 1993; Luft, 1981; Shortell, Morrison, & Hughes, 1989; Thorpe, 1992). The micro level includes hospital or organization intra-structures such as case management programs, and hospital-based services such as primary care groups, hospital-based skilled nursing facilities, and hospital-based home care (Robinson, 1994; Sullivan & Flynn, 1992; Wheller, Wickizer, & Shortell, 1986).

At the macro level, is a typical integrated health care system is the managed care network. The integration of risk-based capitation payments with the provision of services seems to be a key factor in describing the various organizational forms of a capitated system (Rossiter, 1987). According to the extent to which the capitation payment is risk-based, there are four types of HMO models: 1) staff HMO, 2) group HMO, 3) network independent practice association (network IPA), and 4) Traditional independent practice association (traditional IPA) (Luft, 1981). Another organizational form of risk-based capitation payment is PPO. Compared to the four types of HMO models, PPO is the least integrated.

The continued growth of HMOs and PPOs indicates the acceptance of these structures by the general public. The growth of vertically integrated firms, particularly HMOs, also reveals how health care organizations respond to high transaction costs (Thorpe, 1992). In order to promote cost containment by health-care providers, Medicare has aggressively encouraged its beneficiaries to enroll in HMOs (Wilensky & Rossiter, 1991). In addition to the federal trend, state governments have also adopted managed care as an instrument to achieve cost-effective medical care for the poor (Freund & Hurley, 1987). This has quickly increased the number of HMOs and the number of Medicare beneficiaries enrolled in them, even though patients' satisfaction with HMOs varies among groups, and the quality and cost of care are not necessarily better than from fee-for-service providers (Brown, Clement, Hill, Retchin, & Bergeron, 1993).

HMO growth is reflected in the increase in their members from only 12.5 million in 1983 to almost 42 million by the end of 1992 (Group Health Association of America, 1993). Total membership in the 546 HMOs in 1992 represented 16% of the nation's population and almost 19% of those insured. The same trend was present in another type of managed care network, PPOs; by the end of 1991, the 584 corporate entities operating 978 individual PPO plans had established networks of various providers caring for approximately 85.4 million eligible employees and their family members in every state of the U. S. (Marion Merrel Dow, 1992).

Significant total cost savings have been demonstrated in managed care plans. Luft (1980) reported up to 40% saving among HMOs as compared to fee-for-service

plans, and somewhat more hospital utilization savings in staff and group models than in individual practice associations (IPAs). Wolinsky (1980) also suggested that service use and costs are generally lower among staff models as compared to group models. The literature implies that the most integrated models may maximize cost savings.

At the micro level, on the other hand, many hospital-based integrated delivery systems have proven to be powerful and successful (Hurley, 1993; Sullivan & Flynn, 1992). The hospital-based services can take different forms and be at different levels. The most frequently used include ambulatory primary care groups, hospital-based SNFs, and home health care services.

An analysis conducted by Wheeler, Wickizer and Shortell (1986) provides an example of hospital-based primary care group practices. Wheeler and colleagues concluded that among the selected set of hospitals participating in a national demonstration program, the average hospital's inpatient days and admissions increased, by 9.0 % and 8.2 %, respectively. The increase was accompanied by an increase in the hospitals' patient days (3.6%) and in the market share of admissions (4.9%) after the development of hospital-based primary care group practice. Patients in the hospital-based nursing homes were found to need more medical and highly skilled nursing services than did patients in freestanding nursing homes. This indicates that hospital-based nursing homes have the capacity to care for more severe patients (Shaughnessy, Kramer, Schlenker, & Polesovsky, 1985).

The literature makes clear that organizational researchers have advocated vertical integration as a management strategy. They suggest that the advantages of a hospital's taking more control over critical resources are efficiency, increased market share, and improved quality of care. However, vertical integration in itself does not guarantee success. The success of vertical integration depends on reimbursement policies, competition, organizational experience, and managerial ability to coordinate various activities in an organization (Conrad & Dowling, 1990; Harrigan, 1984).

Summary

The literature review comprised four sections. The first section reviewed demand and supply in the nursing home market. The growing elderly population, the change in disease patterns, and treatment advances have stimulated demand for post-acute care. The demand has not been met, however, because of regulations and nursing home responses to reimbursement policies. The consequence has been difficulties for hospitals in discharging patients to nursing home care, as described in the second section.

The third section presented the varying definitions and interpretations of vertical integration offered by different disciplines. In this study, vertical integration is defined as efficient governance that is not restricted to dichotomous decisions, but based on a spectrum of choices, as proposed by Williamson's transaction cost economics.

The last section of this chapter examined the motivation and risks for health care organizations in vertically integrating different levels of services. The success of vertical integration is not always guaranteed. The time, place, type of service or good, and the

hospital's ability should all be evaluated when considering vertical integration. Finally, examples of macro-level and micro-level vertical integration were discussed.

Chapter 3

Theoretical Framework

In this chapter, the theory of organizational economics is outlined first. The definition of transaction cost economics, assumptions of market failure, and three dimensions of efficient governance of transactions are presented. This is followed by illustrations of how health care researchers have adopted TCE to interpret health care phenomena. In order to determine which indicators truly represent the three dimensions of transactions, a comprehensive literature review is conducted of empirical studies that have tested TCE in fields other than health care. After the literature review, a set of hypotheses is derived for each construct.

Organizational Economics

In recent years economists have considerably expanded their scope by adding to the phenomena they examine. In doing so they have developed a body of theoretical work labeled organizational economics (OE), or new institutional economics, (Barney, 1990; Perrow, 1986; Williamson, 1975, 1985). Organizational economics has made an important, even revolutionary, contribution to organization theory, providing an answer to the most fundamental question in organizational research, "Why do organizations exist?" (Hesterly, Liebeskind, & Zenger, 1990).

Previous theories of organizations have studied their evolution, but have not explained why organizations are necessary in the first place. From the perspective of organizational economics, organizations are neither collectivities oriented to the pursuit of relatively specific goals nor coalitions of shifting interest groups that develop goals by negotiation, as Scott (1987) defined them. Rather, to scholars of organizational economics, organizations are the sets of arrangements that govern the collectivities and permit efficient exchange among interest groups.

The new organizational economics is preoccupied with the origins, incidence, and ramifications of transaction cost economics theory. Fundamentally, transaction cost theory is a new economic model based on individual competitive self-interest.

An early statement about the role of costs of using market organizations in governing market exchange in given circumstances was that provided by Coase (1937). However, it was not until the 1970s that Oliver Williamson made a significant contribution to refining transaction cost economics as a systematic framework for organizational economics. Williamson initial statement in his book Markets and Hierarchies: Analysis and Antitrust Implication (1975), not only provides insight into how economic and other organizations differ in their behaviors from the pure market model, but also synthesizes some earlier applications of transaction cost economics to internal labor markets, vertical integration, and the economics of internal organizations, to name a few. Another work, The Economic Institutions of Capitalism: Firms, Markets, Relational Contracting (Williamson, 1985), further extends the boundaries of TCE. His

more recent work (Williamson, 1991) has emphasized the importance of the hybrid form to organizations.

Transaction Cost Economics

Transaction cost economics is a theory that incorporates concepts from economic and contract law into a broader model explaining how organizations respond to market "failure" to provide the most efficient model of exchange (Williamson, 1975, 1985, 1991). The theory focuses on the transaction -- the exchange between buyer and supplier -- as the primary unit of importance and suggests that the dimensions and attributes of transactions determine the preferred transacting form. The form may be "spot market" exchanges, in which buyers and sellers may have no prior established relationships; contracting of a mid- or long-term duration (via contract or joint venture arrangement), where a transaction setting has been developed to guide exchanges (called a "hybrid arrangement"); or vertical integration, where the buyer ultimately gains permanent control over the supplier. Vertical integration is also characterized as "hierarchy." Transaction cost theory suggests that the design of organizations may be interpreted as the result of the exchange partners' continuing calculation of "make or buy" decisions.

Definition of Transaction Costs

Formal definitions of transaction costs are remarkably rare in the literature (Robins, 1987). Defined by Arrow (1969), transaction costs are the "costs of running the economic system." They are different from production costs, on which neoclassical

analysis has concentrated. Transaction costs are the economic equivalent of a physical system's friction, which is inevitable between or among the technological units.

In basic terms, transaction costs are those costs associated with economic exchange that vary independently of the competitive market place of the goods or services. They include all search and information costs, as well as the costs of monitoring and enforcing contractual performance; the opportunity costs associated with contracting and administrative costs; and legal action costs as a result of contracting violations. In short, transaction costs include costs incurred in consulting, completing or revising inter-organization agreements (Williamson, 1975, 1985).

Consider opportunity costs, an important category of transaction costs, as an example. Opportunity costs can be defined as "the loss of the benefit the resources could have produced had they been put to the next-best use," or "the lost opportunity to invest in that alternative" (Thorpe, 1992). The benefits from the next-best use may be smaller or larger than those of the current use, depending on the situation. With a hospital bed, for example, discharging a medically stable patient could bring in more revenue if the bed is immediately taken up by a new acute patient, or could cause a loss if no other patient is ready to be admitted.

Williamson (1985) gives this explanation of transaction costs: "Holding the nature of the good and service to be delivered constant, economizing takes place with reference to the sum of production and transaction costs." He further suggests that the different organizational modes will be used to minimize two types of transaction costs -- *ex ante*

and *ex post*. *Ex ante* costs refer to those of drafting, negotiating, and safeguarding a contract, while *ex post* costs refer to the setup and operational costs associated with governance structures. These two types of costs are difficult to quantify and have to be addressed simultaneously, as they are actually independent.

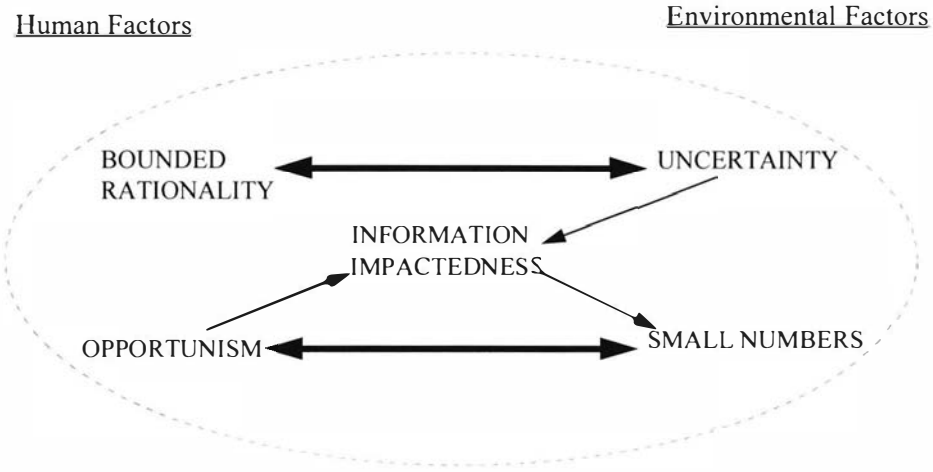
Several health care researchers have used the TCE perspective to interpret the scope and definition of the transaction costs in health care. Mick and Conrad (1988) interpreted transaction costs in markets and inside organizations, following Williamson and Ouchi's definition (1981). They divided market transactions into two categories. The first category consists of transaction costs incurred in the market search process: costs associated with searching for firms that produce, supply, or distribute the product or service of interest; the second category consists of transaction costs incurred in the contracting process: costs associated with negotiating, monitoring, and enforcing the provisions of a contract.

The transaction costs in the market search process can be further decomposed into 1) costs of determining what is necessary for the goods or service; 2) scouting, environmental scanning and intelligence costs, such as costs to obtain information about the reputation of a specific firm; 3) costs of developing requests for contract proposals; and 4) costs associated with deciding which firms will enter into contract-related proceedings (Conrad, Mick, Madden, & Hoare, 1988). In sum, excessive transaction or friction costs are incurred in the exchanges between providers and purchasers and among providers.

Assumptions of the Market Failure Framework

In proposing the market failure model, Williamson (1975) made certain paired assumptions. One pair of assumptions concerns uncertainty/complexity and bounded rationality, the other small numbers and opportunism (Figure 1). Further, an important factor is associated with these two pairs: information impactedness. Information impactedness means that information pertaining to a transaction, or set of transactions, is frequently asymmetrically distributed between the parties to an exchange, that is, often one party has more information than the other has. Bounded rationality refers to the limitations of any individual as an information processor. Actors or parties cannot anticipate every contingency and objectively deduce the optimal response. As the environment becomes more complex or uncertain, these limitations are quickly reached.

Williamson's second pair of concepts -- small numbers and opportunism -- is used to develop a different argument about the relative advantages of the market and of organizations. Opportunism means "self-interest seeking with guile" (Williamson, 1975). Williamson (1975, 1985) asserts that if there are few available partners, the buyer may be unable to avoid deceitful transactions. Creating an organization helps to reduce opportunism among exchange partners. Bringing economic transactions under a hierarchical structure makes better auditing and surveillance possible.



Source: Market and Hierarchies. (p.40) by O. E. Williamson, 1975, New York, The Free Press.

Figure 1. The Organizational Failures Framework

In another work, Williamson (1985) has mentioned again the importance of understanding how opportunism shapes organizational economics. Opportunism refers to the incomplete or distorted disclosure of information, particularly in calculated efforts to mislead, distort, disguise, obfuscate, or confuse. It is the source of behavioral uncertainty in economic transactions (Williamson, 1985). Opportunism can lead to real or contrived conditions of information asymmetry and can complicate problems of economic organizations; but it can be reduced, provided that individuals are absolutely honest in realizing individual advantages, or provided that complete subordination, self-denial, and obedience can be assumed. Williamson has argued that in the study of economic

organizations, understanding transactions that are subject to *ex post* opportunism can be beneficial in that appropriate safeguards can be devised *ex ante*.

Three Dimensions of Efficient Governance

Although the degrees of integration presumably are on a continuum, it can be classified as vertical integration (hierarchy), long-term contracting (hybrid), and spot market trading, moving from fullest to non-integration. Williamson's early work (1975, 1985) introduced a governance form, mixed governance, in which some firms tend to buy and others to make, yet none feel satisfied with their decisions. However, the mixed governance form is now less emphasized. Several years later, Williamson revised his argument, based on the transaction-cost-minimization hypothesis, and proposed that intermediate-level transactions tend to be governed by hybrid forms including long-term contracting, reciprocal trading, regulation and franchising (Williamson, 1991).

Three major dimensions of transactions: asset specificity, uncertainty, and frequency, are proposed by Williamson (1975, 1985) as central to selecting an exchange mechanism from among market, hybrid, or hierarchy. In other words, the choice of governance structure is contingent upon a) the amount of uncertainty associated with the availability of desired resources, b) the level of interchangeability of the sought-after good or service (asset specificity), and c) the frequency of good or service exchange. Asset specificity, among the three, is regarded as the most influential. Buyers may find themselves at different degrees of risk of overpaying, due to the interaction of these three

dimensions. Such risk can be managed or even avoided by adopting alternative transaction arrangements (Williamson, 1975, 1985, 1991).

Efficient boundaries are important to efficient governance. To achieve an efficient boundary, Williamson (1985) suggests that the make-or-buy decision should be made only after the consequences of alternative modes for production and transaction costs have been assessed. The production cost is generally measured by the unit of service or goods sold in the market. The more units a firm can produce, the more it can reduce the marginal production cost at certain levels of outputs.

Transaction uncertainty, being one of the principal factors affecting the choice of governance form, arises from the firm's lack of ability to predict contingencies, which makes contract writing difficult. Market contracts should be adapted to changes when unforeseen situations occur, because opportunistic partners may interpret unspecified clauses to their own advantages.

To internalize transactions is considered a sensible response to environmental uncertainty, because a vertically integrated administrative mechanism enables sequential and adaptive decision making as well as smoother processing. Furthermore, an authority structure can quickly resolve conflicts over differing interpretations of new circumstances. Thus, the information flow between two entities can be enhanced and they can react better to uncertainties (Williamson, 1975, 1985). In addition to environmental uncertainty, Williamson notes behavioral uncertainty, defined as the "difficulty of ascertaining the actual performance or adherence to contractual agreement"

(Williamson, 1985). It is different from environmental uncertainty, which is exogenously imposed on the exchange; behavioral uncertainty rather arises within the exchange itself because of the opportunistism of the parties involved.

Asset specificity refers to "durable investments that are undertaken in support of particular transactions, the opportunity cost of which investments is much lower in best alternative uses or by alternative users should the original transaction be prematurely terminated" (Williamson, 1985). In other words, the significant attribute of transactions refers to the extent to which specialized, i.e., nonredeployable, investments are needed to support an exchange. Four types of asset specificity are suggested by Williamson -- site specificity, physical asset specificity, human asset specificity, and dedicated assets. The nature of all but dedicated assets is clear in the common sense meaning of the words. Dedicated assets refer to "general investment by a supplier that would not otherwise be made but for the prospect of selling a significant amount of product to a particular customer" (Williamson, 1985). In his more recent paper (Williamson, 1991), Williamson added two types of asset specificity -- brand name capital and temporal specificity. The latter is akin to technological nonseparability and can be thought of as a type of site specificity in which timely responsiveness by on-site human assets is vital.

Williamson explains site specificity by borrowing Thompson's (1967) concept of "core technology," which suggests that some stages in the production process are the technological core and should be consolidated in order to produce a good or service efficiently. In considering modes of control, site specificity should be favored for

vertical integration (Williamson, 1985). The degree of asset specificity can range from nonspecific, to mixed, to highly specific (idiosyncratic).

Transaction frequency also affects the choice of governance structure. Frequency of transactions clearly has to do with scale economies. That neoclassical concept is derived from Adam Smith's famous theorem that "the division of labor is limited by the extent of the market." More generally, the object is to economize not only transaction costs, but both transaction and neoclassical production costs. In other words, whether the volume of transactions through a specialized governance structure utilizes the structure to capacity is the important issue. High frequency of transactions also permits an organization to monitor or evaluate the goods or services provided by the suppliers, to ensure their desired behavior and reduce the organization's own risk, since it accumulates knowledge from the frequent transactions.

Additional implications arise from considering the effects of quantity (or firm size) and organizational form. The basic proposition is that diseconomies associated with own-production will diminish as the quantity of the component to be supplied increases. In other words, the firm is better able to realize economies of scale as its own requirements increase relative to the market size. Therefore, Williamson has ascertained that, ceteris paribus, larger firms will be more likely to integrate components than smaller firms will be (Williamson, 1985). According to Williamson's taxonomy, the frequency of exchange can range from one-time, to occasional, to recurrent.

The **interaction** between and among the three dimensions -- asset specificity, uncertainty, and frequency of exchange -- deserves attention. The nature of institutional arrangements tends to vary with different combinations of these three dimensions. To minimize costs, a firm may choose from among simple anonymous market (spot market) contracting, more complicated long-term contractual arrangements with protective provisions, or internalizing organization. Williamson terms these three institutional arrangements classical contracting, non-classical contracting, and relational contracting. He further points out two types of relational contracting: 1) bilateral structure, in which the autonomy of the parties is maintained, and 2) unified structure, in which transactions are removed from the market and integrated into the organization.

Several propositions based on Figure 2 can be derived. For nonspecific transactions, the market is perfectly competitive. In a perfectly competitive market, many buyers and sellers deal with an interchangeable product or service, and no one can influence pricing. For such transactions, spot market contracting is the most appropriate (left cell). Long-term contracting suits transactions that are either 1) occasional and of mixed specificity, regardless of uncertainty, or 2) very specific with high uncertainty and not frequent enough to achieve scale economies. Vertical integration is favored when transactions are very idiosyncratic, frequent, and with high environmental uncertainty (the upper right cell) (Williamson, 1991).

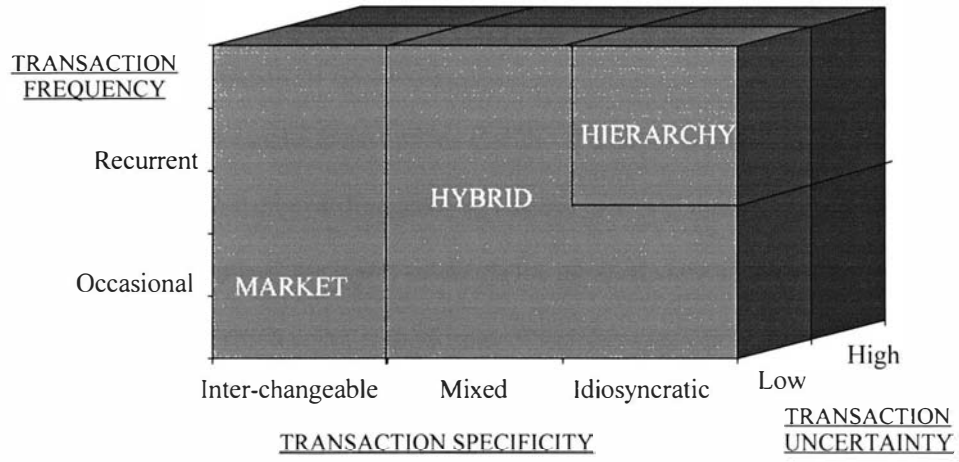


Figure 2. Three Dimensions of Williamson's Framework of Transaction Cost Economics

To internalize or vertically integrate, standardized transactions for which market aggregation economies are greater tends to cause loss. In contrast, for highly specific transactions, increasing degrees of uncertainty will lead to larger contractual gaps and increasingly important and numerous sequential adaptations; under such situations, vertical integration becomes favorable. For the in-between transactions for which the cost disadvantage decreases but remains positive (at intermediate degrees of asset specificity), a firm may find itself better off with mixed or hybrid governance, such as long-term contracting with outside suppliers. Briefly, market competition results in scale economies when asset specificity is low; internalizing an organization is advantageous

when asset specificity is tangible; and mixed governance is favored when transactions have an intermediate degree of specificity.

Three examples make these notions clearer. If a buyer is interested in acquiring a good or service which the buyer frequently needs and of which there is an abundant supply and many suppliers, the (spot) market is the most efficient source. The buyer does not incur substantial search costs, comparisons of suppliers are easily made, and no supplier can monopolize or corner the market if the supply is ample. On the other hand, if a frequently acquired product must be specifically developed by a few suppliers or a single qualified supplier, open market exchange is compromised, and the buyer is in many respects at risk of exploitation by an opportunistic supplier in negotiating price and other terms. Such a situation requires more careful delineation of the exchange framework, for example by formal contractual relationship. Sometimes, even a joint venture or quasi-firm is needed. In the most extreme case, a crucial supplier would become a target for acquisition by a buyer who wants both to avoid exploitation and to maximize control over the supplier's performance.

TCE Interpretation of Vertical Integration in the Health Care Industry

Studies which examine transaction cost economics in health care are quite limited. One article has attempted to examine vertical integration by using TCE (Mick & Conrad, 1988); but, with exceptions, they have failed to incorporate Williamson's core concepts: market failure and the three dimensions of transactions (Hurley, 1993; Hurley & Fennel,

1990). Only one paper uses Williamson's model to test the theory (Chiu, Hurley, & Chen, 1993). The studies' arguments and findings are briefly described below.

Conrad and colleagues (Mick & Conrad, 1988) used the concept of transaction cost to explain the hospital-physician and provider-insurer relationships. They formulated seven propositions which relied heavily on Williamson's concepts, such as the conditions under which vertical integration can offset uncertainty or opportunism. They used other studies' findings to examine their propositions, even though those studies were not designed to test the theory. Consequently, they were not able to test the three dimensions of transactions.

Hurley and Fennell (1990) extensively used Williamson's market failure and two dimensions of transactions to interpret the emergence of case-management programs. Case-management programs may emerge as a result of market failure, in which for many transactions the spot market of the health service system is not cost-effective for individual patients seeking care. Case management gives primary physicians responsibility for arranging a certain range of medical services. The primary physicians act as case managers as well as gatekeepers, serving as the enrollee's only starting point of access to medical services.

Case management is intended to replace inefficient transactions with a pre-arranged governance structure of sustained contractual relationships. The characteristics of case management fit into the two dimensions -- asset specificity and frequency. Asset specificity exists in that primary physicians link patients with medical specialists, decide

on patients' particular needs for care, and restrain patients' opportunistic behaviors, thus minimizing transaction costs. The relatively high frequency of visits to primary physicians helps explain why case managers, by controlling physician visits, can minimize costs (Hurley & Fennel, 1990). The gatekeeping function of case management is seen as the potential solution to Medicaid's problems of unnecessary care, curbed access to primary care (Freund & Hurley, 1987), and inefficiencies and discontinuities in care seeking (Hurley & Fennel, 1990).

Adopting Williamson's governance forms, Hurley (1993) discussed integrated health care systems ranging from fully to least integrated: provider-sponsored integrated systems, bilateral compact models, and network/selective contracting models. In a provider-sponsored integrated system, the decision to integrate vertically is based primarily on human and site specificity, and the system's facilities and resources can provide continued care efficiently through case management and integrative mechanisms. The bilateral compact model is characterized by the existence of a long-term bilateral contract between the provider and an intermediary such as a product distributor, and the product is jointly sponsored by both. The fast-growing network/selective contracting model represents the broker-developed spot market contracting with a provider. The bilateral compact model is exemplified by group model HMOs, and the network/selective contracting model is exemplified by PPOs.

The growth of each of the three models suggests how distinctively providers can be reconfigured to meet consumers' needs. The co-existence and popularity of different

types of integrated health care systems indicates that some are superior to the others under particular conditions. The pressure to restructure comes mainly from care purchasers, because the "buyers-market" (Brink, 1986) has arrived, in which care providers face tremendous challenges. The selection of vertical integration types largely depends on the objectives of the purchasers (Hurley, 1993).

Chiu, Hurley and Chen (1993) attempted to apply transaction cost economics to health care settings. In their pilot study, they used 507 acute hospitals in the mid-Atlantic region (New York, New Jersey and Pennsylvania) as the study sample. The three dimensions of Williamson's TCE were used to derive hypotheses. The authors proposed that hospital's make-or-buy decisions about discharging elderly patients would depend on transaction uncertainty, transaction specificity and transaction frequency. Their findings supported the model's fit in distinguishing between spot market and hybrid/hierarchy. But in distinguishing between hybrid and hierarchy arrangements the model was less successful.

Empirical Studies of TCE in Fields Other than Health Care

The following review synthesizes various findings from studies using TCE in fields other than health care. These studies are categorized as 1) comparisons of pairs of governance forms, that is vertical integration vs. hybrid; 2) comparisons of spot market, hybrid arrangement, and vertical integration; and 3) theory testing by economic simulation and case studies. Attention is directed toward type of industry, governance

forms (market, hybrid, and vertical integration), uncertainty, asset specificity, and frequency (scale economies).

A pair comparison of governance forms, hybrid arrangement vs. vertical integration, is presented in Appendix A.

To understand why GM and Ford integrated backward into selected components, Monteverde and Teece (1982) investigated 133 component groupings that contain major items of a vehicle. Whether or not the component was manufactured internally was chosen as an indicator of integration. Existence of engineering effort to develop a component, and whether the component was specific to a particular auto company or generic to all companies indicated asset specificity. Monteverde and Teece (1982) concluded that a company with more application engineering effort, more specific specificity, and large size is more likely to adopt vertical integration. Their finding supported the proposition that the higher the specificity and the volume of transactions, the higher the possibility that a firm will choose hierarchy (vertical integration).

Decisions by firms in the electronic components industry to integrate the marketing function were measured by Anderson and Schmittlein (1984), using the firms' reliance on either direct sales people (employees) or independent sales agents (manufacturer's representatives). The product lines that individual firms sold in specific sales territories were the units of analysis. The authors focused on integrated governance forms as affected by asset specificity and scale economies. Asset specificity was measured by variation in service territory characteristics and difficulty in monitoring the

performance of sales personnel. Scale economies were measured by source of internalization costs. They found positive associations between integration and levels of asset specificity, difficulty of performance evaluation, and the combination of these two. Employees at larger firms were more likely to have to market their own products. The construct of transaction uncertainty did not have a significant impact on integration.

A study by Masten (1984) analyzed an aerospace firm in its make-or-buy decisions about components sold to the government on contract. The study compared two governance structures, direct incorporation and market procurement. The dependent variable was whether a certain component was produced internally or purchased in the market. Asset specificity contained design specificity and site specificity. The degree of specialization and the complexity of components were found to affect the make-or-buy decision. Vertical integration became more likely as contracting became more costly, supporting Williamson's argument.

Walker and Weber (1984) also studied automobile manufacturers, but focused on the comparatively simple parts used in the initial assembly stage. In examining the effects of asset specificity, uncertainty, and scale economies, they analyzed 60 decisions and evaluations by a component division about making or buying a certain component. Their findings showed significant effects of supplier production advantage and volume uncertainty on the make-or-buy decision.

Palay (1984) studied transportation transactions between manufacturers and railroads. Most rail shipment contracts were for standardized services, but some

shipments created problems of special car design and handling. The study revealed that the highly idiosyncratic nature of the rail equipment favored its ownership by the railroad.

Next, the governance forms of spot market, hybrid, and hierarchy are compared. Four studies are reviewed -- two dealing with forward integration and two with backward. All the studies compared governance forms by pair. Outlines of each study are presented in Appendix B.

Rangan and colleagues (1993), interested in understanding complex channel phenomena rather than testing the theory, interviewed managers in five industries (50 key informants in 15 selected manufacturing firms, and 20 key informants in seven related distribution firms) about their rationales for channel choice decisions. The authors examined the polar modes and also studied two important but less explored aspects of forward vertical integration -- channels in the hybrid mode (sharing of tasks between "direct" and "indirect" channels rather than assigning them wholly to one or the other) and channels in transition (evolving from one form to another). Taking one industry as an example, the study noted the responses of two leading blood collection systems to environmental uncertainty in health care. After the PPS took effect, manufacturers became more integrated by switching from performing only the function of product communication, to undertaking all channel functions except inventory support and physical delivery. The authors concluded that hybrid channels affect transactions that require intermediate or mixed levels of asset specificity, and that channel functions are allocated among direct and indirect channels according to gains in efficiency.

Klein, Frazier, and Roth (1990) surveyed 10 Canadian companies with 925 items in order to understand why they adopted channel integration in the international market and how governance forms were affected by asset specificity, external uncertainty, and production cost or channel volume. They used the extent to which durable, transaction-specific assets were found in the export market as an indicator of asset specificity; volatility (the degree to which the environment changes and allows a company to be caught by surprise) and diversity (the number of final customers and competitors) as indicators of external uncertainty; and channel volume as an indicator of production cost, a proxy for transaction frequency. Governance forms had four modes as follows: 1) hierarchy mode through the establishment of a foreign sales subsidiary, 2) hierarchy mode serving the foreign market from home, 3) intermediate mode (the use of commission agents or joint ventures), and 4) market mode (the use of merchant distributors).

Some of their results supported propositions of TCE, while others did not. The decisions about channel structure in a foreign country depended on how well the market could limit the opportunistic tendencies of outside intermediaries. Various forms of forward integration emerged as alternatives when the enforcement of contractual arrangements by relying on the market failed. Such integration in channel international markets was influenced by channel volume, the use of shared channels, and country destination. What did not support Williamson's theory was the finding that firms used

intermediaries in foreign markets that had high environmental diversity, to cope with the inherent complexity yet maintain flexibility.

Walker and Poppo (1991) inquired about the influence of asset specificity on transaction costs at hybrid manufacturing organizations, by examining supply relationships of one large assembly division. They investigated how transaction costs or governance forms are influenced by asset specificity, preselection investment in technology, and supplier market competition. Transaction costs were measured by the difficulty the assembly division had in reaching agreements with suppliers on the allocation of adjustment costs (costs of material and engineering change). The three exogenous variables -- asset specificity, preselection investment, and market competition -- were represented, respectively, by the uniqueness of the supplier's technical labor skills and equipment to manufacture the product delivered to the assembly division; by whether the supplier invested in new technology to promote its chance of being selected as a supplier; and by the degree to which there were enough potential suppliers to ensure adequate competition to supply the product. Similarly to Klein, Frazier, and Roth's study (1990), not all of this study's results supported Williamson's transaction cost theory. The results confirmed that supplier specificity within the corporation is more related to lower transaction costs than is asset specificity in the market.

Joskow (1985) examined vertical integration and long-term contracts to supply coal to coal-burning electric utilities. A variety of coal supply relationships existed: 15% of utility coal was supplied by utility subsidiaries, another 15% purchased in a spot

market, and the rest purchased under contracts with terms ranging from one year to fifty years. Mine-mouth plants were compared with other types of electric generating plants burning coal, to test the relationship between site specificity and the governance form. It was found that mine-mouth plants (site specific) were more likely to vertically integrate, and that when vertical integration was not chosen, long-term contracts were often used to govern exchanges.

Another approach found in the literature to test the TCE is case study and economic simulation. Stuckey's (1983) research is a case study, and Garvey's (1993) is an economic simulation study. Stuckey (1983) explored vertical integration and joint ventures in the aluminum industry. He found that physical asset specificity and site specificity result in reliance on vertical integration of the bauxite and aluminum refineries. Information asymmetries about the quality and extent of bauxite deposits are an incentive to integrate.

Garvey (1993) investigated the problem of adaptation to information emerging after governance structures and contracts have been established. The study compared the efficiency of pre- and post-adaptations when the buyer and seller were independent to those when they were integrated. In the pre-stage, aspects of technology, preferences, distribution of uncertainty, and obligations exchanged under the alternative organization modes were common knowledge. The buyer was assumed to have private information regarding the potential benefits of adaptation, and the seller was assumed to have private information as well, about the costs to be incurred by the adaptation. The results support

the transaction cost theory in that hierarchy is favored when asset specificity increases, and market-based models are favored when asset specificity is slight. Hierarchy tends to be efficient under high asset specificity, when bargaining costs are likely to exceed the costs caused by opportunism.

Conceptual Models and Hypotheses

Williamson's concept of transaction cost economics can be applied to the relationship between hospitals and nursing homes. In their two-way channel, the hospital is a seller of hospital services as well as a buyer of nursing home services, while the nursing home is a buyer of hospital services and a seller of nursing home services. Dependency is critical to such relationships, according to the concepts of social exchange and resource dependency (Pfeffer & Salancik, 1978). As buyers' needs can be met by substitutes, suppliers can benefit little from acting opportunistically. Any cost increase motivated by the seller's opportunism is likely to have a negative impact in turn on the sellers. The uniqueness of each patient's needs for a hospital discharge plan and nursing home admission established the idiosyncrasy of transactions between hospitals and nursing homes (Williamson, 1975, 1985).

The transfers between hospitals and nursing homes that are tapped by Williamson's three dimensions are essential to this study. Uncertainty is highly associated with environmental uncertainty and behavioral uncertainty, that is, the demand and supply of SNF beds and the opportunistic behaviors of nursing homes. Hospitals in areas with an undersupply of nursing home beds and a higher percentage of indigent

elderly may find it difficult to discharge their patients, and therefore may employ vertical integration (hierarchy) to overcome nursing homes' opportunism. On the other hand, if located in areas with sufficient nursing home beds, hospitals may take no formal arrangement (market). If located in areas where the supply of nursing home beds is between these two extremes, hospitals may use formal arrangements (hybrid) to discharge their patients (Figure 3).

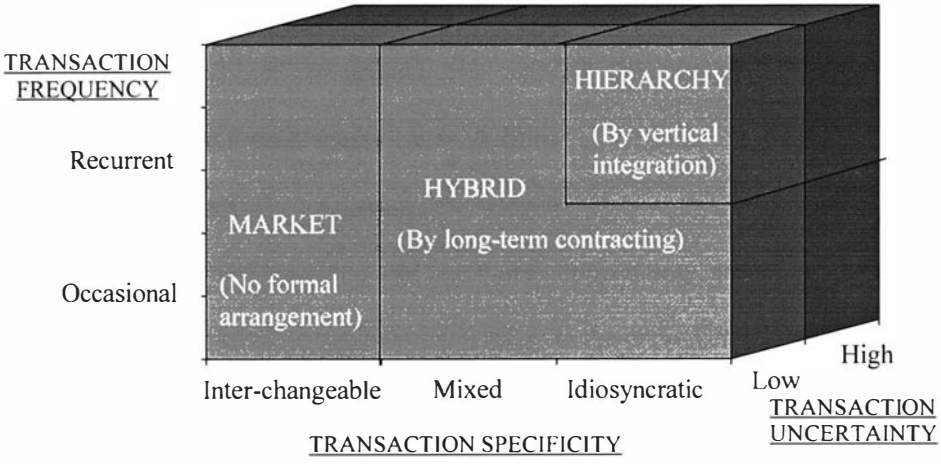


Figure 3. Three Dimensions of Patient Transfers: An Application of Williamson's Framework of Transaction Cost Economics

However, the choice of governance may well depend on two other factors, as well. Hospitals with special experience and expertise in elderly care may have higher expectations from nursing home outlets. Such experience or expertise also protects

hospitals from risks in employing vertical integration. In addition, hospitals with a high use of the downstream services are more likely to vertically integrate extended care facilities, because doing so can reduce costs of transaction and production. More importantly, the hospital's financial loss due to unnecessary stays may be reduced, and its space and equipment fully utilized. In short, hospitals with a high volume of patient exchanges have learned what is critical to the elderly's needs through constantly serving the elderly, and that knowledge encourages a hospital to vertically integrate nursing home care. Hospitals with low volumes of patient exchanges and thus a lack of experience will be likely to prefer no formal arrangement (spot market). Other hospitals in between the two extremes may use formal arrangements (hybrid).

Transaction Uncertainty

Williamson (1985) has proposed two types of uncertainty, environmental and behavioral. Environmental uncertainty, here, refers to the unpredictability coming from the environment as a hospital discharges patients. The number of available nursing home beds represents the degree of difficulty faced by a hospital when it intends to discharge patients for post-acute care. Behavioral uncertainty occurs when there are only a small number of suppliers, so the suppliers can exploit their advantage in information asymmetry over hospitals.

Hospitals used to enjoy a steady growth in profits due to growing population, higher incomes, mounting insurance coverage, limited competition, and retrospective cost reimbursement, until implementation of the Medicare PPS and other third parties' cost-

sharing reimbursement policies (Conrad, Mick, Madden, & Hoare, 1988). Cost consciousness replaced the laissez faire attitude toward costs that had characterized hospitals in the 1980s. That situation will continue and become more intense in this decade with the government's and the public's concerns about costs of health care.

The reimbursement changes have significantly increased the interdependencies in the health care market. The ability to arrange a patient's timely discharge to an appropriate facility is crucial to hospital profits in a DRG-dominated or risk-sharing market. Thus hospitals are now more dependent on nursing homes to receive their patients and to end the financial drain of patients' unnecessary stays. Furthermore, as both acute care costs and the general public's morbidity increases, the opportunity cost a hospital bears is high, because a bed occupied by a medically transferable patient could have accommodated another patient and generated more revenue for the hospital.

The DRG payment system also has encouraged hospitals to discharge patients earlier (Morrisey, Sloan, & Valvona, 1988a; Morrisey, Sloan, & Valvona, 1988b). In order to avoid malpractice suits, however, hospitals try to discharge patients to the next available health care institutions, such as nursing homes or home care agencies. Earlier discharges increase the volume of transactions between hospitals and nursing homes (DesHarnais, Kobrinski, & Chesney, 1987; Gornick & Hall, 1988; Kahn, Keeler, Sherwood, et al., 1990; Lewis, Leake, Leal-Sotelo, & Clark, 1987; Long, Chesney, & Ament, 1987; Morrisey, Sloan, & Valvona, 1988b; Neu & Harrison, 1988; Tresch, Simpson, & Burton, 1985).

In addition to the impact of the DRG payment system, hospital characteristics and competition affect hospital decision making. Hospital acute care occupancy is an indicator of the degree to which a hospital encounters uncertainty in the market, represented by the unavailability of discharge sites for hospitals with high occupancy. Hospital occupancy can be examined in two forms. One is an individual hospital's occupancy and the other is average hospital occupancy in the same market area. Hospitals with high occupancy rates have pressures to discharge their patients sooner so that they can admit new patients and avoid costs from the late discharges. Hospitals with high census and more patients waiting to be admitted usually deal with higher opportunity costs than do those with low occupancy rates. Hospitals in a high occupancy market area or neighboring area will demonstrate more urgency about relocating their elderly patients than will those in areas with relatively low occupancy rates. In other words, higher occupancy creates higher uncertainty in the disposition of elderly patients. In any event, hospital occupancy is an ostensible measure of uncertainty.

H1: A hospital that has a relatively higher occupancy rate and/or is located in an area with a high average occupancy rate is more likely to employ a higher degree of vertical integration in providing SNF services.

Since hospitals' abilities to discharge patients depend on the availability of nursing home beds, transactions will differ with the supply and/or occupancy of nursing homes (Gruenberg & Willemain, 1982; Nyman, 1993). Nyman's (1993) study showed a significant problem of access to nursing homes, but those findings were not consistent with his 1988 study, probably because of changes in nursing home occupancy rates. In

Wisconsin, problems of the elderly in gaining access to nursing homes were present in 1983 but disappeared in 1988. The overall occupancy rate dropped by about 2 % between 1983 and 1988, from 94.5% to 92.4%. Another study found that applicants' waiting time increased as the occupancy of nursing homes increased (Gruenberg & Willemain, 1982).

Several studies have indicated that the shortage of nursing home beds is positively associated with the costs of delayed discharge, or financial loss due to acute care beds being occupied by medically transferable patients. Kenney et al. (1991) found the elasticity of nursing home bed supply to be -0.07 in relation to inpatient length of stay. In other words, LOS decreases by 0.7% with a 10% increase in nursing home beds per elderly patient. Abramowitz (1986) has indicated that the nursing home bed supply is inadequate to meet the demand at all times, leading to costly (for the hospital) delays in discharge.

To minimize transaction costs, Williamson (1985, 1991) suggests two options with different degrees of control. The one with more control is vertical integration (hierarchy), and the other, with less control, is long-term contracting or hybrid mode. In areas with very low supply of nursing home beds, vertical integration is more appropriate, because capital losses are very unlikely. In areas with high nursing home occupancy, however, special caution has to be used in assessing the sufficiency of supply in the market. When high occupancy rates are coupled with sufficient supply, long-term contracting is adequate to overcome environmental uncertainty. If nursing home beds are

sufficient and occupancy rates are low, hospitals may use market arrangements for discharging patients, because the probability of delayed discharges and consequent financial loss is low.

H2: A hospital that is located in an area with a relative shortage of SNF beds and/or a high average SNF occupancy rate is more likely to employ a higher degree of vertical integration in providing SNF services.

Intending to maximize profits, nursing homes may preferentially select private-pay patients, since they pay as charged. This price discrimination behavior, which rejects first-come-first-served as a criterion, has been proved to exist by several studies (Dubay & Cohen, 1990; Massachusetts Hospital Association, 1979; Scanlon, 1980; Shapiro & Roos, 1981). The willingness of nursing homes to take public patients becomes less when beds are in critical undersupply (Coburn, Fortinsky, McGuire, & McDonald, 1993; Ettner, 1993; Nyman, 1989; Nyman, 1993; Weissert & Musliner, 1992), or when the public payment is relatively low and patients are relatively sicker (Bishop & Dubay, 1991; Dor, 1989; Dubay & Cohen, 1990; Shaughnessy, Kramer, Schlenker, & Polesovsky, 1985).

Opportunistic discrimination against patients by nursing homes increases hospitals' uncertainty and the costs associated with it. This situation appears more severe in areas where the bed supply is tight and many residents are poor. Two examples support this argument. Ettner (1993) used patient's length of delay (LOD) on a waiting list before being admitted to a nursing home as a proxy for the access measure, in a profit maximization model of for-profit facilities and a size maximization model of not-for-

profit facilities. The results indicated that nursing homes have incentives to favor admitting those patients, usually private patients, who offer more revenue and need less expensive care. Medicaid patients are kept waiting most often in counties where the capacity of nursing homes is limited and a high proportion of potential nursing home residents are private payors (Ettner, 1993).

Coburn and colleagues (1993) investigated how nursing home costs and access to care for public patients were affected by the adoption of prospective payment for nursing homes services in Maine during the period 1979 to 1985. Responsiveness to the efficiency incentives of the payment mechanism declined and problems arose in achieving further cost reductions, which in turn affected public patients' access to nursing homes. For Medicaid patients, the share of patient days declined, from 80.2% in year three to 75.9% in year six. Moreover, Medicare's share of patient days also declined, from 83.2% in year three to 75.9% in year six.

H3: A hospital in an area with relatively more indigent persons and a shortage of SNF bed supply is more likely to employ a higher degree of vertical integration in providing SNF services.

Transaction Asset Specificity

Experience in geriatric services and/or experience in caring for elderly patients who need subacute care gives a hospital advantages in human asset specificity as well as managerial expertise when developing nursing home services. Experience enables a hospital to thoroughly evaluate the advantages and risks of penetrating to the next stage of business services. Hospitals without such experience are less likely to be aware of or

concerned about variations in quality among their suppliers, and they may also be less demanding when selecting nursing homes, doing so mostly according to what is available.

A hospital's experience with the elderly health care market is essential to the decision to make, contract, or buy. The expertise in providing geriatric services can represent asset specificity or hospital identity. The geriatric service areas may include geriatric assessment units (GAUs), Alzheimer's diagnosis/assessment, geriatric clinics, and others. Geriatric assessment, for example, is defined as a "multi-dimensional -- usually interdisciplinary -- diagnostic process designed to quantify an elderly individual's medical, psychosocial, and functional capabilities and problems with the intention of arriving at a comprehensive plan for therapy and long-term follow-up" (Rubenstein, 1988). GAUs are acknowledged to yield improvements in patient functioning and to facilitate appropriate use of nursing homes and hospitals (Rubenstein, 1988; Saltz, 1988). The effects of GAUs are found to be especially on discharge efficiency, coordination and continuity of care (Bowlyow, 1994). In addition, home care is an important proxy for a hospital's capacity to integrate nursing homes, because home care services, which are extended to the community as a substitute for nursing home care, represent a hospital's expertise in caring for elderly patients.

It can be concluded that the more experienced and knowledgeable a hospital is in caring for the elderly, the more discriminating it will be in selecting nursing homes for its discharged patients.

H4: A hospital that provides a wider variety of geriatric services to elderly patients is more likely to employ a higher degree of vertical integration in providing SNF services.

H5: A hospital that provides home health services to elderly patients is more likely to employ a higher degree of vertical integration in providing SNF services.

Transaction Frequency

The dimension of transaction frequency refers simply to the number of transfers that a hospital makes. Since most nursing home residents are elderly, the number of Medicare patients should reflect the frequency of exchanges between hospitals and nursing homes. Increased transfer rates were found after the implementation of Medicare PPS. One study reviewed hospitalization and mortality data for Medicaid and the general population in Wisconsin for 12 months after the implementation of PPS (Sager, Alaine, Leventhal, & Easterling, 1987). The average annual hospitalization for the community elderly fell, but for nursing home residents the rate rose sharply. Hospital length of stay dropped for both groups, but less so for nursing home residents (Sager, Alaine, Leventhal, & Easterling, 1987). In 1984, 72% of the Medicaid institutionalized elderly had been hospitalized; most admissions had followed on hospital discharges (Sager, Alaine, Leventhal, & Easterling, 1987).

The Rand Corporation's study of Medicare asserted that 2.5% to 3.2% of Medicare hospital-discharge claims are incurred for post-hospital care in skilled nursing facilities (Neu & Harrison, 1988). Morrissey and his colleagues' finding (1988b) not only confirms what has been claimed by Neu and Harrison (1988), but also shows a substantial

increase in patients transferred from hospital to subacute care after the implementation of Medicare PPS. The increase in exchanges holds true especially for hospitals with higher proportions of elderly patients. Several studies have used channel volume as a proxy for exchange frequency (Anderson & Coughlan, 1994; Anderson & Schmittlein, 1984; Klein, Frazier, & Roth, 1990), and others found that volume of exchange was positively associated with firms' decisions to make rather than buy (Anderson & Coughlan, 1994; Klein, Frazier, & Roth, 1990).

H6: A hospital with a relatively higher proportion of Medicare patients is more likely to employ a higher degree of vertical integration in providing SNF services.

HMOs are generally characterized by receiving a fixed and prepaid fee, irrespective of service use, thereby accepting financial risk for providing or arranging a stated range of services (Boland, 1991). PPOs, on the other hand, have contractual agreements with defined groups of providers -- typically both hospital and physician -- to offer discounted fee-for-service to particular groups of individuals (Rice, Lissovoy, Gabel, & Ermann, 1985). Under risk-sharing, hospitals and physicians have an incentive not to admit patients to costly acute care units, and to make subacute care institutions the patients' next destination when they are no longer acutely ill. Physicians are known to affect the demand for medical care and would be motivated under the risk-sharing reimbursement to send patients home or to long-term care units more quickly in order to reduce acute care use. That behavior, in turn, increases patient transfers to nursing homes, raising the demand.

Several studies reported that hospital utilization and management have been changed due to contracting with managed care organizations. In a randomized study comparing HMOs with fee-for-service sectors between 1950 and 1980, it was found that HMO patients used 30% fewer hospital days, attributable to a lower level of spending (Luft, 1980). Greenfield (1992) also found that patients in fee-for-service plans had about 40% more hospitalizations than did patients in HMOs. Adjusting these experimental data for the average level of copayment in the United States, Schwartz (1987) estimated that HMO enrollees used about 31% fewer days than did fee-for-service enrollees. To reduce hospital days, hospitals may be willing to offer skilled nursing services through vertical integration arrangements, to serve a larger pool of patients.

H7: A hospital affiliated with managed care organizations is more likely to employ a higher degree of vertical integration in providing SNF services.

Hospital size largely determines the volume of patient transfers, because the more beds a hospital owns, the more patients it can care for and the more patients it will have to transfer. As Williamson (1985) has argued, the size of a firm affects its ability and willingness to vertically integrate, because costs can be spread over more units of goods or services and thus it can achieve savings on production and transaction costs. Firm size has been used as a proxy for the transaction frequency or scale economies (Anderson, 1985; Anderson & Schmittlein, 1984; John & Weitz, 1988; Monteverde & Teece, 1982). Several studies have found size to be positively and significantly associated with the hierarchy mode of control (Anderson & Schmittlein, 1984; Monteverde & Teece, 1982).

However, size alone is not fully representative of the volume of exchanges between hospitals and nursing homes, since with larger size there may be only a larger portion of non-elderly patients. But hospitals with both larger size and higher proportions of Medicare patients have more transactions between hospitals and extended care facilities than do those hospitals without these characteristics. The interaction of the proportion of Medicare patient discharges and hospital size should well represent the frequency of patient transfers.

H8: A hospital with a higher proportion of Medicare patients and a relatively larger size is more likely to employ a higher degree of vertical integration in providing SNF services.

Interaction of Three Dimensions

The dynamics between and among governance structure and the three dimensions -- uncertainty, asset specificity, and frequency of exchange -- can be analyzed. The interaction effects of each two of the three factors (i.e. first-order interaction effects) are tested in H9. First-order interaction terms represent the interactions of uncertainty and specificity, uncertainty and frequency, and specificity and frequency.

Several studies have analyzed interaction terms of different constructs associated with the mode of efficient governance. Anderson (1985) compared the use of employees and outside agents as salespersons, to test TCE. He concluded that the combination of environmental unpredictability and transaction-specific assets is positively associated with the likelihood of a direct sales force. Walker and Weber (1984) used the interaction of frequency and environmental uncertainty to investigate the combined effect of those

two dimensions. To test the interaction of each two of the three constructs, H9 is decomposed into three sub-hypotheses (H9a, H9b and H9c).

H9: The higher interaction effects of each two of the three constructs are (i.e., uncertainty × specificity, uncertainty × frequency, and specificity × frequency), the more likely the hospital is to employ a higher degree of vertical integration in providing SNF services.

H9a: The higher the environmental uncertainty, and the more knowledge the hospital has in elderly care, the more likely the hospital is to employ a higher degree of vertical integration in providing SNF services.

H9b: The higher the environmental uncertainty, and the higher the frequency of patient transfers, the more likely the hospital is to employ a higher degree of vertical integration in providing SNF services.

H9c: The more knowledge the hospital has in elderly care, and the higher the frequency of patient transfers, the more likely the hospital is to employ a higher degree of vertical integration in providing SNF services.

Williamson (1985) emphasizes that the selection of vertical integration is **simultaneously** determined by three dimensions of transaction. H10 is used to test the interaction effect of three constructs, that is, to examine the second-order interaction effect. The interaction effect of environmental uncertainty, hospital specificity in providing elderly care, and frequency of patient transfers is hypothesized to affect the hospital's make-or-buy decision.

H10: The higher the environmental uncertainty, the more knowledge the hospital has in elderly care, and the higher the frequency of patient transfers, the more likely the hospital is to employ a higher degree of vertical integration in providing SNF services.

The main purpose of this study is to test whether transaction cost economics theory can be applied to a hospital's make-or-buy decision in channeling their most

important consumers (i.e., the elderly) to extended care facilities. Distributed by dimension, three hypotheses are derived for transaction uncertainty, two for transaction specificity, and three for transaction frequency. One further hypothesis is developed to test the interaction of the three constructs. Hypotheses and propositions for the corresponding constructs are summarized in the following paragraphs.

Table 1 presents a summary of the study hypotheses. H1, H2 and H3 relate to transaction uncertainty and encompass five indicators. These hypotheses are primarily intended to address the proposition, "The greater the uncertainty of the nursing home market, the more likely a hospital is to use the hierarchy or hybrid mode of control."

Two hypotheses, H4 and H5, are developed from transaction specificity construct. They are to test the proposition, "The more experience or expertise a hospital has in caring for the elderly, the more likely is to employ the hierarchy or hybrid mode of governance."

H6, H7, and H8 are derived for the construct of transaction frequency. They address the proposition, "The higher the volume of exchange frequency is, the more likely the hospital is to employ the hierarchy or hybrid mode of governance."

The last proposition of this study is: "A hospital's decision on hierarchical arrangements depends on the degree of integration among the three constructs." H9 (H9a, H9b, and H9c) and H10 are derived to test this proposition.

Table 1

Summary of the Study Hypotheses

H1:	A hospital that has a relatively higher occupancy rate and/or is located in an area with a high average occupancy rate is more likely to employ a higher degree of vertical integration in providing SNF services.
H2:	A hospital that is located in an area with a relative shortage of SNF beds and/or a high average SNF occupancy rate is more likely to employ a higher degree of vertical integration in providing SNF services.
H3:	A hospital in an area with relatively more indigent persons and a shortage of SNF bed supply is more likely to employ a higher degree of vertical integration in providing SNF services.
H4:	A hospital that provides a wider variety of geriatric services to the elderly patients is more likely to employ a higher degree of vertical integration in providing SNF services.
H5:	A hospital that provides home health services to elderly patients is more likely to employ a higher degree of vertical integration in providing SNF services.
H6:	A hospital with a relatively higher proportion of Medicare patients is more likely to employ a higher degree of vertical integration in providing SNF services.
H7:	A hospital affiliated with managed care organizations is more likely to employ a higher degree of vertical integration in providing SNF services.
H8:	A hospital with a higher proportion of Medicare patients and a relatively larger size is more likely to employ a higher degree of vertical integration in providing SNF services.
H9:	The higher interaction effects of each two of the three constructs (i.e., uncertainty specificity, uncertainty × frequency, and specificity × frequency) are, the more likely the hospital is to employ a higher degree of vertical integration in providing SNF services.
H10:	The higher the environmental uncertainty, the more knowledge the hospital has in elderly care, and the higher the frequency of patient transfers, the more likely the hospital is to employ a higher degree of vertical integration in providing SNF services.

Summary

This chapter presents the concepts of organization economics through its representative theory -- transaction cost economics. Williamson's concept of market failure and the three dimensions of efficient governance are described. The three dimensions (transaction uncertainty, specificity, and frequency) are presented to build testable hypotheses. Two figures are presented to illustrate the importance of each dimension and the interaction of these three dimensions. The figures are also intended to map out Williamson's TCE approach developed in the 1980s.

Even though many health care organization researchers have adopted transaction cost economics as a theoretical framework to interpret health care phenomena, most of the studies concentrated on the interpretation or descriptive stage with little effort to validate the theory by empirical studies. Fortunately, a number of organization researchers have attempted to test transaction cost economics in many other fields, such as transportation (aerospace, automobile, railroad) and industry (electronic components). In terms of the direction of channels, some focus on forward vertical integration (downstream), and some on backward vertical integration (upstream). Most of the studies use the three-dimensional approach and employ bivariate analysis to examine a firm's decision to make or buy. TCE has been proven to be a theory that can be used to explain the emergence of organizations, even though some results are mixed.

The conceptual models and hypotheses in this study are derived for acute care hospitals and nursing homes, using the three dimensions related to governance forms,

while other demographic and hospital attributes are controlled. Since the purpose of this study is to test TCE, all the hypotheses closely tap these basic constructs of TCE. A total of 4 propositions and 10 hypotheses are proposed in this study.

Chapter 4

Methods

This chapter begins with a description of the study design and sample. There follows a description of data sources, model specification and measurement of variables. Then the analytic plan, including model building and multivariate logistic regression analysis, is presented. This chapter concludes with a summary of methods.

Study Design and Sample

The purpose of this study is to investigate why and how hospitals vertically integrate into skilled nursing facilities, by using Williamson's transaction cost economics theory. As explained by Williamson, the selection of a governance structure is contingent on three dimensions of transactions, i.e. transaction uncertainty, asset specificity, and frequency. A cross-sectional design is used to examine the association of different modes of hospital governance and the three dimensions of transactions. Cross-sectional design means that the study population is observed at a single point in time.

The study sample consists of all the non-federal, acute-care general hospitals in 50 states and the District of Columbia of the United States (excluding associated areas such as the Virgin Islands) that responded to the American Hospital Association's (AHA) 1990 annual survey. The year 1990 is chosen because managed care networks and the

Medicare PPS had matured by then, so that effects of those two developments can be included. The criterion for a hospital to be selected for the sample is that the hospital must have been in full operation for at least one year by the time of the survey. In all, 4,908 hospitals met the criterion and are included in this study.

There are two advantages of studying almost all non-federal hospitals. First, the sample is close to the entire population of interest (i.e. non-federal, acute general hospitals), so selection bias becomes very unlikely. Second, since the population includes all hospitals in the United States, the generalizability of the results is more assured.

Data Sources

In this study, data are extracted from four sources: the American Hospital Association (AHA) 1990 Annual Survey of Hospitals Data Base, the 1993 Area Resource File (ARF), the Health Care Financing Administration's (HCFA) National Minimum Data Set for Skilled Nursing Facilities (SNFs), and state stringency measures for CON regulation. Details of each data source are described below.

The AHA annual survey data contain information on all hospitals in the U.S. that are registered with the AHA and respond to the organization's annual survey. The information describes organizational structure, facilities and services, utilization, personnel, medical staff and financial status. This data source has been the most recognized and informative of individual hospital data bases. It has been used

extensively by health care researchers (Alexander & Morrisey, 1989; Fennell & Alexander, 1987).

The 1993 Area Resource File is a county-based file that includes all counties in the U.S. The file provides data related to health facilities, health professions, utilization, population, economics, environment, and vital statistics. It is widely recognized and used in different disciplines (Alexander & Morrisey, 1989). The file for 1993 is chosen because it contains information for 1990, which matches the time period of the AHA data set.

The SNF data were obtained from the Health Care Financing Administration's National Minimum Data Set, which covers the period of October 1990 to September 1991. The data set includes the most current cost reports and organizational characteristics of Medicare-certified skilled nursing facilities.

The state stringency measures for CON regulation are based on 1984-1986 data collected by the Center for Health Services and Policy Research, Northwestern University. It has been used in several studies (Abu-Jaber, 1992; Begun, Ozcan, & Luke, 1992).

Model Specifications

Many hospitals face tremendous difficulties and financial risks in the competition for skilled nursing beds in their market area. When market uncertainty increases to the extent that a hospital can no longer rely on spot-market purchasing to release its burden of delayed discharges, two options remain -- long-term contracting or leasing

arrangements with SNFs (hybrid), or vertical integration of SNFs (hierarchy). In short, the market, hybrid, and hierarchy modes are three types of arrangements by which hospitals can provide skilled nursing care services. The hospital's decision about which to use usually has two stages. In the first stage, hospitals decide between the spot market and integration. If integration is chosen, hospitals have to decide on its degree, that is, either hybrid or hierarchy. Extreme vertical integration is always reserved as a last resort (Williamson, 1991), since capital costs are higher with hierarchy than with hybrid governance.

There are two phases to the model specification. In phase one, five primary models are established to examine the variations in the arrangements hospitals make to discharge patients to skilled nursing facilities. In phase two, the model specification focuses on interaction effects. As Williamson proposed, three dimensions of transactions, transaction uncertainty (UNCER), transaction specificity (SPEC) and transaction frequency (FREQ), are used as independent variables across all the study models. In order to avoid the bias that may be caused by other variables, variables such as CON stringency, demographic factors, and hospital characteristics are entered as control variables (CONTRL).

Table 2 presents the five primary models as well as the interaction term models. Model 1 differentiates whether or not a hospital decides to integrate skilled nursing facilities (Hierarchy/Hybrid vs. Market). Model 2 examines why hospitals adopt the extreme mode to manage patient discharges (Hierarchy vs. Market). Model 3 identifies

the factors affecting a hospital's choice between the different degrees of integration (Hierarchy vs. Hybrid). Model 4 examines whether hospitals that use the hybrid form differ from those that use the market option (Hybrid vs. Market). Model 5 examines the factors affecting a hospital's decision to use vertical integration rather than hybrid and spot market (Hierarchy vs. Hybrid/Market). In phase two, Model 6 examines whether there is an interaction effect of each two of the three factors on the hospital's governance decision. Model 7 examines the interaction effect of three dimensions.

Table 2

Description of Model Specifications

Phase One	
Model 1	Hierarchy /Hybrid vs. Market = f (UNCER, FREQ, SPEC, CONTRL)
Model 2	Hierarchy vs. Market = f (UNCER, FREQ, SPEC, CONTRL)
Model 3	Hierarchy vs. Hybrid = f (UNCER, FREQ, SPEC, CONTRL)
Model 4	Hybrid vs. Market = f (UNCER, FREQ, SPEC, CONTRL)
Model 5	Hierarchy vs. Hybrid/Market = f (UNCER, FREQ, SPEC, CONTRL)
Phase Two	
Model 6	Hierarchy/Hybrid vs. Market = f (UNCER × SPEC, UNCER × FREQ, SPEC × FREQ, CONTRL)
Model 7	Hierarchy/Hybrid vs. Market = f(UNCER × SPEC × FREQ, CONTRL)

Measurement of Variables

The variables in this study can be divided into three categories. The first group is the dependent variables, hospitals' forms of governance in discharging patients to SNFs. The second group is theory-driven independent variables, including transaction uncertainty, transaction frequency and transaction specificity. The last group is the control variables to reduce bias in estimating effects of the theory-driven variables.

Dependent Variables

The dependent variables, the three types of arrangements a hospital takes to discharge its patients to skilled nursing facilities, are abstracted from the AHA 1990 Annual Surveys of Hospitals Data Base. The AHA survey asked two questions central to the current study: whether a hospital offered a Medicare-certified, distinct, skilled nursing unit, and whether it offered other skilled nursing care. Possible answers to each of these two questions by a hospital were: 1) not provided by the hospital, 2) provided by other providers through a formal contractual arrangement (including joint ventures), and 3) provided by the hospital (AHA, 1991).

These responses represent three levels of vertical integration, the dependent variable of interest, such that 1= spot market (hospital providing no SNF services); 2 = hybrid or long-term contracting (hospital not maintaining SNF services, but providing them through long-term contracting); and 3 = hierarchy (hospital providing in-house SNF services). The three levels of distribution channels for goods or services have been

adopted in many studies testing transaction cost economics (Klien, Frazier, & Roth, 1990; John & Weitz, 1988; Rangan, Corey, & Cespedes, 1993).

Independent Variables

The independent variables are chosen to represent three transaction constructs. Table 3 presents the variables for measuring transaction **uncertainty**. The transaction uncertainty dimension has two subcomponents: environmental or market uncertainty (i.e., market competition for nursing home beds), and behavioral uncertainty. The county is used as the hospital market area in this study, because it is widely recognized and used by researchers as a health care market or environment boundary (Alexander & Morrisey, 1989).

Table 3

Operational Definitions of Transaction Uncertainty Variables

AH_OPY	Hospitals' occupancy rate in a hospital market area (H1)
H_OPY	Individual hospital occupancy rate (H1)
SNF_OLD	Skilled-nursing-bed-to-elderly-population ratio in a hospital market area (H2)
SNF_OPY	Skilled nursing facility occupancy rate in a hospital market area (H2)
BEH_UNC	cross-product term of the SNF beds to elderly population ratio and persons-below-the-poverty-level percentage in the hospital market area (H3)

The uncertainty of the nursing home market measures the degree of hospital competition for SNFs. In this study, competition for skilled nursing beds is measured by four continuous variables. The first variable is the average occupancy rate of all acute care hospitals in the market area (AH_OPY). It is used as a proxy that measures the degree to which hospitals are competing for limited nursing home beds. The second is the occupancy rate of an individual hospital (H_OPY). Hospital occupancy indicates the urgency that a hospital experiences in discharging patients. Area hospital occupancy rate and individual hospital occupancy rate are used to test H1. The third variable is the ratio of skilled nursing beds to the elderly population in the hospital market area (SNF_OLD); the fourth variable is the average skilled nursing facility occupancy rate in the hospital market area (SNF_OPY). These last two variables, representing the availability of SNF beds to which hospitals can discharge patients, are used to test H2.

Behavioral uncertainty (BEH_UNC) is measured by the cross-product term of the SNF-beds-to-elderly-population ratio and the persons-below-the-poverty-level percentage in the hospital market area. The rationale is that the relatively low reimbursement for Medicaid patients motivates SNFs to preferentially admit private-pay patients, especially in areas where an undersupply of beds exists. The cross-product term represents the interaction of opportunism and small numbers and is used to test H3.

The second construct is **asset specificity**. Presumably, a hospital evaluates the discharge sites more critically if the hospital has considerable experience or expertise in providing geriatric services. It is hypothesized that a hospital's geriatric experience or

expertise enhances the likelihood of using vertical integration. Table 4 presents the two variables that are chosen to represent experience and knowledge: the number of geriatric services that a hospital provides (GI_INDX), and the availability of home care (HOME_1). Each of the two variables is used to test H4 and H5, respectively.

Table 4

Operational Definitions of Transaction Specificity Variables

GI_INDX	The number of geriatric services provided by the hospital, including adult day care program, Alzheimer's diagnostic/assessment services, comprehensive geriatric assessment, emergency response for the elderly, geriatric acute care unit, geriatric clinics, respite care, senior membership. It is coded as "1" if provided in-house or through contracts, and as "0" otherwise (H4).
HOME_1	Whether a hospital provides agency home health care, through either the hospital or a long-term contract. It is coded as "1" if provided in-house or through contracts, and as "0" if otherwise (H5).

The geriatric service item is a continuous variable with few integer values, ranging from 0 to 8. The eight services include: 1) adult day care program, 2) Alzheimer's diagnostic and assessment services, 3) comprehensive geriatric assessment, 4) emergency response for the elderly, 5) geriatric acute-care unit, 6) geriatric clinics, 7)

respite care, and 8) senior membership program. Each service item is coded as "1" if a hospital provides this service, either hospital-based or through long-term contract; otherwise it is coded as "0." The availability of home health care is coded as "1" if provided in-house or through contract, and as "0" if provided otherwise.

Table 5 presents four variables that represent transaction **frequency** between hospitals and skilled nursing facilities. Three hypotheses for this construct posit that the volume of exchange is positively associated with a hospital's use of hierarchy or hybrid as a management strategy.

The first indicator is the proportion of Medicare discharged patients to total discharges (MCR_D). The rationale for selecting this indicator is that skilled nursing services are used primarily by elderly patients, and the majority of Medicare beneficiaries are over 65. A hospital with more Medicare patient days is likely to have more transactions between skilled nursing facilities. A relatively higher proportion of Medicare patient days imposes more pressure on a hospital's discharge-planning activities. Hospital-owned long-term care has been shown to be associated with shorter LOS and lower cost (Welch & Dubay, 1989). The proportion of Medicare patients may represent the extent to which a hospital is exposed to risk from an inadequate patient discharge process. This indicator is used to test H6. Furthermore, a hospital's affiliation with a managed care organization (HMO/PPO) is used to test H7. The cross-term of Medicare discharges and hospital size is employed to test H8.

Table 5

Operational Definitions of Transaction Frequency Variables

MCR_D	Proportion of Medicare discharges to total discharges of the hospital, continuous variable (H6).
HMOs	Whether a hospital has a formal written contract with any HMOs: 1 = yes, 0 = no (H7).
PPOs	Whether a hospital has formal written contracts with any PPOs: 1 = yes, 0 = no (H7).
MCR_SIZE	Cross-product term of hospital size and the proportion of Medicare discharges, continuous variable (H8)

It is important to evaluate Williamson's postulate that as uncertainty, asset specificity, and the volume of transactions increase simultaneously, the probability of vertical integration increases. To examine the **interaction effects** of the three dimensions of transactions on hospital SNF integration, and interaction between or among transaction specificity, transaction uncertainty and transaction frequency, first-order and second-order interaction terms are tested in H9 and H10. First-order interaction terms represent the interaction of uncertainty and specificity, uncertainty and frequency, and specificity and frequency. The second-order interaction term represents the interaction of uncertainty, specificity, and frequency. Mathematically, the model with first-order interaction terms can be expressed as:

$$Y = f(\text{UNCER} \times \text{SPEC}, \text{UNCER} \times \text{FREQ}, \text{SPEC} \times \text{FREQ}); \text{ and}$$

the model with the second-order interaction term can be expressed as:

$$Y = f(\text{UNCER} \times \text{SPEC} \times \text{FREQ}).$$

Control Variables

Environmental and hospital characteristics were included as control variables (Table 6). Two environmental variables that may covary with hospitals' managerial decisions are controlled in this study. One of the most important control variables is the state regulatory stringency of CON, which is controlled because of its impact on the supply of nursing home beds. The CON stringency for each state is a summated score based on the following five stringency indicators: 1) 1986 CON review threshold levels for capital expenditures, 2) threshold levels for major medical equipment, 3) threshold levels for new institutional services, 4) 1984 state planning agency budget size per non-federal hospital, and 5) 1984 CON application approval rates. Each of the five indicators is given an ordinal value from 0 to 3, depending on the breakpoints. These values are then summated to obtain overall stringency scores that range from 0 to 15. The other environmental control variable is locality (LOCAL), whether a hospital is located in an urbanized or a rural area. The criterion defining an urbanized or a rural area is whether the population is over or below 100,000.

The controlled hospital characteristics include hospital bed size (SIZE), the availability of swing beds at a hospital (SWING), membership in a multihospital system (MEMBER), and two dummy variables representing three types of ownership (OWN_PUB; OWN_NPRO). It is a common practice to control for hospital size. Swing

beds are a unique form of providing long-term care in that only certain hospitals, for example, those located in rural areas and those with less than 100 beds, are eligible to switch their acute beds to chronic care beds. In terms of memberships, hospitals are grouped as either belonging to a multi-health-care system or not. For ownership, hospitals are categorized into 1) public or government hospitals, 2) private not-for-profit hospitals, and 3) private for-profit hospitals. All four variables are dummy variables except for bed size, which is a continuous variable.

Table 6

Operational Definitions of Control Variables

CON	CON stringency in the area where a hospital is located - summated score ranging from 0 to 15
LOCAL	Whether a hospital is located in an urbanized area: 1= rural, 0 = urban.
SIZE	Hospital staffed beds; continuous variable
SWING	Whether a hospital operates swing beds: 1 = yes, 0 = no.
MEMBER	Whether a hospital is in any multi-hospital system: 1 = yes, 0 = no.
OWN_PUB	Measured as dummy variable for public hospitals (1 = yes), with profit hospitals as reference
OWN_NPRO	Measured as dummy variable for private non-profit hospitals (1 = yes), with profit hospitals as reference

Analysis Plan

The unit of analysis for this study is the individual hospital. A series of analyses are performed, beginning with univariate analysis, which examines the distribution of the study variables. The second segment of the analysis is model building to assess the proposed variables. Finally, multivariate logistic regression analysis is performed to examine the relative impact of each dimension on a hospital's governance form.

Univariate Analysis

Study variables are examined first in terms of distribution and normality, through univariate analysis. The observations that have unreasonable or extreme values or are incorrectly coded are considered for deletion. Nominal or ordinal variables are examined through frequency tables and bar charts.

Model Building

Model building includes factor analysis, univariate logit analysis, contingency table analysis, bivariate analysis, and collinearity diagnostic analysis to assess the proposed variables.

Factor analysis. Factor analysis is performed to simplify complex and diverse relationships that exist among the selected independent variables. The purpose is to uncover common dimensions or factors that link together the seemingly unrelated variables (Dillon & Goldstein, 1995).

Univariate logistic regression. Univariate logistic regression is applied to each of the proposed variables to evaluate whether a variable is statistically sufficient to be

included in the multivariate models. The coefficient estimate, standard error, p-value, odds ratio, and the likelihood ratio test for the significance of the coefficient obtained from univariate logit regression for each variable are evaluated.

Contingency table analysis. Contingency table analysis is employed to evaluate nominal, ordinal, and continuous variables with integer values. This method entails an analysis of a two-way contingency table. The purpose of analyzing contingency tables is to determine whether or not the two variables, such as number of geriatric services and SNF integration, can be regarded as independent of each other, that is, to examine the association between two variables.

Bivariate analysis. A correlation matrix is obtained to examine the two-way relationships between selected pairs of variables. The purpose is to detect possible collinearity problems. If the correlation coefficient of any two variables reaches 0.95, one of the variables conveys essentially all of the information contained in the other (Afifi & Clark, 1990), and the variables are considered collinear.

Collinearity diagnostic analysis. The inclusion of a variable with high collinearity may hinder the revelation of the true relationship between variables, by disturbing the directions or estimated regression coefficients of variables. Therefore, deleting highly collinear variables is necessary. Since correlation matrices detect only the possibility of collinearity problems, collinearity diagnostic analysis is used simultaneously to confirm their existence.

Multivariate Logit Analysis

Hospitals' arrangements to discharge patients to nursing homes are predicted by using multivariate logistic regression. A logistic regression model is used when the dependent variable is measured by a binary or discrete variable, and the independent variables are continuous and discrete variables. Since the dependent variable is a discrete variable, the predicted probability lies in the unity boundary. Logistic regression is preferable to ordinary least squares (OLS), because OLS estimates are biased and yield predicted values that are not between 0 and 1.

Several studies of hospitals involving logistic response models have addressed hospital strategy formulation. Alexander and Morrisey (1989) used logistic models to examine the determinants of hospitals' entry into management contracts with multihospital systems. Logistic models have also been used by Fennell and Alexander (1987) to examine why hospitals employ buffering or bridging as boundary spanning strategies to overcome regulatory stringency. Many researchers outside the health care field have used binary and logistic regression to test Williamson's transaction cost economics (Anderson, 1985; John & Weitz, 1988; Rangan, Corey, & Cespedes, 1993; Walker & Poppo, 1991). Logistic regression is an appropriate tool because here analysis of the transaction cost economics theory mainly involves comparing discrete institutional alternatives -- of which classical market contracting is located at one extreme; centralized, hierarchical organization at the other; and mixed modes of firm and market arrangements in between.

Logistic regression estimates the probability of the occurrence of an event. In a binary response model, an outcome is either an event (coded as 1) or a non-event (coded as 0). The event in this study is a hospital providing SNF services through either the hierarchy or hybrid mode. Each factor affecting the outcome is entered as the vector of explanatory variables. The probability function is specified as:

$$P\,(\text{event}) = \frac{1}{(1+e^{(\beta_0+\beta_i X_j)})}$$

where P = probability of hospital's SNF integration;

B_i = coefficient estimated from the data;

Xj = vector of explanatory variable; and

e = the base of natural logarithms, or approximately 2.718.

In order to interpret logistic coefficients (B_i), the model can be expressed in terms of an odds ratio. Let P represent the probability of an event; the logit (P) = P/(1-P) is a linear function of the predictor variables. The log of the odds ratio (also termed the log-odds ratio or log-odds) is defined as:

Odds ratio = P_z / (1-p_z).

The concept of an odds ratio is used extensively in predicting the occurrence of a given event. For a dichotomous or polynomous variable, the odds ratio is a measure of association of a binary variable (predictor) with the occurrence of an event (in this study, SNF integration). For a continuous variable, it is necessary to develop a method for point and interval estimation for an arbitrary change of "X" units in the covariate. Certainly, any reasonable value can be used as an interval. Generally, changes in multiples of 5 or

10 may be most meaningful and easiest to understand (Hosmer & Lemeshow, 1989). In this study, the interval for area hospital occupancy rate as well as for the proportion of Medicare discharges is 10%.

To examine how well the logistic regression model predicts outcomes, two measures of goodness-of-fit are employed: Pearson chi-squares and correct classification rates (Afifi & Clark, 1990). The chi-square values based on the difference between the observed and fitted values reveal how well the logit equation fits the data. These differences between observed and fitted values are summated to form a chi-square value (χ^2) (Hosmer & Lemeshow, 1989). Large values of the test statistic indicate a poor fit of the model, and conversely, low values indicate a good fit. Equivalently, small p-values indicate poor fit.

An intuitively appealing way to summarize the results of a fitted logistic model is with a classification table, in which estimated probabilities predict group membership. Presumably, if the model predicts group membership accurately according to some criteria, that is evidence that the model fits. Accurate vs. inaccurate classification does not address our criteria for goodness-of-fit: that the distance between observed and expected values may be unsystematic, and within the variation of the model. Nonetheless, the classification table may be a useful adjunct to other measures based more directly on residuals. In summary, the classification table is most appropriate when classification is a stated goal of the analysis; otherwise it should only supplement more rigorous methods for assessing fit.

Summary

This chapter delineates the methods for this research. A cross-sectional design is used, and the hospital is the unit of analysis. Data sources are the 1990 AHA annual survey, the Area Resource File, and the SNF data set from HCFA. The definitions and measurements of the dependent as well as the independent variables for all the models are specified. The selected variables are validated and finalized in model building. Five primary models and one interaction-term model are used to test the likelihood of three forms of governance (hierarchy, hybrid, and market) by using multivariate logistic regression analysis. The results of the series of analyses are reported in the next chapter.

Chapter 5

Results

This chapter presents the results of data management and statistical analysis, including descriptive statistics, model building, and multivariate logistic regression analysis. Data management is reported in terms of data sources and the process of data merging. Descriptive statistics of the study population are presented to illustrate the distribution of study variables. In the section on model building, the results of exploratory factor analysis are provided for construct validation. The results of univariate logit regression, contingency table analysis, and collinearity diagnostics, are presented to justify the modifications of final models. The findings of two-phase multivariate logit regression analysis are then delineated. This chapter concludes with a summary of statistical findings.

Descriptive Statistics

In this section, the data sources, the study population, and the distribution of study variables are described.

Data Management and the Study Population

The unit of analysis was the individual hospital. Four data files: the AHA File data, the ARF dataset, the HCFA SNF Minimum Data Set, and the state CON stringency

The unit of analysis was the individual hospital. Four data files: the AHA File data, the ARF Dataset, the HCFA SNF Minimum Data Set, and the state CON stringency data file, were examined before they were merged. The unit of data collection varied by data set -- it was "hospital" in the AHA File (county code was available); "county" in the ARF Dataset; "skilled nursing facility" in the HCFA Minimum SNF Data Set (county code was available); and "state" in the state CON stringency data. All variables in the HCFA Minimum SNF Data Set were converted to county-based so that the first three detests could be merged by county code. The merged dataset was then further merged with the state CON stringency data by state.

Nationwide, 4,908 hospitals met the selection criteria -- being a general, acute, non-federal hospital that had operated for at least one full year by the time of study. The normality of continuous variables was examined through univariate analysis. Extreme outliers were carefully investigated before being deleted. Nominal or ordinal variables were examined through the frequency tables and bar charts. A hospital was deleted if any of its key variables, namely Medicare discharges, affiliation with HMOs and PPOs, locality, or swing bed status, were missing, because those variables were crucial to the proposed multivariate regression models.

In total, 4,703 hospitals in the 50 states and the District of Columbia were retained for study. The geographic distribution of hospitals varied from region to region and state to state. For example, there were 211 hospitals in the New England region, and 722 hospitals in the Southern Atlantic region. There was only one qualified hospital located

in Alaska, but 351 hospitals and 400 hospitals in California and Texas, respectively. About the same percentages of hospitals were located in rural (47.4%) and in urbanized areas (52.6%). The average hospital size was 168 beds, with a standard deviation of 173 beds.

Dependent Variables

The dependent variable was the arrangement that a hospital chose to provide skilled nursing services to its medically ready discharged patients. Table 7 presents the distribution of the three types of arrangements, namely, hierarchy, hybrid, and market. For ease of identification, the hospitals that owned or operated at least one skilled nursing facility were considered the **hierarchy group**, representing the highest degree of vertical integration; the hospitals that provided skilled nursing services through long-term contracts or joint venture were considered the **hybrid group**; and the hospitals that relied solely on the spot market to provide skilled nursing services to discharged patients were considered the **market group**.

As shown in Table 7, there were 1,098 hospitals (23.3% of all study hospitals) integrated with Medicare-certified SNFs, and 936 hospitals (19.9%) integrated with non-Medicare SNFs. Since the interest of the study was focused on the occurrence of an event, namely, SNF integration, hospitals were considered as vertically integrating a SNF regardless of the SNF's certification status.

In Table 7, the total number of hospitals that used the hierarchy arrangement was the sum of the cells with darker shading, totaling 1,681 (35.7% of all hospitals). The

lighter shaded cells represent hospitals that used the hybrid arrangement, a total of 394 (8.4% of all hospitals). The last, white cell represents the majority of the study hospitals (2,628 hospitals, 55.9% of all hospitals). These hospitals did not provide any arrangement for skilled nursing services, but relied on the spot market.

There were five primary multivariate logistic regression models. Each of the five models compared different contrasting groups. Model 1 compared the hierarchy/hybrid group and the market group; Model 2 compared the hierarchy group and the market group; Model 3 compared the hierarchy group and the hybrid group; Model 4 compared the hybrid group and the market group; and Model 5 compared the hierarchy group and the hybrid/market group.

Table 7

The Distribution of the Types of Medicare and Non-Medicare SNFs

	Medicare-Certified SNF			
Non-Medicare SNF	Hierarchy	Hybrid	Market	Total
Hierarchy	353	24	559	936 (19.9%)
Hybrid	36	266	98	400 (8.5%)
Market	709	30	2628	3367 (71.6)
Total	1098 (23.3%)	320 (6.8%)	3285 (69.8%)	4703 (100%)

Likelihood ratio 1370.68 ; SIG: .0000

Hierarchy group = (1098 + 936) -353 =1681
Hybrid group = 266 + 98 +30 =394
Market group = 2628

Independent Variables

The descriptive statistics of independent and control variables are presented in Tables 8 and 9. Table 8 describes means and standard deviations for continuous variables, for the three subgroups as well as for the entire population. Table 9 presents the distribution of polynomous and dichotomous variables in the same manner.

Selection of the hierarchical arrangement was hypothesized to be determined by the uncertainty, specificity, and frequency of transactions. Transaction uncertainty was measured by area average hospital occupancy rate, individual hospital occupancy rate, SNF beds to elderly population ratio, SNF occupancy rate, and the percentage of population below the poverty level. The means and standard deviations are shown in Table 8. Overall, the average hospital occupancy rate in the county market area was 59.6%, with a standard deviation of 16.3%. The hybrid group had the highest area average hospital occupancy rate (65.6%), as compared to the hierarchy group (58.9%) and market group (59.3%). On average , there were 27 beds available per 1,000 older adults. The average bed availability in the areas where hospitals used hierarchy arrangements was 21 beds per 1,000 elderly persons. Availability was 34 and 29 beds per 1,000 elderly persons where hospitals took hybrid and market forms, respectively. The ratio of SNF beds to the elderly population was transformed by taking the natural logarithm to correct skewed distributions. Since the natural logarithm could be calculated only on positive values, .0001 was added to the values of the relevant variables before calculating the logarithm.

The indicators of transaction specificity included the number of available geriatric services and the availability of home health services. The two ordinal variables were recoded as dummy variables. It should be noted that the recoding differed among the five models. Models 1 and 4 differentiated two forms of providing geriatric services and home services -- the market form vs. either the hierarchy or hybrid form. In Models 1 and 4 the availability of a service was coded as "1" if provided in-house or through contract, and as "0" if otherwise. In Models 2, 3, and 5, which differentiate differently between the contracting forms -- the hierarchy form vs. the hybrid or market form, the availability of a service was coded as "1" if provided in-house and as "0" if otherwise.

On average, all hospitals provided at least one geriatric service. In three groups, the hybrid group offered more geriatric service items (3.09 in Models 1 and 4; 1.53 in Models 2, 3, and 5) than the other two groups did. The market group provided the fewest geriatric services (1.04 in Models 1 and 4; 0.99 in Models 2, 3, and 5).

For home services, substantial differences existed among the models. In Models 1 and 4, home services were provided by 91.6% of the hospitals (361 out of 394) in the hybrid group, by 68.1% of the hospitals (1,141 out of 1,681) in the hierarchy group, and by 59.1% of the hospitals (1,555 out of 2,628) in the market group. In Models 2, 3 and 5, only 42.9% of the hierarchy group, 35.8% of the hybrid group, and 32.9% of the market group provided home services. In general, fewer hospitals in the market group provided home services.

Table 8

Means and SD for Continuous Independent Variables, by Arrangements of SNF Services

Constructs/Variables	Arrangement of Skilled Nursing Services			
	Hierarchy (n=1681)	Hybrid (n=394)	Market (n=2628)	Overall (N=4703)
Transaction Uncertainty				
Area average hospital occupancy rate	.589 (.167)	.656 (.140)	.593 (.163)	.596 (.163)
Hospital occupancy rate	.483 (.189)	.632 (.176)	.556 (.191)	.536 (.195)
SNF beds to elderly population ratio	.021 (.024)	.034 (.023)	.029 (.022)	.027 (.023)
SNF occupancy rate	.642 (.200)	.766 (.146)	.760 (.168)	.727 (.184)
Percentage of persons below poverty level	.16 (.06)	.14 (.07)	.15 (.07)	.15 (.07)
Transaction Specificity				
Number of geriatric services (for models 1 & 4)	1.41 (1.69)	3.09 (2.55)	1.04 (1.27)	1.34 (1.66)
Number of geriatric services (for models 2, 3 & 5)	1.39 (1.37)	1.53 (1.48)	.99 (1.15)	1.08 (1.28)
Transaction Frequency				
Proportion of Medicare discharges to total	.44 (.13)	.37 (.12)	.39 (.12)	.40 (.13)
Control Variables				
Hospital bedsize	123 (157)	252 (194)	184 (183)	168 (173)
CON stringency score	6.97 (3.55)	8.15 (3.58)	7.71 (3.69)	7.48 (3.65)

Note. ( ) = Standard Deviation.

The proportion of Medicare discharges (Table 8) and the affiliations with HMOs and PPOs (Table 9) were used to measure transaction frequency. Overall, more than 40% of discharged patients of all hospitals were Medicare beneficiaries. The percentage of Medicare discharges was highest for the hierarchy group (44%), followed by the market group (39%) and the hybrid group (37%). As for HMO and PPO affiliations, 47.3% of all hospitals had formal contracts with HMOs, and 53.2% with PPOs. More hospitals in the hybrid group were affiliated with HMOs (64.5%) and PPOs (60.2%) than in the hierarchy group (HMO affiliation: 50.9%; PPO affiliation: 57.5%) or in the market group (HMO affiliation: 37.5%; PPO affiliation: 45.0%). About 75% of hospitals in the hybrid group were affiliated with either HMOs or PPOs.

To investigate the pure effect of the three theoretical constructs on hospitals' decisions about providing SNF services, other hospital characteristics that might cause variations in hospitals' decisions were included in the models as control variables, as described in Table 9. More than half of the hospitals in the hierarchy group were certified by HCFA to switch their acute beds to subacute beds. Many fewer hospitals in the hybrid group (8.9%) and the market group (12.8%) were allowed to do so. The hybrid group had the highest percentage of hospitals that were members of health systems. A majority of hospitals in the hierarchy group (65.6%) were located in rural areas; much lower percentages of the hybrid group (24.9%) and the market group (39.1%) were. Overall, about 60% of hospitals were non-profit hospitals, as compared to 28% of hospitals were public hospitals.

Table 9

Distribution of Polynomous and Dichotomous Variables by Arrangements of SNF Services

Constructs/Variables	Arrangements of SNF Services			
	Hierarchy (n=1681)	Hybrid (n=394)	Market (n=2628)	Overall (N=4703)
Transaction specificity				
Availability of home health service (for models 1 & 4)	1144 (68.1%)	361 (91.6%)	1555 (59.2%)	3060 (65.1%)
Availability of home health service (for Models 2, 3 & 5)	721 (42.9%)	141 (35.8%)	865 (32.9%)	1727 (36.7%)
Transaction frequency				
Affiliation with HMO	633 (37.5%)	254 (64.5%)	1338 (50.9%)	2225 (47.3%)
Affiliation with PPO	757 (45.0%)	237 (60.2%)	1510 (57.5%)	2504 (53.2%)
Affiliation with HMO/PPO	909 (54.1%)	294 (74.6%)	1727 (65.7%)	2930 (62.3%)
Hospital characteristics				
With swing beds	798 (52.5%)	35 (8.9%)	337 (12.8%)	1170 (24.9%)
Member of health system	513 (30.5%)	184 (46.7%)	989 (37.6%)	1686 (35.9%)
Rural location	1103 (65.6%)	98 (24.9%)	1028 (39.1%)	2229 (47.4%)
Non-profit ownership	964 (57.3%)	311 (78.9%)	1520 (57.8%)	2795 (59.4%)
Governmental ownership	591 (35.2%)	54 (13.7%)	676 (25.7%)	1321 (28.1%)

Model Building

This section first describes the grouping and validation of the proposed variables by using exploratory factor analysis. Then findings of univariate logit regression analysis, cross-tabular analysis, and bivariate analysis are presented. Correlation analysis as well as collinearity diagnostics to detect possible collinearity problems are presented next. The dimensionalities of the finalized variables are identified by another factor analysis.

Grouping the Proposed Variables by Exploratory Factor Analysis

The major purpose of the study is to test the application of the three-construct theoretical model developed from Williamson's transaction cost economics to the linkage between hospitals and nursing homes. Whether the proposed variables tap the intended construct is critical to the assessment. Factor analysis is an appropriate statistical tool for testing the extent to which the multiple indicators measure the intended constructs. The theoretically-derived dimensionality is strongly supported if the variables proposed for a construct are grouped into one factor.

Table 10 presents the results of orthogonal varimax rotated principal component factor analysis on all the proposed independent variables. Overall, the factor patterns concur with the proposed taxonomy. The nine variables were loaded on four unobservable common factors. Four factors explained 71.4% of the total variance, and the sum of eigenvalues was 6.424. The details follow.

Factor 1 accounted for 32.9% of the total variance, with an eigenvalue of 2.96. The area average hospital occupancy rate and individual hospital occupancy rate, which were proposed to measure transaction uncertainty and were grouped into Factor 1, had factor loadings of 0.875 and 0.854, respectively. The high loadings indicated a strong relationship between the two indicators and the intended factor. Factor 2 accounted for 14.2%, with an eigenvalue of 1.275. The ratio of SNF beds to elderly population and the SNF occupancy rate, which were also proposed to measure transaction uncertainty, comprised Factor 2. Given the nature of the variables grouped together, **Factor 1** could be labeled as "**demand uncertainty**" and **Factor 2** as "**supply uncertainty**."

Factor 3 accounted for 12.8% of total variances, with an eigenvalue of 1.152. Two of the three variables proposed to measure transaction frequency on Factor 3 had high factor loadings (HMO affiliation: 0.788; PPO affiliation: 0.875). The proportion of Medicare discharges had a moderate loading (-0.337) on Factor 3. Therefore**, Factor 3** can represent **transaction frequency**. Finally, Factor 4 accounted for 11.5% of total variances, with an eigenvalue of 1.036. Two variables, the number of geriatric services and the home health service availability, were grouped together (factor loadings 0.733 and 0.809, respectively.) **Factor 4** represented **transaction specificity**.

In summary, the results of factor analysis supported the variables proposed to measure their related constructs. The proposed variables appropriately measure the three dimensions of transactions suggested by Williamson.

Table 10

Factor Analysis for Proposed Independent Variables

	Factor Loadings *				Communalities
Constructs/Variables	F_1	F_2	F_3	F_4	h_i^2
Transaction Uncertainty					
Area hospital occupancy rate	0.875	0.083	0.035	0.138	0.794
Hospital occupancy rate	0.854	0.153	0.090	0.205	0.803
SNF-beds-to-elderly-popu. ratio	0.041	0.931	0.072	0.078	0.880
SNF occupancy rate	0.251	0.864	0.194	0.032	0.848
Transaction Specificity					
Availability of home health service	0.165	0.047	0.096	0.733	0.577
Number of geriatric services	0.018	0.047	0.075	0.809	0.662
Transaction Frequency					
Proportion of Medicare discharges	-0.472	-0.094	-0.337	0.121	0.360
Affiliation with HMO	0.233	0.141	0.788	0.146	0.716
Affiliation with PPO	0.010	0.097	0.875	0.099	0.785
Factor contribution (eigenvalue)	2.961	1.275	1.152	1.036	6.424
Variance explained (%)	32.9%	14.2%	12.8%	11.5%	71.4%

* Vertical lines indicate large loadings.

Validation of Proposed Variables

Each variable was examined before being retained for the final multivariate logit regression models. In order to validate the nominal, ordinal, polynomous, and continuous variables with integer values, univariate logistic regression and a contingency table of outcome variables (y = 0, 1) versus the levels of the independent variables are provided.

Univariate logistic regression was performed upon each of the independent variables except for cross-product terms. For nominal, ordinal, and continuous variables with fewer integer values, a contingency table with the chi-square test was generated (Hosmer & Lemeshow, 1989). The predicted probability of SNF integration by selected variables was plotted as supplemental to the contingency table. Bivariate analysis and collinearity diagnostics were performed to examine the relationships between individual variables as well as to detect potential collinearity problems. The dependent and independent variables of Model 1 (hierarchy/hybrid vs. market) were used to perform the validation procedure in preliminary analyses.

Univariate logit regression analysis. Table 11 presents the results of univariate logit regression analysis of all proposed independent variables except two within-construct interaction terms. The constant for each univariate regression model is not presented, since this information is unnecessary for the analysis. All proposed variables except the area average hospital occupancy rate had p-values at the .000 level, which was much smaller than the recommended .25 cutpoint of p-value (Bendel & Afifi, 1977). It is ascertained that all the proposed variables are associated with hospitals' make-or-buy decisions about SNF to some extent. Therefore, all proposed variables should be considered as candidates for predictor variables.

The results of univariate logistic regression are further demonstrated by the probability plot. The probability scatterplot, done on the logit scale, is helpful in illustrating not only the potential importance but also the appropriate scale of a variable

(Hosmer & Lemeshow, 1989; Pindyck & Robinfeld, 1976). Examples are given of a continuous variable (Figure 4) and a polynomous variable (Figure 5).

Table 11

Univariate Logit Regression for Hierarchy/Hybrid vs. Market Groups

Constructs/Variables	Expected sign	Beta	P-value	Odds Ratio
Transaction Uncertainty				
Area average hospital occupancy rate	+	0.333	0.065	1.395
Hospital occupancy rate	+	-1.191	0.000	0.304
SNF-beds-to-elderly-popu. ratio	-	-11.922	0.000	0.000
SNF occupancy rate	+	-1.514	0.000	0.220
Transaction Specificity				
Availability of home health service	+	0.600	0.000	1.822
Number of geriatric services	+	0.261	0.000	1.298
Transaction Frequency				
Proportion of Medicare discharges	+	2.654	0.000	14.215
Affiliation with HMO	+	-0.329	0.000	0.720
Affiliation with PPO	+	-0.385	0.000	0.681

Figure 4 shows the effect of Medicare discharges on the probability of SNF integration. The probability rose with the increase of Medicare patients. Hospitals without any Medicare patients were associated with .2 probability of vertical integration. When more then 50% of hospitals' discharged patients were Medicare beneficiaries, the probability rose to .50, an odds ratio equal to 1. The intercept indicates that hospitals with 50% or more Medicare patients were more likely to vertically integrate skilled

nursing facilities than were those with fewer than 50% Medicare patients. The probability of vertical integration for hospitals with the highest proportion of Medicare patients was .785, or an odds ratio of 3.65.

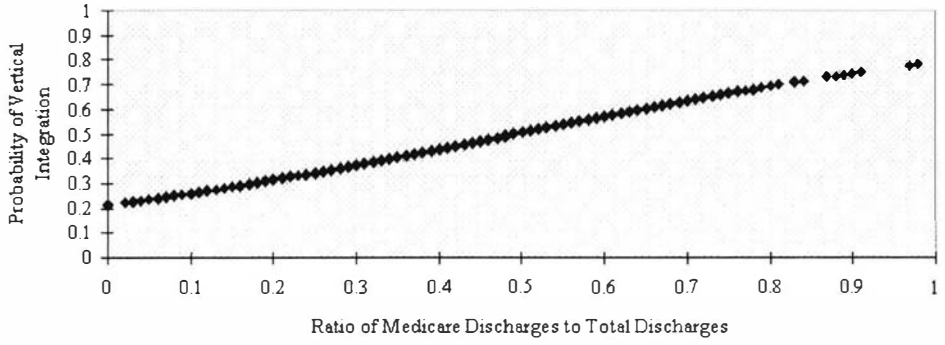


Figure 4. The Effect of Proportion of Medicare Discharges on Probability of Vertical Integration

Contingency table analysis. Contingency table analysis was employed to evaluate nominal, ordinal, and continuous variables with integer values. Taking the variable, number of geriatric services, as an example, Table 12 portrays a 16-cell table with the number of geriatric services ranging from 0 to 7. The far left of the table shows that 682 of the 1,836 hospitals (37.1%) that provided no geriatric services chose hierarchy/hybrid arrangements of SNF. Among the hospitals that offered three items of geriatric services, more than half (180 out of 340) were in the hierarchy or hybrid group. A majority (131 out of 135, or 97%) of hospitals that offered 7 items of geriatric services were in the hierarchy/hybrid group.

Table 12

Contingency Table by Arrangement of SNF and Number of Geriatric Services

Arrangement of SNF	Number of Geriatric Services							
	0	1	2	3	4	5	6	7
Market	1154	767	397	160	85	40	21	4
Hierarchy /Hybrid	682	559	327	180	98	66	32	131
Total	1836	1326	724	340	183	106	53	135

Likelihood Ratio 259.04; P-value =.000

Obviously, hospitals that offered more than three geriatric services tended to employ hybrid or hierarchical arrangements. The association becomes stronger as the number of available geriatric services increases. The chi-square test also supports an association between the SNF arrangement and the number of geriatric services (not reported). It can be concluded that the probability of taking vertical integration grows with an increasing number of geriatric services.

Figure 5 illustrates a better picture of a probability plot, on a 0-to-7 scale, as compared to Figure 4, on a 0-to-100 scale. The probability for a hospital to integrate SNF services was .357 if it provided no geriatric service. The probability increased to

.549 (OR > 1) if a hospital offered three geriatric services items. If a hospital provided seven items of geriatric services, it was very likely to adopt the hierarchy arrangement (probability = .775, OR = 3.44).

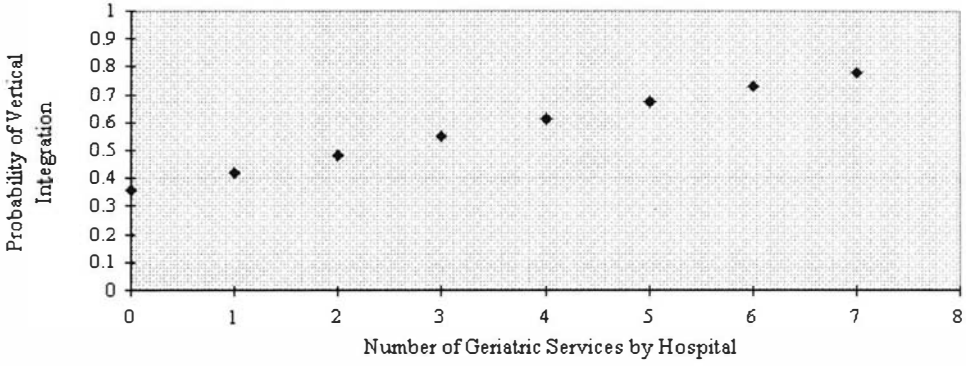


Figure 5. The Effect of Number of Geriatric Services on Probability of Vertical Integration

Table 13 depicts how the probability of a hospital's integration with a SNF increased along with an increase in the number of geriatric services at the hospital. For example, the probability increased from .357 to .419 between a hospital that provided no geriatric services and a hospital that provided one item of geriatric services.

Table 13

Probability of SNF Integration by Change in Number of Geriatric Services

Geriatric services	Probability	Odds Ratio	Number of Hospitals
0	0.357	0.556	1836
1	0.419	0.721	1326
2	0.484	0.936	724
3	0.549	1.216	340
4	0.612	1.578	183
5	0.672	2.048	106
6	0.727	1.946	53
7	0.775	3.460	135

Bivariate analysis. Correlation analysis was performed to detect potential collinearity problems. Table 14 presents the correlation matrix of the proposed independent variables. The relationship between each two proposed variables was examined without controlling for other variables.

Overall, all variables were moderately and positively correlated except the proportion of Medicare discharges (MCR_D). The availability of home health services (HOME_1) had the least correlated relationship with other variables. It should be noted that the within-construct variables were more highly correlated than the between-construct variables. For example, the four variables representing transaction uncertainty were highly interrelated: individual hospital occupancy rate (H_OPY) and area average hospital occupancy rate (AH_OPY) had a correlation coefficient of 0.6887 ($p = .001$); another high correlation coefficient, 0.6965, was found between the ratio of skilled

nursing beds to elderly population (SNF_OLD) and the area SNF beds occupancy rate (SNF_OPY).

Table 14

Correlation Matrix for Proposed Independent Variables

	AH_OPY	H_OPY	SNF_OLD	SNF_OPY	GI_INDX	HOME	MCR_D	HMO	PPO
AH_OPY	1								
H_OPY	0.6887 P= .000	1							
SNF_OLD	0.1478 P= .000	0.1942 P= .000	1						
SNF_OPY	0.291 P= .000	0.3657 P= .000	0.6965 P= .000	1					
GI_INDX	0.2074 P= .000	0.2413 P= .000	0.121 P= .000	0.1273 P= .000	1				
HOME	0.1259 P= .000	0.2002 P= .000	0.1026 P= .000	0.0907 P= .000	0.2633 P= .000	1			
MCR_D	-0.2288 P= .000	-0.2912 P= .000	-0.1495 P= .000	-0.2275 P= .000	-0.104 P= .000	-0.0691 P= .000	1		
HMO	0.2861 P= .000	0.3071 P= .000	0.2156 P= .000	0.325 P= .000	0.2095 P= .000	0.1566 P= .000	-0.2351 P= .000	1	
PPO	0.1222 P= .000	0.1795 P= .000	0.1655 P= .000	0.2613 P= .000	0.1402 P= .000	0.1375 P= .000	-0.1798 P= .000	0.5244 P= .000	1

Note. 4,703 observations in all cells.

HMO affiliation and PPO affiliation, likewise, were highly correlated. The high correlation coefficients only imply rather than confirm the existence of collinearity. Two variables are considered collinear with each other only when their correlation coefficient

reaches 0.95, which means one of the variables can convey essentially all of the information contained in the other (Afifi & Clark, 1990).

Collinearity diagnostic analysis. The results of collinearity diagnostic are shown in Table 15. Two rules were followed to determine whether collinearity existed among variables. The first section of Table 15 shows, for certain variables, the amounts of variance that are explained by each group. Across a group, any pair of variables that have similar amounts of variance are considered collinear (Andrew, 1992). The second rule states that the variable with the smallest tolerance, or the largest values of variance inflation factor (VIF), may have collinearity problems (Neter, Wasserman, & Kutner, 1990).

Applying the first rule, three pairs of variables might be collinear -- area average hospital occupancy rate (.407) and individual hospital occupancy rate (.760) in group 6; ratio of SNF-bed-to-elderly-population (.538) and SNF occupancy rate (.828) in group 8; and HMO affiliation (.587) and PPO affiliation (.720) in group 9. Applying the second rule, SNF occupancy rate has the smallest tolerance (0.437), and the largest VIF (2.290), and hospital occupancy rate has the second smallest tolerance (0.466) and the second largest VIF (2.144).

The results of the correlation matrix and collinearity diagnostics were taken into account in deciding which variables were highly collinear with others. Individual hospital occupancy rate and SNF occupancy rate were both highly correlated with other variables, and had small tolerances and large VIF. In order to stabilize the estimated

regression coefficients, hospital occupancy rate and skilled nursing bed occupancy rate were removed from the original models (Neter, Wasserman, & Kutner, 1990). Since the nature of HMO affiliation and of PPO affiliation were different and their VIF values were not higher than those of other variables, both were retained.

Table 15

Multicollinearity Diagnostic for Proposed Independent Variables

Group	AH_OPY	H_OPY	SNF_ OLD	SNF_ OPY	GI_ INDX	HOME_1	MCR_D	HMO	PPO
1	0.001	0.001	0.003	0.002	0.005	0.004	0.001	0.004	0.004
2	0.002	0.002	0.000	0.000	0.003	0.015	0.018	0.243	0.166
3	0.000	0.000	0.041	0.017	0.711	0.028	0.001	0.000	0.005
4	0.002	0.001	0.217	0.045	0.143	0.026	0.014	0.014	0.063
5	0.005	0.004	0.019	0.000	0.091	0.897	0.016	0.002	0.000
6	0.002	0.005	0.009	0.000	0.024	0.004	0.002	0.587	0.720
7	0.023	0.109	0.168	0.104	0.011	0.000	0.198	0.142	0.008
8	0.027	0.068	0.538	0.828	0.010	0.012	0.058	0.002	0.011
9	0.407	0.760	0.003	0.002	0.000	0.001	0.295	0.002	0.001
10	0.532	0.050	0.003	0.002	0.001	0.013	0.396	0.004	0.021
Tolerance	0.514	0.466	0.506	0.437	0.874	0.899	0.879	0.639	0.706
VIF	1.946	**2.144**	1.978	**2.290**	1.145	1.113	1.137	1.564	1.416

Note. Large values are in bold type.
Horizontal lines indicate large variance in those horizontal groups.

Dimensionalization of modified variables. Factor analysis was performed again with two variables -- individual hospital occupancy rate and area SNF occupancy rate -- deleted because of their collinearity. The seven remaining variables were grouped into

three factors as shown in Table 16. Two variables, HMO affiliation and PPO affiliation, were identified as Factor 1, accounting for 30.9% of the total variance. Three variables, area hospital occupancy rate, the ratio of SNF beds to elderly population, and the proportion of Medicare discharges, comprised Factor 2, explaining 15.3% of the total variance. The number of geriatric services and the availability of home health services were grouped into Factor 3, accounting for 13.7% of the total variance. Compared to the results of factor analysis in Table 10, less of the total variance was explained. Nevertheless, three factor patterns tapped the proposed constructs fairly well.

Table 16

Factor Analysis for Modified Independent Variables

	Factor Loadings *			Communalities
Constructs/Variables	F_1	F_2	F_3	h_j^2
Transaction Uncertainty				
Area hospital occupancy rate	0.005	0.729	0.236	0.588
SNF-beds-to-elderly-popu. ratio	0.246	0.421	0.090	0.246
Transaction Specificity				
Number of geriatric services	0.063	0.200	0.746	0.601
Availability of home health service	0.116	-0.031	0.799	0.652
Transaction Frequency				
Proportion of Medicare discharges	-0.135	-0.743	0.094	0.579
Affiliation with HMO	0.784	0.289	0.141	0.718
Affiliation with PPO	0.896	0.043	0.062	0.809
Factor contribution (eigenvalue)	2.161	1.071	.961	4.193
Variance explained (%)	30.9%	15.3%	13.7%	59.6%

* Vertical lines indicate large loadings.

Multivariate Logistic Regression Analyses

Two-phase multivariate logistic regression was performed to examine the simultaneous influences of the three constructs on the likelihood of SNF integration. Five primary models were analyzed at the first stage; analysis of the two models that included only the first-order and the second-order interaction effects followed at the second stage. This section first briefly introduces the model refinement. The results of the five primary models and the two interaction models are then reported.

Refinement of Models

In the initial run, the seven variables surviving the validation procedure were entered into the multivariate logistic regression model. The expected signs and significance levels for all variables and a statistical summary of each model were examined. Among all independent and control variables across all the five primary models, variables of the frequency construct had the smallest effects on hospitals' vertical integration. Of the three variables, only Medicare discharge proportion was influential on hospitals' integration decisions. Almost every variable in the constructs of transaction uncertainty and transaction specificity was significantly associated with SNF integration. However, the chi-square goodness-of-fit was not satisfactory. To improve the model fit, two dummy variables, HMO affiliation and PPO affiliation, were combined into one variable, HMO/PPO, to represent a hospital's involvement with managed care. HMO/PPO was coded as 1 if a hospital was affiliated with either HMOs or PPOs.

Although HMOs and PPOs differ in nature, they are both likely to pressure hospitals to discharge patients as soon as their stay is no longer medically necessary.

Phase One: Five Primary Multivariate Logistic Regression Models

Tables 17-21 present the results of the five primary multivariate logistic regression models, and show the likelihood of vertical integration of a skilled nursing facility to be contingent on transaction uncertainty, transaction specificity, and transaction frequency while controlling for seven hospital characteristics. The results of Model 1, which compared the hierarchy/hybrid and market groups, are presented in Table 17; the results of Model 2, which compared the hierarchy with market groups, are in Table 18; the results of Model 3, which compared the hierarchy and hybrid groups, are in Table 19; the results of Model 4, which compared the hybrid and market groups, are in Table 20; the results of Model 5, which compared the hierarchy and hybrid/market groups, are in Table 21. Finally, Table 24 summarizes the results of the five primary models.

Model 1: Hierarchy and hybrid vs. market. All of the variables that measured transaction uncertainty were statistically significantly associated with a higher likelihood of vertical integration (Table 17). Area average hospital occupancy was statistically significant and positively associated with the event ($p = .000$). Hospitals located in market areas with higher hospital occupancy were about 37% more likely to employ the hierarchy or hybrid arrangement for every 10% increase in average occupancy rate, as compared to those located in areas with relatively lower hospital occupancy (OR = 1.37;

95% CIE: 1.30, 1.44). The ratio of SNF beds to elderly population was negatively associated with the probability of vertical integration (p = .000; OR = 0.81; 95% CIE: 0.76, 0.86), meaning a hospital was less likely to integrate a SNF in a market area that had a higher ratio of SNF beds to elderly population. The interaction of the below-poverty-level-population and SNF bed supply was positively related to SNF integration (p=.001, OR = 1.00; 95% CIE: 1.00, 1.00).

Two variables measuring transaction specificity both had significant and positive relationships with the likelihood of vertical integration. For every additional item of geriatric service a hospital offered, there was about 41% greater likelihood that it would use a hierarchy or hybrid arrangement (p = .000; OR = 1.41; 95% CIE: 1.34, 1.47). Hospitals offering home care services (either in-house or through contract/joint venture) were almost 1.8 times as likely to vertically integrate a SNF as were hospitals that did not offer home care services (p = .000; OR = 1.81; 95% CIE: 1.55, 2.10).

Only one out of the three variables that measured transaction frequency was significantly and positively associated with the probability of vertical integration. For every 10% increase in elderly patients served, hospitals were about 13% more likely to take control over the SNF services, as compared to hospitals with relatively smaller proportions of Medicare patients (p = .001; OR = 1.13; 95% CIE: 1.05, 1.23). Neither affiliation with managed care organizations nor the cross-term of Medicare discharges and hospital size had significant impact on SNF integration.

Table 17

Model 1: Likelihood of SNF Integration : Hierarchy/Hybrid vs. Market Groups (N=4,703)

Constructs/Variables	Expected Sign	Beta	P-Value	Odds Ratio	95% CIE
Transaction Uncertainty					
Area hospital occupancy rate	+	3.125	0.000	1.37*	1.30, 1.44
SNF-beds-to-elderly-popu. ratio	-	-0.213	0.000	0.81	0.76, 0.86
Cross term of % of poor persons and ratio of beds to elderly popu.	+	0.000	0.001	1.00	1.00, 1.00
Transaction Specificity					
Number of geriatric services	+	0.341	0.000	1.41	1.34, 1.47
Availability of home care service	+	0.591	0.000	1.82	1.55, 2.10
Transaction Frequency					
Proportion of Medicare discharges	+	1.258	0.001	1.13*	1.05, 1.23
Affiliation with HMO/PPO	+	0.067	0.400	1.07	0.91, 1.25
Cross term of Medicare discharges and hospital size	+	0.001	0.696	1.00	1.00, 1.00
Control Variables					
State CON stringency score		-0.064	0.000	0.94	0.92, 0.96
Beds set up and staffed		-0.001	0.074	1.00**	0.89, 1.00
Availability of swing beds		1.439	0.000	4.22	3.49, 5.10
Member of health system		0.054	0.488	1.06	0.91, 1.23
Located in rural area		0.597	0.000	1.82	1.51, 2.19
Governmental ownership		0.400	0.003	1.49	1.14, 1.94
Not-for-profit ownership		0.433	0.000	1.54	1.22, 1.95
Constant		-4.308	0.000		

Goodness of Fit Statistic

Chi-Square (15 df) = 1154.1 (p = .000)

Correct Classification Rate = 70.23%

* Odds ratio and 95% C.I.E. based on continuous interval = 10%.

** Odds ratio and 95% C.I.E. based on continuous interval = 50 beds.

Overall, Model 1 was successful in testing the theory, according to goodness of fit statistics. The correct classification rate as shown in the classification table, which indicates the number of correctly predicted ("concordant") cases, is one of the goodness of fit indices. A total of 70.23% of the observations in Model 1 were classified correctly. The model chi-square value was 1154.1 with 16 degrees of freedom. The inclusion of continuous variables in this study created numerous covariate patterns, which may cause the extremely high chi-square value. The dependent and independent variables of Model 1 (hierarchy/hybrid vs. market) were used to evaluate first-order and second-order interaction effects in Model 6 and Model 7.

Model 2: Hierarchy vs. market. Table 18 presents the likelihood of integrating a SNF for the hierarchy and market groups. The results were very similar to those for the previous model. All of the variables that measured transaction uncertainty had significant and independent relationships with the likelihood of integration. Hospitals located in market areas with higher hospital occupancy were about 41% more likely to employ the hierarchy arrangement for every 10% increase in average occupancy rate, as compared to those located in areas with relatively lower hospital occupancy ($p = .000$; OR = 1.41; 95% CIE: 1.33, 1.49). The ratio of SNF beds to elderly population, which measured the supply of SNF beds, had a significant and negative association with SNF integration ($p = .000$; OR = .79; 95% CIE: 0.74, 0.84). The variable measuring nursing homes' behaviors had a significantly positive, but light impact on SNF integration ($p = .000$; OR = 1.00; 95% CIE: 1.00, 1.00).

Two variables (the number of geriatric services and the availability of home care services) that represented transaction specificity had significant and positive effects on SNF integration. For every additional item of geriatric services that hospitals offered, a hospital was 36% more likely to adopt a hierarchical arrangement for SNF services ($p = .000$; OR = 1.36; 95% CIE: 1.28, 1.44). The availability of home care service, another transaction specificity variable, also had a significant and positive association with SNF integration. Hospitals with home care services were 37% more likely to have hospital-owned SNFs than were those without home services ($p = .000$; OR = 1.37; 95% CIE: 1.18, 1.60).

Of the three variables measuring transaction frequency, only the Medicare discharge proportion was positively associated with SNF integration. For every 10% increase in elderly patients served, hospitals were about 14% more likely to have hierarchical arrangements for SNF services, as compared to hospitals with relatively smaller proportions of Medicare patients ($p = .000$; OR = 1.14; 95% CIE: 1.05, 1.23). Neither affiliation with managed care organizations nor the cross-product term of Medicare discharges and hospital size had any impact on the probability of SNF integration.

The higher chi-square value ($X^2 = 1{,}138.7$, $p = .000$) indicates an unsatisfactory model fit. The high chi-square may be due to the inclusion of many continuous variables in the model. Nonetheless, comparing the predicted probabilities and observed responses, the 72.69% correct classification rate indicates a high prediction accuracy.

Table 18

Model 2: Likelihood of SNF Integration: Hierarchy vs. Market Groups (N=4,703)

Constructs/Variables	Expected Sign	Beta	P-Value	Odds Ratio	95% CIE
Transaction Uncertainty					
Area hospital occupancy rate	+	3.411	0.000	1.41*	1.33, 1.49
SNF-beds-to-elderly-popu. ratio	-	-0.239	0.000	0.79	0.74, 0.84
Cross term of % of poor persons and ratio of beds to elderly popu.	+	0.001	0.000	1.00	1.00, 1.00
Transaction Specificity					
Number of geriatric services	+	0.305	0.000	1.36	1.28, 1.44
Availability of home care service	+	0.317	0.000	1.37	1.18, 1.60
Transaction Frequency					
Proportion of Medicare discharges	+	1.270	0.003	1.14*	1.05, 1.23
Affiliation with HMO/PPO	+	0.123	0.149	1.13	0.96, 1.34
Cross term of Medicare discharges and hospital size	+	0.003	0.227	1.00	1.00, 1.01
Control Variables					
State CON stringency score		-0.079	0.000	0.92	0.90, 0.94
Beds set up and staffed		-0.002	0.021	0.99**	0.85, 0.99
Availability of swing beds		1.516	0.000	4.55	3.75, 5.53
Member of health system		0.033	0.699	1.03	0.87, 1.22
Located in rural area		0.700	0.000	2.01	1.65, 2.46
Governmental ownership		0.358	0.013	1.43	1.08, 1.90
Not-for-profit ownership		0.380	0.003	1.46	1.14, 1.88
Constant		-4.385	0.000		

Goodness of Fit Statistic

Chi-Square (15 df) = 1138.7 (p = .000)

Correct Classification Rate = 72.69%

* Odds ratio and 95% C.I.E. based on continuous interval = 10%.

** Odds ratio and 95% C.I.E. based on continuous interval = 50 beds.

Model 3: Hierarchy vs. hybrid. The comparison of hierarchy and hybrid was focused on two groups with different degrees of SNF integration. Table 19 presents how the three transaction constructs influenced hospitals' forms of SNF services. All of the three variables measuring transaction uncertainty were significantly associated with a higher likelihood of SNF integration. Hospitals located in market areas with higher hospital occupancy were about 21% more likely to employ fully owned SNF services for every 10% increase in average occupancy rate, as compared to those located in areas with relatively lower hospital occupancy ($p = .001$; OR = 1.21; 95% CIE: 1.08, 1.35). The ratio of SNF beds to elderly population was negatively associated with the probability of integration, meaning that a hospital was less likely to integrate SNF in a market area with a higher ratio of SNF beds to elderly population ($p = .000$; OR = .69; 95% CIE: 0.60, 0.80). The last variable, the cross-product term of below-poverty-level population and the availability of SNF beds, was significantly associated with the likelihood of integration ($p = .001$; OR = 1.00; 95% CIE: 1.00, 1.00).

With respect to the two variables measuring asset specificity, hospitals that provided home health care services were about 55% more likely to own SNFs than were those that contracted out for home health care services ($p = .001$; OR = 1.55; 95% CIE: 1.19, 2.02). The number of geriatric services a hospital offered was marginally significantly associated with the likelihood of SNF integration ($p = .080$; OR = 1.09; 95% CIE: 0.99, 1.19).

Table 19

Model 3: Likelihood of SNF Integration: Hierarchy vs. Hybrid Groups (N=2,075)

Constructs/Variables	Expected Sign	Beta	P-Value	Odds Ratio	95% CIE
Transaction Uncertainty					
Area hospital occupancy rate	+	1.888	0.001	1.21*	1.08, 1.35
SNF-beds-to-elderly-popu. ratio	-	-0.371	0.000	0.69	0.60, 0.80
Cross term of % of poor persons and ratio of beds to elderly	+	0.001	0.001	1.00	1.00, 1.00
Transaction Specificity					
Number of geriatric services	+	0.082	0.080	1.09	0.99, 1.19
Availability of home care service	+	0.437	0.001	1.55	1.19, 2.02
Transaction Frequency					
Proportion of Medicare discharges	+	1.474	0.066	1.16*	0.99, 1.36
Affiliation with HMO/PPO	+	0.115	0.473	1.12	0.82, 1.53
Cross term of Medicare discharges and hospital size	+	0.003	0.351	1.00	1.00, 1.01
Control Variables					
State CON stringency score		-0.101	0.000	0.90	0.87, 0.94
Beds set up and staffed		-0.002	0.099	0.99**	0.80. 1.02
Availability of swing bed		1.401	0.000	4.06	2.60, 6.34
Member of health system		-0.185	0.181	0.83	0.63, 1.09
Located in rural area		0.869	0.000	2.38	1.65. 3.44
Governmental ownership		0.164	0.569	1.18	0.67, 2.07
Not-for-profit ownership		-0.347	0.155	0.71	0.44, 1.14
Constant		-0.748	0.171		

Goodness of Fit Statistic

Chi-Square (15 df) = 416.0 (p= .000)

Correct Classification Rate = 81.40%

* Odds ratio and 95% C.I.E. based on continuous interval = 10%.

** Odds ratio and 95% C.I.E. based on continuous interval = 50 beds.

None of the transaction frequency variables had a significant association with the likelihood of SNF integration. However, the proportion of Medicare discharges tended to be positively associated with SNF integration ($p = .066$). In other words, hospitals that served more Medicare beneficiaries tended to seek more control over the SNF.

The chi-square of 416.0 was much smaller than that in the previous two models. The substantial drop of the chi-square value may be due to the reduced number of cases. Comparing the predicted probabilities and observed responses, overall, 81.40% were correct.

Model 4: Hybrid vs. market. This model examined the likelihood of vertical integration in the hybrid and market groups (Table 20). Two out of the three variables measuring transaction uncertainty and both variables measuring transaction specificity were significantly associated with the event of integration. None of the variables from the transaction frequency construct had any association with SNF integration.

Area hospital occupancy rate, which measured transaction uncertainty, was, as expected, positively associated with the probability of integration. Hospitals located in market areas with higher hospital occupancy were about 15% more likely to employ vertical integration arrangements for SNF services for every 10% increase in average occupancy rate, as compared to those located in areas with relatively lower hospital occupancy ($p = .022$; OR = 1.15; 95% CIE: 1.02, 1.29). The cross-product term of the below-poverty-level-population and the ratio of SNF beds to elderly population was significantly but negatively (i.e., opposite to the expected sign) associated with

integration. This finding indicates that hospitals were less likely to employ SNF integration if confronting SNF providers' behavioral uncertainty. Nonetheless, the probabilities of selecting either option (hybrid or market form) were very close (p = .021; OR = 1.00; 95% CIE: 1.00, 1.00).

Both variables that represented transaction specificity had a significant and positive association with SNF integration. For every additional item of geriatric service hospitals offered their patients, hospitals were 68% more likely to use a hierarchical arrangement for SNF services (p = .000; OR = 1.68; 95% CIE: 1.57, 1.79). Home care service, another transaction specificity variable, also had a significant and positive impact on SNF integration. Hospitals with hospital-based or contracted home services were almost 4.16 times as likely to own a SNF as were those without home services (p = .000; OR = 4.16; 95% CIE: 2.81, 6.14).

Model 4 had a relatively lower chi-square of 516.5 as compared with the previous models. The correct prediction percentage was much higher than for the previous three models. In total, 89% of observations were correctly classified.

Model 5: Hierarchy vs. hybrid and market. Model 5 tested the probability of using vertical integration for the hierarchy group and for the hybrid/market group (Table 21). All transaction uncertainty variables were significantly associated with SNF integration. Hospitals located in market areas with higher hospital occupancy were about 39% more likely to vertically integrate SNF services for every 10% increase in average

Table 20

Model 4: Likelihood of SNF Integration: Hybrid vs. Market Groups (N=3,022)

Constructs/Variables	Expected Sign	Beta	P-Value	Odds Ratio	95% CIE
Transaction Uncertainty					
Area hospital occupancy rate	+	1.374	0.022	1.15*	1.02, 1.29
SNF-beds-to-elderly-popu. ratio	-	0.146	0.082	1.16	0.98, 1.36
Cross term of % of poor persons and ratio of beds to elderly popu.	+	-0.001	0.021	1.00	1.00, 1.00
Transaction Specificity					
Number of geriatric services	+	0.516	0.000	1.68	1.57, 1.79
Availability of home care service	+	1.425	0.000	4.16	2.81, 6.14
Transaction Frequency					
Proportion of Medicare discharges	+	0.058	0.946	1.01*	0.85, 1.19
Affiliation with HMO/PPO	+	-0.114	0.468	0.89	0.66, 1.21
Cross term of Medicare discharges and hospital size	+	-0.002	0.578	1.00	0.99, 1.00
Control Variables					
State CON stringency score		0.024	0.217	1.03	0.99, 1.06
Beds set up and staffed		-0.001	0.517	0.99**	0.88, 1.07
Availability of swing beds		0.148	0.526	1.16	0.73, 1.83
Member of health system		0.278	0.035	1.32	1.02, 1.71
Located in rural area		-0.035	0.857	0.97	0.66, 1.41
Governmental ownership		0.185	0.512	1.20	0.69, 2.09
Not-for-profit ownership		0.477	0.041	1.61	1.02, 2.54
Constant		-5.137	0.000		

Goodness of Fit Statistic

Chi-Square (15 df) = 516.5 (p = .000)

Correct Classification Rate = 89.48%

* Odds ratio and 95% C.I.E. based on continuous interval = 10%.

** Odds ratio and 95% C.I.E. based on continuous interval = 50 beds.

occupancy rate, as compared to those located in areas with relatively lower hospital occupancy (p = .000; OR = 1.39; 95% CIE: 1.13, 1.47). The ratio of SNF beds to elderly population had a negative influence on hospitals' decisions to use hierarchical arrangements (p = .000; OR = 0.78; 95% CIE: 0.73, 0.82). The cross-product term of the percentage of population below the poverty level and the ratio of SNF beds to elderly population had a positive impact on the event. This finding indicates that hospitals facing higher behavioral uncertainty of nursing home providers were almost equally as likely to take control of SNF services as were those that did not confront such uncertainty (p = .000; OR = 1.00; 95% CIE: 1.00, 1.00). Nonetheless, the behavioral uncertainty of nursing home providers still contributed to the likelihood of SNF integration.

Two variables measuring transaction specificity both had significant and positive relationships with the likelihood of vertical integration. For every additional item of geriatric service a hospital offered, it was 31% more likely to use the hierarchical form of SNF services (p = .000, OR = 1.31; 95% CIE: 1.24, 1.39). Hospitals offering home care services were almost 40% more likely to vertically integrate a SNF than were hospitals that did not offer home care services (p = .000; OR = 1.40; 95% CIE: 1.21, 1.62).

Only one transaction frequency variable turned out to be significant. For every 10% increase in elderly patients served, hospitals were about 14% more likely to take control over the SNF services, as compared to hospitals with relatively smaller proportions of Medicare patients (p = .001; OR = 1.14; 95% CIE: 1.05, 1.24). Neither

Table 21

Model 5: Likelihood of SNF Integration: Hierarchy vs. Hybrid/Market Groups (N=4,703)

Constructs/Variables	Expected Sign	Beta	P-Value	Odds Ratio	95% CIE
Transaction Uncertainty					
Area hospital occupancy rate	+	3.283	0.000	1.39*	1.31, 1.47
SNF-beds-to-elderly-popu. ratio	-	-0.254	0.000	0.78	0.73, 0.82
Cross term of % of poor persons and ratio of beds to elderly popu.	+	0.001	0.000	1.00	1.00, 1.00
Transaction Specificity					
Number of geriatric services	+	0.272	0.000	1.31	1.24, 1.39
Availability of home care service	+	0.339	0.000	1.40	1.21, 1.62
Transaction Frequency					
Proportion of Medicare discharges	+	1.332	0.001	1.14*	1.05, 1.24
Affiliation with HMO/PPO	+	0.128	0.124	1.14	0.97, 1.34
Cross term of Medicare discharges and hospital size	+	0.002	0.298	1.00	1.00, 1.01
Control Variables					
State CON stringency score		-0.079	0.000	0.92	0.90, 0.94
Beds set up and staffed		-0.002	0.016	0.99**	0.85, 0.99
Availability of swing beds		1.491	0.000	4.44	3.68, 5.36
Member of health system		-0.011	0.899	0.99	0.84, 1.16
Located in rural area		0.713	0.000	2.04	1.68, 2.48
Governmental ownership		0.316	0.026	1.37	1.05, 1.79
Not-for-profit ownership		0.295	0.020	1.34	1.05, 1.72
Constant		-4.345	0.000		
Goodness of Fit Statistic					
Chi-Square (15 df)	=	1209.6 (p = .000)			
Correct Classification Rate	=	74.17%			

* Odds ratio and 95% C.I.E. based on continuous interval = 10%.

** Odds ratio and 95% C.I.E. based on continuous interval = 50 beds.

HMO/PPO affiliation nor the interaction of Medicare discharges and hospital size had any impact.

Overall, Model 5 was successful in testing the theory, according to goodness of fit statistics. The model chi-square was 1,209.6 with 15 degrees of freedom ($p = .000$). About 74.17% of cases were correctly predicted.

Phase Two: Models with Inter-Construct Interaction Effects

Tables 22 and 23 present the results for the second stage of multivariate logistic regression analysis, which examined the inter-construct interaction effects on the likelihood of SNF integration. For each construct in Model 1, the variable with the highest odds ratio and/or the greatest partial R^2 was selected for the second stage of multivariate logistic regression models. The rationale behind this selection was that a variable with the greater predictive power (as judged by high odds ratios and partial R^2) was assumed to be the most representative of a construct. These variables, named as "Interactors," were used to test the conceptual model.

For the first-order interaction model, three interactors were created. For each interactor, the most representing variable was selected from each of two of the three constructs; these three pairs were each multiplied, to create the Interactors. For the second-order interaction model, variables from each of three constructs were multiplied to form one interactor. Using the selection rules, the variables of area average hospital occupancy rate, home care service, and proportion of Medicare discharges were chosen to represent the respective constructs.

Hierarchy/hybrid vs. market arrangements were the two forms compared. Because the interaction terms were the focal interest, they were considered as "independent predictors" instead of confounders, and the variables that had been hypothesized to have main effects (e.g., area average hospital occupancy) were removed from the models. The applicability of keeping only the interaction terms in a logistic regression model has been confirmed by other studies (Klein, Frazier, & Roth, 1990; Pindyck & Robinfeld, 1976).

Model 6: First-order interaction. Table 22 presents the likelihood of SNF integration, using the first-order interaction term without measuring main effects while controlling for seven hospital characteristic variables. Two out of the three interactors had significant associations with SNF integration. $\text{Interactor}_{\text{AH\_OPY} \times \text{GI\_INDX}}$, the interaction term of the area hospital occupancy rate and the ratio of SNF beds to elderly population, was significantly and positively associated with the hospital's decision to integrate ($p = .000$; OR = 1.65; 95% CIE: 1.43, 1.89). $\text{Interactor}_{\text{GI\_INDX} \times \text{MCR\_D}}$, the interaction of the number of geriatric services and the proportion of Medicare discharges, also had a significant impact on SNF integration ($p = .000$; OR = 39.05; 95% CIE: 17.84, 85.50). A hospital was more likely to use vertical integration if it provided more geriatric services and had more Medicare discharges.

Overall, Model 6 was successful in testing the theory, according to goodness of fit statistics. The model chi-square was 978.7 with 10 degrees of freedom ($p = .000$). About 70% of cases were correctly predicted.

Table 22

Model 6: Likelihood of SNF Integration with the First-Order Interaction Terms (Hierarchy/Hybrid vs. Market, N=4,703)

Variables	Expected Sign	Beta	P-Value	Odds Ratio	95% CIE
Interaction Effects					
$Interactor_{AH\_OPY \times GI\_INDX}$	+	0.499	0.000	1.65	1.43, 1.89
$Interactor_{AH\_●PY \times MCR\_D}$	+	0.104	0.361	1.11	0.89, 1.39
$Interactor_{GI\_INDX \times MCR\_D}$	+	3.665	0.000	39.05	17.84, 85.50
Control Variables					
State CON stringency score		-0.064	0.000	0.94	0.92, 0.96
Beds set up and staffed		-0.001	0.032	1.00	0.95, 1.00
Availability of swing beds		1.392	0.000	4.02	3.38, 4.79
Member of health system		0.101	0.190	1.11	0.95, 1.29
Located in rural area		0.564	0.000	1.76	1.49, 2.08
Governmental ownership		0.501	0.000	1.65	1.28, 2.13
Not-for-profit ownership		0.581	0.000	1.79	1.43, 2.24
Constant		-2.167	0.000		
Goodness of fit Statistic					
Chi-Square (10 df)	=	978.7 (p =.000)			
Correct Classification Rate	=	69.85%			

Model 7: Second-order interaction. The interaction effect of the same three variables selected for the first-order interaction model was tested in the second-order interaction model. Table 23 presents results of the hypothesis testing. The interaction effect was significantly and positively associated with SNF integration (p = .000; OR =

4.40; 95% CIE: 3.67, 5.27). Hospitals located in areas with high average hospital occupancy and having more geriatric services and a higher proportion of Medicare discharges were more likely to vertically integrate SNF services. In other words, hospitals with high levels of all three variables are the most likely candidates for hierarchy or hybrid groups.

Table 23

Model 7: Likelihood of SNF Integration with the Second Order Interaction Term (Hierarchy/Hybrid vs. Market, N=4,703)

Variables	Expected Sign	Beta	P-Value	Odds Ratio	95% CIE
Interaction Effects					
$\text{Interactor}_{\text{AH\_OPY} \times \text{GI\_INDX} \times \text{MCR\_D}}$	+	1.481	0.000	4.40	3.67, 5.27
Control Variables					
State CON stringency score		-0.047	0.000	0.95	0.94, 0.97
Beds set up and staffed		0.000	0.070	1.00	0.96, 1.00
Availability of swing beds		1.395	0.000	4.04	3.40, 4.79
Member of health system		0.099	0.191	1.10	0.95, 1.28
Located in rural area		0.466	0.000	1.59	1.35, 1.88
Governmental ownership		0.485	0.000	1.63	1.26, 2.09
Not-for-profit ownership		0.634	0.000	1.89	1.51, 2.36
Constant		-1.420	0.000		

Goodness of fit Statistic

Chi-Square (10 df)	=	880.8 (p =.000)
Correct Classification Rate	=	69.53%

Control Variables

Finally, several control variables were consistently positively and significantly associated with SNF integration; they include state CON stringency, the availability of swing beds, and hospital location. State certificate-of-need stringency scores, indicative of restrictions on the construction or expansion of health care facilities, had a negative and significant association with SNF integration. In other words, hospitals located in the states with stringent restrictions on health care facilities were less likely to take on ownership of SNFs. On the other hand, a hospital's swing bed status and location were positively related with SNF integration. Hospitals that were allowed to mobilize the use of beds or that were located in rural areas were more likely to integrate SNF services.

Summary of Findings

The results of univariate analysis, bivariate analysis, factor analysis, and multivariate logistic regression analysis are summarized in this section.

Univariate Analysis

According to the descriptive statistics of the study variables, the hybrid group seemed to have a greater likelihood than the hierarchy group of using hierarchical arrangements. The hybrid group had higher transaction uncertainty (area average hospital occupancy, hospital occupancy, SNF-beds-to-elderly-population ratio, SNF occupancy rate), higher transaction specificity (number of geriatric services, availability of home care services), and higher transaction frequency (HMO/PPO affiliation) than did the hierarchy group. After controlling for hospital characteristics, however, the contrast was

reversed. This supports the importance of controlling for hospital characteristics when conducting hospital-related studies.

Bivariate Analysis and Factor Analysis

Through correlation analysis and collinearity diagnostics, two variables (individual hospital occupancy rate and SNF occupancy rate) were diagnosed to have collinearity problems and were deleted from further analysis. The results of factor analysis helped to validate the theoretically derived, three-construct model, because all the variables were loaded at least moderately on their intended constructs.

Multivariate Logistic Regression Analysis

Model fit was assessed at a micro level -- individual variables, as well as at a macro level -- summary statistics. For the micro level, the expected sign, beta coefficient, odd ratio, and statistical significance level of each variable were evaluated. For the macro level, the assessment emphasized the residual or chi-square and correct prediction of the classification table. Table 24 shows a comparison of odd ratio and summary statistics for five primary models. Individual variables in each construct are summarized across all models first, and then the number of significant variables and overall goodness of fit statistic of each model are compared.

Micro-level analysis. At least one variable representing each dimension had a statistically significant influence on SNF integration, with one exception -- the transaction frequency construct in Model 4. Area hospital occupancy, which measured transaction uncertainty, was significantly and positively associated with the event of

integration across all five variables. This indicates that hospitals located in market areas with a relatively higher hospital occupancy rate were likely to take more control over SNF services. The ratio of SNF beds to elderly population, another transaction uncertainty variable, had a significant and negative impact (as expected) on the action of vertical integration, except in Model 4. This finding implies that hospitals located in areas with more SNF beds were less likely to use a hierarchy or hybrid arrangement for SNF service. As reported earlier in the factor analysis, one transaction uncertainty variable, area hospital occupancy, was identified as demand uncertainty, and another, the ratio of SNF beds to elderly population, as supply uncertainty. Therefore, demand and supply for SNF beds affected a hospital's make-or-buy decision.

The interaction term of the below-poverty-level population and the ratio of SNF beds to elderly population, representing SNF behavioral uncertainty, also had a significant association with SNF integration across the five models. Compared with previous variables, this cross-term had relatively weaker predictive power, because the probability of using SNF integration was about the same as that of not using SNF integration (OR = 1.00).

The number of geriatric services and the availability of home services were used to measure transaction specificity. Both independent variables were positively and significantly associated with SNF integration in all models but Model 3. The findings indicate that geriatric services and home services were associated with the likelihood of SNF integration. The odds ratio ranged from 1.09 to 4.16.

Table 24

Comparison of Odds Ratios and Summary Statistics of Primary Models

Constructs/Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Transaction Uncertainty					
Area hospital occupancy rate	1.367 §	1.406 §	1.208 §	1.147 †	1.389 §
SNF-beds-to-elderly-popu. ratio	0.809 §	0.788 §	0.690 §	1.157	0.776 §
Cross term of % of the poor and ratio of beds to elderly popu.	1.001 §	1.001 §	1.001 §	0.999 †	1.001 ‡
Transaction Specificity					
Number of geriatric services	1.407 §	1.357 §	1.086	1.675 §	1.312 §
Availability of home care service	1.805 §	1.373 §	1.549 §	4.158 §	1.403 §
Transaction Frequency					
Proportion of Medicare discharges	1.134 §	1.135 §	1.159	1.006	1.142 §
Affiliation with HMO/PPO	1.070	1.131	1.121	0.089	1.136
Cross term of Medicare discharges and hospital size	1.001	1.003	1.003	0.998	1.002
Control Variables					
State CON stringency score	0.938 §	0.924 §	0.904 §	1.025	0.924 §
Beds set up and staffed	0.999	0.998 †	0.998	0.999	0.998 ‡
Availability of swing beds	4.218 §	4.554 §	4.059 §	1.160	4.441 §
Member of health system	1.056	1.034	0.831	1.320 †	0.990
Located in rural area	1.817 §	2.013 §	2.384 §	0.966	2.401 §
Governmental ownership	1.491 §	1.430 ‡	1.178	1.203	1.372 †
Not-for-profit ownership	1.541 §	1.463 §	0.707	1.611	1.343 †
Goodness of Fit Statistic					
Chi-Square	1154.1	1138.7	416	516.5	1209.6
Concordant	70.2%	72.7%	81.4%	89.5%	74.2%
Number of cases	4703	4703	2075	3022	4703

† Significant at .05 level, two-tailed test
‡ Significant at .01 level, two-tailed test
§ Significant at .001 level, two-tailed test

Of the two variables measuring transaction frequency, only the proportion of Medicare discharges had a positive association in Models 1, 2 and 3. Neither HMO/PPO affiliation nor the cross-product term of Medicare discharges and hospital size had a significant relationship with SNF integration. The predictive power of this construct was much weaker than that of the other constructs when judged by the number of significant variables. However, the odds ratios of the proportion of Medicare discharges were much greater than those of most variables from the other two constructs. To wit, a hospital's commitment to Medicare patient care influenced its form of providing SNF services.

Macro-level analysis. This section summarizes comparisons of significant variables in five primary models. In Models 1, 2 and 5, a hospital's decision about SNF integration was contingent on six out of the eight study variables. The three models, which essentially compared two more extreme forms of SNF integration, had similar significant variables. The consistent results show that hospitals were more likely to take hierarchical or hybrid control if they confronted environmental uncertainty, had more experience with related services, and had higher volumes of transactions. Models 3 and 4, which compared two less extreme forms (i.e., hierarchy vs. hybrid and hybrid vs. market), had relatively fewer variables that reached statistical significance.

The goodness of fit statistics and the correct prediction percentages of the five primary models were compared. Chi-square values of Models 3 and 4 were much lower than those of the other models, probably because these two models had many fewer observations. Since the p-values were less than 0.001 in all models, the differences in the

chi-squares were not as discernible. As for the predicted probabilities and observed responses, Models 3 and 4 had higher percentages of correct prediction. (81.4% for Model 3; 89.5% for Model 4). Although Models 3 and 4 seem to have better summary statistics, this may be due to the fact that they included fewer cases, so the results were not disturbed by covariate patterns.

Overall, individual variables demonstrated fair predictive power in terms of odds ratios and the number of significant variables. While the chi-squares show unsatisfactory model fits, the high chi-squares may be caused by the inclusion of continuous variables. Other articles address the limitation of using either R^2 or chi-square to measure the overall model fit without considering individual components (Hosmer & Lemeshow, 1989; Rossiter, Chiu, & Chen, 1994). Nevertheless, the correct prediction is satisfactory. In sum, these models did fairly well in general, especially in predicting the event of SNF integration across all models.

In the five primary logistic regression models, the effects of all the three transaction constructs were tested simultaneously. In the two interaction models, the interaction of each two constructs and that of the three constructs were found to have significant effects on hospitals' decisions about SNF integration. The interpretation of these results for testing the proposed hypotheses are discussed in the next chapter.

Chapter 6

Discussion

The purpose of this study is to investigate why and how hospitals vertically integrate into skilled nursing care facilities, by using Williamson's transaction cost economics theory. Previous studies have rarely applied transaction cost theory to health care. Little theory-based research has been offered to explain why hospitals act to integrate into skilled nursing services. Thus, the focal interest of this study is to examine why hospitals expand their boundary to sub-acute care, which they have not traditionally provided. Understanding the organization of sub-acute care is essential to hospital management and health care policy planning.

The analysis focuses on the determinants of vertical integration, with the objective of identifying the factors associated with a hospital's make-or-buy decision about providing sub-acute care. The general assumption, based on transaction cost economics, is that uncertainty, specificity, and frequency of transactions have a positive effect on SNF integration.

This chapter first presents the results of individual hypothesis testing of the effects of the three constructs. Both the supported and the unsupported hypotheses are interpreted in terms of the theory. A discussion of whether the study has answered the

research questions successfully is presented. The application of the transaction cost theory to the health care field is then assessed by using Bacharach's (1989) criteria. Finally, the limitations of the study are addressed.

Hypothesis Testing and Interpretation

This study offered four propositions and tested ten corresponding hypotheses. The propositions and hypotheses are laid out in the order of the three transaction constructs -- transaction uncertainty, transaction specificity, and transaction frequency. Under each proposition, the derived testable hypotheses are restated. Interpretations are presented as to why some of the propositions and hypotheses are supported, whereas others are not. Table 25 summarizes the results of hypothesis testing for the five primary models; Table 26 presents the results of the two interaction models.

Transaction Uncertainty on SNF Integration

Proposition One addresses the transaction uncertainty dimension. It states that the more uncertain the SNF market is, the more likely a hospital is to undertake a higher degree of vertical integration in providing SNF services. In essence, transaction uncertainty embraces environmental and behavioral uncertainty, which are both important to a hospital's decision about SNF integration. Environmental uncertainty (market uncertainty) includes both supply and demand factors. Behavioral uncertainty refers to factors that emerge from humans' bounded rationality and opportunism. H1 and H2 are used to test environmental uncertainty; H3 is used to test behavioral uncertainty.

Table 25

Results of Hypothesis Testing for Five Primary Models

Hypo-thesis	Construct/Variables	Model 1	Model 2	Model 3	Model 4	Model 5
		Hierarchy /Hybrid vs. Market	Hierarchy vs. Market	Hierarchy vs. Hybrid	Hybrid vs. Market	Hierarchy vs. Hybrid/ Market
	Transaction Uncertainty					
H 1	Area hospital occupancy rate	S	S	S	S	S
H 2	SNF-beds-to-elderly-popu. ratio	S	S	S	-	S
H 3	Cross-product term of % of the poor and ratio of beds to elderly popu.	S	S	S	-	S
	Transaction Specificity					
H 4	Number of geriatric services	S	S	-	S	S
H 5	Availability of home health services	S	S	S	S	S
	Transaction Frequency					
H 6	Proportion of Medicare discharges	S	S	-	-	S
H 7	Affiliation with HMOs/PPOs	-	-	-	-	-
H 8	Cross-product term of Medicare discharges and hospital size	-	-	-	-	-

Note. S = Hypothesis was supported.
- = Hypothesis was not supported.

H1: A hospital that has a relatively higher occupancy rate and/or is located in an area with a high average occupancy rate is more likely to employ a higher degree of vertical integration in providing SNF services.

H1 is supported across all five models. The results indicate that the **demand factor** is influential on a hospital's decision about providing SNF services. This holds true regardless of whether the decision is between hierarchy and market, between hierarchy and hybrid, or between any other combinations.

Due to the nature of the DRG prospective payment system, hospitals are under pressure to discharge patients quickly, if not prematurely. If hospitals cannot discharge patients to other institutions that will provide appropriate post-acute care, they incur opportunity costs and absorb the costs associated with delayed discharges. Therefore, utilization of hospital acute beds reflects the competition for discharge sites and the degree of demand uncertainty. For hospitals that are located in areas with higher average occupancy rates, the competition for nursing home beds becomes more severe. In order to overcome such demand uncertainty, hospitals are more likely to reduce their dependency on the environment by providing SNF services internally.

H2: A hospital that is located in an area with a relative shortage of SNF beds and/or a high average SNF occupancy rate is more likely to employ a higher degree of vertical integration in providing SNF services.

As opposed to H1, which addresses uncertainty associated with the demand side, H2 focuses on the **supply factor**. The supply of SNF beds is hypothesized to have a direct and negative association with SNF integration. H2 is supported in all but Model 4.

The supply factor is shown to be a key determinant of hospitals' SNF integration. It is specially influential for hospitals located in areas with relatively fewer SNF beds.

That the supply of SNF beds is constrained by Certificate of Need (CON) has been shown by the long waiting lists for nursing home replacements and by other access problems (Ettner, 1993; Harrigan, 1984; Nyman, 1993). States use CON to limit the nursing home supply, reasoning that if there are fewer nursing home beds, there will be fewer Medicaid patients to pay for. The stringency of CON varies by state. After controlling for CON, SNF bed availability still affects hospitals' forms of SNF services. This finding implies that, regardless of CON stringency, hospitals are apt to employ a higher degree of vertical integration in providing SNF services if the market supply of SNF beds is not assured.

Model 4 is intended to differentiate hybrid from market arrangements. The results, however, fail to support H2. In other words, the supply of SNF beds does not affect a hospital's decision between hybrid and market arrangements. Three explanations are possible for this result. First, it may be due to the fact that in areas where the nursing home occupancy rate is high, few SNFs are available for hospitals to contract with them. Second, nursing homes probably are disinclined to be constrained by contracting. Once long-term contracts have been signed with hospitals, nursing homes may lose the ability to maximize their profits. Yet another explanation is information impactedness. Not every hospital has information on the availability of SNF beds in the market area. An uninformed hospital may not undertake any action even if it is located in an area with an

undersupply of SNF beds. In other words, those hospitals in the hybrid and market groups may not be aware of the degree of uncertainty about SNF bed supply. In this regard, the supply factor has no significant influence on the mode of SNF integration.

H3: A hospital in an area with relatively more indigent persons and a shortage of SNF bed supply is more likely to employ a higher degree of vertical integration in providing SNF services.

To address the uncertainty of nursing home behavior, the cross-product term of the SNF beds to elderly population ratio and the persons-below-the-poverty-level percentage is used in testing H3. This hypothesis is supported in all primary models with the exception of Model 4. It indicates that hospitals are more likely to use SNF integration if they perceive a threat from nursing home providers' price discrimination. Nursing homes are known for a tendency to discriminate against prospective patients on the basis of price (Dubay & Cohen, 1990; Scanlon, 1980; Shapiro & Roos, 1980). In order to maximize profit, nursing homes may select those patients from whom optimal revenue can be generated, and may be reluctant to accept patients who need heavy sub-acute care. Such a situation becomes more obvious where the nursing home supply is tight and many patients are indigent, as shown by the delays in admission endured by Medicaid patients in counties where nursing home beds are limited (Ettner, 1993). Provided all other conditions are equal, however, nursing homes' behavioral uncertainty has no influence on whether a hospital chooses a hybrid or a market arrangement (Model 4).

Thus for Proposition One, the three hypotheses derived for the construct of transaction uncertainty are sufficiently supported across the five primary models, except that H2 and H3 are not supported in Model 4. What makes Model 4 different from the other models may be that the difference between hybrid and market arrangements is minimal. The demand factor outweighs the supply factor only when a hospital has to choose between hybrid and market arrangements. Several studies also have shown that environmental uncertainty (Anderson, 1985; John & Weitz, 1988; Walker & Weber, 1984) and behavioral uncertainty (John & Weitz, 1988) contribute to the firm's integration decision.

Transaction Asset Specificity on SNF Integration

Proposition Two is intended to measure the transaction specificity dimension. Where asset specificity is high, an internal organization is preferred because bilateral dependency is great. Where asset specificity is low because suppliers are interchangeable, the market mode is favored because of the bureaucratic disabilities of internal organization in controlling production cost (Williamson, 1985). This study assumes that the more experience or expertise a hospital has in caring for the elderly, the more likely the hospital is to pursue more vertical integration in providing SNF services. The number of geriatric services (H4) and the availability of home care services (H5) are used to measure asset specificity.

H4: A hospital that provides a wider variety of geriatric services to elderly patients is more likely to employ a higher degree of vertical integration in providing SNF services.

H5: A hospital that provides home health services to elderly patients is more likely to employ a higher degree of vertical integration in providing SNF services.

According to Williamson (1985), asset specificity includes site specificity, physical asset specificity, human asset specificity, and dedicated assets. Knowledge about providing specific geriatric services is regarded as human asset specificity as well as physical asset specificity. A hospital's experience with providing elderly care is hypothesized to be crucial to the hospital's decision on SNF integration. H4 and H5 are supported across different degrees of vertical integration. A hospital is able to develop expertise through providing geriatric services and home health services. Consequently, a hospital should have specific personnel arrangements to provide specific geriatric services for the elderly. Such expertise and knowledge equip a hospital to manage nursing-home services and enable a hospital to accurately assess associated advantages and risks. All other things being equal, a hospital that is comparatively more prepared and experienced in elderly care (asset specificity) has the propensity to choose SNF integration and will be more selective in its placement of nursing home patients. It should be noticed that H4 in Model 3 is supported only at a marginally significant level ($p = .080$).

The strong support of the two hypotheses confirms Williamson's (1985) assertion that specificity is the most important factor in decisions about vertical integration. Eastaugh (1992) has recently shown significant cost savings accompanying hospital service specialization. Several studies in other fields also have shown that asset

specificity is predictive of vertical integration (Anderson, 1985; Anderson & Coughlan, 1994; Masten, 1984; Rangan, Corey, & Cespedes, 1993)

Transaction Frequency on SNF Integration

The objective of a governance structure is to economize not only transaction costs but also production costs. Whether transaction cost economies are reached at the expense of scale economies needs to be assessed. Transaction volume is used as a proxy for exchange frequency in several studies (Anderson & Coughlan, 1994; Anderson & Schmittlein, 1984; Klein, Frazier, & Roth, 1990). It is also suggested that volume may represent the production costs factor in the application of transaction cost theory (Klein, Frazier, & Roth, 1990). In this study, scale economy assumes that the higher transaction frequency a hospital has, the more likely the hospital is to use more vertical integration in providing SNF services.

Proposition Three is intended to address the transaction frequency dimension. Three hypotheses are derived for this construct. H6 is tested by using the proportion of Medicare patients; H7 is tested by affiliation with managed care organization as a surrogate for private purchaser pressure. H8 is tested through a cross-term product of the proportion of Medicare patients and hospital size.

H6: A hospital with a relatively higher proportion of Medicare patients is more likely to employ a higher degree of vertical integration in providing SNF services.

H6 is supported in the three models that compare two relatively extreme governance modes (Model 1: hierarchy/hybrid vs. market; Model 2: hierarchy vs. market;

Model 5: hierarchy vs. hybrid/market). Only when a hospital has to decide between two extreme arrangements for providing SNF services does the proportion of Medicare discharges appear influential. That is probably one reason why H6 is not supported in Models 3 and 4. In terms of scale economies, only the hospitals with extremely high transaction volume will employ SNF integration to minimize production/transaction costs. It can be concluded that transaction frequency does not distinguish the use of intermediate exchanges from the use of either market exchanges or hierarchical exchanges, suggesting that high volume of transactions is a prerequisite only for the choice of either extreme.

H7: A hospital affiliated with managed care organizations is more likely to employ a higher degree of vertical integration in providing SNF services.

A hospital's affiliation with a managed care organization was selected to measure transaction frequency, because managed care organizations are known for reducing patients' length of stay. The affiliated hospitals and affiliated physicians have to discharge patients to sub-acute care sites more frequently. Such frequent transactions, in turn, might lead hospitals to favor vertical integration. However, H7 is not supported in any model.

Several explanations can be postulated for why HMO/PPO affiliation has no influence on a hospital's mode of SNF services. The most likely reason is that the measure did not capture the frequency of managed care discharges. Second, the suppressed use of inpatient services might balance out the volume of induced SNF

services even though managed care organizations tend to reduce enrollees' length of stay. Third, managed care organizations prefer to insure younger persons, who are not the major consumers of SNF services.

H8: A hospital with a higher proportion of Medicare patients and a relatively larger size is more likely to employ a higher degree of vertical integration in providing SNF services.

The cross-product term of Medicare discharges and hospital size is hypothesized to represent the absolute volume of patients transferred from an acute hospital to a skilled nursing facility. Theoretically, transactions are likely to be more frequent at a large hospital caring for a greater proportion of Medicare patients than at a large hospital with a smaller proportion of Medicare patients, or at a small hospital, regardless of its patient mix. However, H8 is not supported in any model. There is no interaction effect of Medicare discharges and hospital bed size on the mode of SNF integration. The lack of interaction effect may be due to the shared variances between the proportion of Medicare discharges and bed size.

In summary, for Proposition Three, the hypothesis testing results indicate that the volume of patient transactions has less significant influence on a hospital's mode of SNF integration than do uncertainty and frequency factors. Indeed, the influence of transaction frequency on a firm's integration decision presents a mixed picture. In some studies, frequency has been found to be significantly associated with the decision about integration (Anderson & Coughlan, 1994; Klein, Frazier, & Roth, 1990), while other studies have not concurred (John & Weitz, 1988; Masten, 1984).

Interaction Effects on SNF Integration

Proposition Four is intended to address the interaction effects of the three dimensions on SNF integration. It assumes that the more uncertainty, specificity, and frequency are associated with the transactions of elderly patients at a hospital, the more likely the hospital is to employ a higher degree of vertical integration in providing SNF services. The interaction effects of the three transaction factors are tested in H9 and H10. H9 is decomposed into three sub-hypotheses to address the interaction of each two of the three factors. Table 26 presents the results of the two interaction effect models.

H9: The higher interaction effects of each two of the three constructs are (i.e., uncertainty × specificity, uncertainty × frequency, and specificity × frequency), the more likely the hospital is to employ a higher degree of vertical integration in providing SNF services.

H9a: The higher the area average hospital occupancy associated with a hospital and the more geriatric services provided by the hospital, the more likely the hospital is to employ a higher degree of vertical integration in providing SNF services.

H9b: The higher the area average hospital occupancy and the higher the proportion of Medicare discharges associated with a hospital, the more likely the hospital is to employ a higher degree of vertical integration in providing SNF services.

H9c: The more geriatric services provided by a hospital and the higher the proportion of Medicare discharges at a hospital, the more likely the hospital is to employ a higher degree of vertical integration in providing SNF services.

Table 26

Results of Hypothesis Testing for Interaction Effects Models

Hypothesis	Constructs/Variables	Model 6	Model 7
H9a	Uncertainty × Specificity $_{(AH\_OPY \times GI\_INDX)}$	S	NA
H9b	Uncertainty × Frequency $_{(AH\_OPY \times MCR\_D)}$	-	NA
H9c	Specificity × Frequency $_{(GI\_INDX \times MCR\_D)}$	S	NA
H10	Uncertainty × Specificity × Frequency $_{(AH\_OPY \times GI\_INDX \times MCR\_D)}$	NA	S

Notes. S: Hypothesis was supported;
-: Hypothesis was not supported.
NA: Not applicable

Williamson asserted that transaction specificity is the most important factor in the vertical integration decision. Both interaction terms tested in H9a $_{(AH\_OPY \times GI\_INDX)}$ and H9c $_{(GI\_INDX \times MCR\_D)}$ support this argument. Table 27 presents the interaction effect of transaction specificity and transaction frequency. The two-by-two table shows that a hospital prefers the hierarchy mode under high specificity and frequency. With low transaction specificity and frequency, a hospital tends to choose the market arrangement. Interestingly, transaction frequency, a relatively weak factor in primary models, becomes more influential when it interacts with transaction specificity. On the other hand, the interaction effect between environmental uncertainty and transaction frequency is not discernible as tested in H9b $_{(AH\_OPY \times MCR\_D)}$ (Table 26). In other words, SNF integration

is not preferred for a hospital that is located in a competitive market area and that cares for a higher proportion of elderly patients.

Table 27

Hospital SNF Integration Based on Interaction of Two Dimensions

	Low Asset specificity	**High** Asset Specificity
Low Frequency	MARKET	HYBRID
High Frequency	HYBRID	HIERARCHY

The first-order interaction models strongly support the absolute importance of asset specificity and the conditional importance of transaction uncertainty and transaction frequency when it comes to deciding on the degree of SNF integration for a hospital. An increase in uncertainty and frequency is of slight consequence for transactions that are not specific. This is not true, however, for transactions carried out by idiosyncratic providers. When suppliers are interchangeable so that new trading relations can be easily arranged, frequency matters little, and environmental uncertainty is not necessarily relevant. Conversely, when exchange is highly specific, increased transaction frequency and

environmental uncertainty make contractual gaps larger and the subsequent necessary adaptations more important. Therefore, it becomes essential for a hospital to set up a particular mechanism to provide SNF services (i.e., an integrated SNF) if exchange is highly specific.

H10: The higher the area average hospital occupancy, the more geriatric services are provided, and the higher the proportion of Medicare discharges is at a hospital, the more likely the hospital is to employ a higher degree of vertical integration in providing SNF services.

The second-order interaction effect of three dimensions is tested in H10. The importance of interaction effects is proven in this study. The results confirm Williamson's emphasis that the selection of vertical integration is **simultaneously** determined by three dimensions of transaction. SNF integration is a plausible choice for a hospital if the following conditions co-exist: its environment is more uncertain, it is more experienced in caring for the elderly patients, and it accommodates more Medicare patients.

Summary of Hypothesis Testing

The hypothesis testing results provide support for most of the fundamental predictions of transaction cost economics theory. The importance of transaction uncertainty (H1, H2 and H3) and transaction specificity (H4 and H5) are strongly supported. Transaction frequency (H6, H7 and H8) receives less support. Compared to the other two factors, transaction frequency has far less influence on a hospital's decision

about SNF integration. As Williamson (1985) suggests, economies of scale are less relevant to a decision about forward integration.

The emergence of SNF integration is assumed to occur due to the failure of the nursing home market. In this case, market failure is considered to be the result of environmental uncertainty and behavioral uncertainty. The hypothesized influence of uncertainty is strongly supported. The sustained H1 and H2 indicate that environmental uncertainty affects hospitals' choice of a governance form to provide SNF services. H3 supports the assertion that nursing homes' opportunistic behaviors also affect the decision about SNF integration. Coase (1937) concluded that opportunistic behavior motivates vertical integration. The results of this study show that hospitals may select the hierarchy or hybrid form to solve their hold-up problems with nursing homes.

The results of testing H4 and H5 confirm that transaction specificity is the most important and distinguishing construct for make-or-buy decisions, as Williamson (1975, 1985) suggested. A hospital's experience and knowledge of elderly care is crucial in its choice of a form for providing SNF services. As compared to the number of geriatric services, furthermore, the availability of home health services is a more significant determinant of SNF integration.

Transaction frequency is shown to be the least significant factor in a hospital's decision among different degrees of SNF integration, since H6 is supported in only three models, and H7 and H8 are not supported in any model. The results, which support Williamson's assertion (1985), indicate that scale economies are not as important to the

transaction cost paradigm as are the other two factors (i.e., uncertainty and specificity). Transaction frequency does not distinguish the use of hybrid exchanges from the use of either market exchanges or hierarchical exchanges, suggesting that only extreme transaction volume (very high or very low) has an impact on a hospital's form for providing SNF services. Similar findings have been reported for other industries (Rangan, Corey, & Cespedes, 1993; Walker & Poppo, 1991).

Two out of the three first-order interaction terms are successfully tested in H9a and H9c. These results confirm that transaction specificity is the most important factor in vertical integration decisions. The second-order interaction effect of three dimensions is also successfully tested in H10.

Responses to Research Questions

This study is guided by three fundamental research questions, raised in Chapter 1. The first question inquires about the degree to which hospitals choose vertical integration in response to delayed discharge problems; the second inquires about the determinants of hospitals' decisions about SNF integration. The analysis results presented in Chapter 5 and the testing of the hypotheses summarized in the previous section have answered the first and the second questions.

Assessment of TCE by Using Bacharach's Criteria

The third question, which focuses on the applicability of Williamson's transaction cost economics theory to the health care sector, is a more global question and so cannot be answered by hypothesis testing. To address the third question, Bacharach's (1989)

criteria of theory assessment are adopted. Bacharach's criteria propose that a theory can be assessed in terms of variables, constructs, and relationships. The falsifiability and utility of each of the three elements are evaluated. The following assessment discusses the value and usefulness of transaction cost economics as a research tool in the study of health services organizations.

Variable falsifiability. Variable falsifiability is evaluated by whether the selected variables are operationally defined, valid, and reliable. It is obvious that transaction uncertainty, asset specificity, and frequency require more operational configuration if they are considered as variables. The selected variables in this study are all defined well. Measurement reliability is verified by the stable beta coefficients of each variable across all five primary models.

Construct validity. There are three parts to construct validation: 1) suggesting what constructs may account for test performance, 2) deriving hypotheses from the theory involving the construct, and 3) testing the hypotheses empirically (Kerlinger, 1986).

Transaction cost economics proposes three discriminant constructs that determine the selection of governance structure -- uncertainty, asset specificity, and frequency. This study makes a particular effort to measure uncertainty, although most economic theories consider uncertainty as given. Environmental uncertainty is decomposed into demand and supply factors. The demand factor is represented by the average area hospital occupancy rate, and the supply factor by SNF-beds-to-elderly-population ratio. On the other hand, behavioral uncertainty of nursing homes is measured by a cross-product term

of the SNF-beds-to-elderly-population ratio and the persons-below-the-poverty-level percentage. The availability of home health services and the number of geriatric services are well representative of transaction specificity. The proportion of Medicare discharges and the affiliation with HMOs or PPOs are indicators of transaction frequency. From the results of factor analysis, all variables are found to be appropriate indicators of their respective constructs. In other words, the constructs are proven to have discriminant validity.

Logical adequacy. Economic methodology has the capacity to develop falsifiable theories that precisely specify both constructs and their relationships. Two criteria must be met to achieve logical adequacy. First, the proposition must be nontautological. Second, the nature of the relationship between antecedent and consequent must be specified. Robins (1987) claimed that transaction cost analysis can "escape this sort of tautology by making the leap to causal explanation." In this study, all propositions and hypotheses are developed to specify the causal relationship between a hospital's mode of SNF integration and the characteristics of transactions. For example, a hospital located in the market with higher uncertainty is more likely to employ SNF integration. This application of transaction cost theory is logically adequate, because the relationship is specified clearly in the non-tautological proposition statements.

Empirical adequacy. A principal reason for using transaction cost economics as a tool for health organizations research is that, to date, empirical work within TCE has been for the most part confirmatory. Research on vertical integration has been used to

examine how consistent the empirical evidence is with the hypothesis that organizations are likely to internalize exchanges involving high asset specificity and uncertainty. In this study, the results also confirm that a hospital's decision about SNF integration is associated with asset specificity and environmental and behavior uncertainty rather than with transaction frequency. This empirical adequacy may be due to a good model composed of valid and stable variables (Bacharach, 1989).

Explanatory potential. Transaction cost theory not only provides an answer to a fundamental question: "why do organizations exist?", but also reframes our understanding of many issues through a novel approach to understanding organizations. Williamson (1975, 1985) provided an explicit statement that the emergence of organizations is due to the failure of a free market system. Because of supply restriction and price discriminating behavior, there can be little confidence that the nursing home market will achieve a competitive market ideal. SNF integration can be considered the result of failure of the nursing home market.

In addition to providing a basis for identifying the forces that shape organization structures, the application of transaction cost theory also explains the diversity of governance structures in response to changing economic conditions. The findings explain what governance structures hospitals choose when confronting different degrees of uncertainty, asset specificity, and transaction frequency. In other words, this study's application of the theory explains how the selection of hierarchy, hybrid, or market arrangement is contingent on the three dimensions of transactions.

Predictive adequacy. The predictive adequacy of a theoretical system is judged by its ability to make predictions within specific spaces and times. With respect to organizational-level topics of vertical integration, evidence in the literature from different fields such as marketing, manufacture, and transportation, is relevant to the propositions and hypotheses of transaction cost economics. Similarly, the results of this study support what is predicted by transaction cost economics theory at the time specified by the cross-sectional study design.

To summarize the answer to the third research question, TCE is appropriate for application to analyze health services organizations, for the following reasons: First, it is possible for this scientific theory to be refuted by empirical experience. Based on the falsifiability of variables, construct validity, logical adequacy, and empirical consistency, the value of TCE is confirmed. Second, TCE is appropriate in terms of its capacity for explanation and prediction. As Bierstedt (1959) pointed out, utility may be viewed as "the bridge that connects theory and research." The utility of TCE is demonstrated by its explanatory and predictive value in this study.

Limitations of the Study

This study is limited in several respects. The limitations due to limited data availability, measurement problems, and study design are addressed in this section.

The dependent variables were abstracted from the AHA Data File, which records the form a hospital uses to provide SNF services -- in-house, long-term contracting, or no arrangements. Long-term contracting, by the definition in the AHA Data File, includes

two arrangements -- formal contracting and joint venture. These two arrangements differ in several ways. Formal contracting is a contractual relationship, whereas joint venture refers to co-ownership. Compared to formal contracting, a joint venture is associated with higher risks, since the involved parties are more closely affiliated. Such distinct natures are not differentiated in the AHA Data File. If they were, more variation might have been detected in the hybrid group.

A hospital's affiliation with managed care organizations was chosen to represent the transaction frequency construct, but it turned out to be a statistically insignificant variable in the testing of Hypothesis 7 across all models. Such insignificance may reveal either 1) that transaction frequency is less important than the other two factors in predicting the make-or-buy decision; or 2) that this indicator is not a good measure of transaction volume. As a remedy, other variables may be used, for example, the proportion of discharged hospital patients by destination (available in the MEDPAR Dataset) and by payment status.

The goodness-of-fit of the models tested was not satisfactory. This may be due to the inclusion of continuous variables in the models, which may generate excessive covariate patterns. Moreover, if continuous variables are used, the more cases that are included in the models, the higher the chi-square obtained. The chi-square value dropped sharply when 5% or 10% of random samples were extracted for analysis (not reported). Nevertheless, this limitation could be removed by recoding the continuous variables into dummy variables.

This study adopts cross-sectional analysis, which can establish association but not causality. In other words, this study cannot infer the cause-effect relationship, in which the emergence of a new governance structure is **caused** by the economic factors.

The two-way contrasts serve to address the hypotheses across all models, but do not address the full-scale test of the models' adequacy to predict the range and ordinality of hospital response. Additional analyses using multi-nominal logit regressions are needed.

Chapter 7

Implications and Conclusions

This chapter first presents several important implications of the findings from this study that are useful for hospital administrators, policy makers, and researchers in the areas of health services organizations and long term care. Suggestions for future research are presented. The chapter concludes with a statement of the significance of this study.

Implications of the Study

The results have implications from different perspectives -- theoretical, methodological, managerial, and health policy.

Theoretical Implications

The transaction cost perspective has not been much subjected to empirical testing in health care organizations. This study, an extension of an earlier study by Chiu and associates (1993), is the first empirical study of downstream integration in the health care field. Using transaction cost economics theory, this application explains well how the selection of hierarchy, hybrid, or market arrangement is contingent on the three dimensions of transactions. Thus, the applicability of transaction cost economics in **health services organizations** is supported.

The major assumption of transaction cost economics is that the emergence of an organization is due to market failure that is caused by environmental and human factors. The findings of this study imply that hospitals' vertical integration of skilled nursing facilities may be considered to be the result of the failure of nursing home markets. In this study, the environmental factors are represented by demand and supply factors instead of by uncertainty and small-number as Williamson (1975, 1985) proposes. From the perspective of economics, the dynamics of demand and supply can well represent market uncertainty.

As the environment becomes more uncertain, the probability of opportunism increases. As Williamson argues (1975), vertical integration is preferred to long-term contracting or the spot market mode in circumstances where small numbers and opportunism conditions are joined. That argument is supported in this study by testing a cross-term of SNF beds to elderly population ratio and the percentage of persons-below-the-poverty-level. In other words, the framework of market failure proposed by Williamson (1975) is empirically demonstrated in this study.

The second dimension of transactions, asset specificity, has been operationalized in many ways. This study measures asset specificity in terms of hospitals' expertise or experience in providing geriatric services. The result is consistent with Williamson's (1985, 1991) emphasis on the importance of asset specificity in make-or-buy decisions. The third dimension, transaction frequency, is proven in this study to be the least significant factor in determining vertical integration, as Williamson argues.

Interestingly, among the three modes of SNF integration, the hybrid group is found to the smallest. This finding supports Williamson's argument that the contract arrangement is more difficult to monitor and control. For hospitals, the transaction costs of employing the hybrid form may be higher than those for market or vertical integration arrangements. Nursing homes, on the other hand, once they sign long-term contracts with hospitals, may lose the opportunity for profit maximization.

Methodological Implications

This empirical study, which applies transaction cost economics to the health care industry, is aimed at disclosing the reasons why certain institutional forms are selected by organizations. Several methodological implications should be noted. First, the results indicate that the semi-microanalytic level is appropriate for transaction cost analysis. Williamson (1975, 1985) suggests that research at this level is best served by using organizational and economic factors rather than accounting data. The well-established and confirmed models of this study imply that empirical studies of transaction cost economics are best conducted at a semi-microanalytic level of analysis.

The necessity of controlling variables that covary with the dependent variables is another methodological implication. The variance in the dependent variables due to control variables should be teased out, to reveal the pure influence that the focal independent variables have on a hospital's form of SNF integration. In the pilot study by Chiu, Hurley, and Chen (1993), fewer control variables were used, and the hypotheses

received less support. Hypotheses in the present study are more strongly supported after controlling for CON and swing bed status.

A persistent concern is the question of whether a sample is representative of its population. Hypotheses were comparatively less supported when 5% and 10% of the population were tested (not reported in this study). The difference also appears when the current study is compared with the pilot study. More hypotheses are supported in the present study, which uses the entire population (all hospitals in the U.S.), than are supported in the pilot study, which uses a sample (hospitals in the Mid-Atlantic region). This comparison makes a strong case that researchers should study the entire population whenever possible.

The last methodological implication concerns testing interaction effects. Williamson argues that the three dimensions simultaneously affect make-or-buy decisions, but this argument has not previously been empirically verified. In this study, the significance of second-order interaction effects has proven Williamson's argument.

Managerial Implications

In addition to theoretical and methodological implications, the findings capture several managerial implications for hospital administrators. More and more hospitals are expanding their service forward or backward into a diversity of services. As Robinson (1994) describes the trend, hospitals are becoming health care centers without boundaries. This study suggests that hospitals choose the most appropriate boundaries according to economic conditions. A hospital administrator has to be sensitive to the existence of

uncertainty in order to choose the most efficient boundary. Transaction specificity and frequency also should be taken into account in deciding on a governance structure. The study findings indicate that hospitals with more experience in geriatric care are more likely to use SNF integration if the nursing home market is relatively competitive. When a hospital considers integrating into long-term care services, the administrator has to assess organizational strengths in providing geriatric care and the proportion of patients needing long-term care, in order to arrive at scale economies.

If a hospital selects a "wrong" mode of governance structure, it probably incurs higher transaction costs and production costs. If the "right " mode is selected, on the other hand, a hospital can minimize transaction costs and possibly production costs as well. If a hospital plans to provide a new service through either forward or backward integration, for example, by establishing an outreach cancer center or a satellite clinic, the hospital should fully assess the three dimensions of transactions as the first step.

It is noteworthy that the mode of vertical integration should be selective. A higher degree of integration is not always the best choice for a hospital. As Coase (1937) first posited, the type of organizational arrangement used to govern any particular exchange depends on the cost effectiveness of the arrangement compared with that of any alternative arrangement.

Health Policy Implications

Calls for the development of "seamless" or "boundaryless" health care delivery systems have been increasingly voiced as a goal of health care reform in the United States

(Conrad & Jeppson, 1993; Gauthier, Rogal, Barrand, & Cohen, 1992; Hurley, 1993; Johnsson, 1992). This preference for seamless delivery implies that inattention to reducing the friction associated with imperfect linkages along the care continuum has impeded the efficiency of health care delivery. According to this study, in 1990 almost 50% of all hospitals in the United States employed hierarchy or hybrid arrangements in providing skilled nursing care, and the other 50% chose spot markets. Since the findings show that the selection of governance mode for hospitals is determined by the three dimensions of transactions, all hospitals can be considered to be selecting the most cost efficient arrangements. In these terms, a seamless health care delivery system does not always guarantee reduced costs.

This study has implications for CON policy. The results indicate that the probability of SNF integration is constrained by the stringency of CON. Hospitals located in a state with more stringent CON criteria are less likely to undertake SNF integration. In this regard, the CON regulations introduce barriers to a seamless health care delivery system.

Suggestions for Future Research

Based on this empirical study, several suggestions for future studies are provided. The first suggestion concerns efficiency measurement, which is the important construct of transaction cost economics suggested by Williamson. The next section on measurement issues suggests to include new variables or alternative variables of transaction frequency. Finally, a lagged panel design is recommended.

Efficiency Measurement

The goal of a governance structure is to achieve efficiency, i.e., to reduce transaction costs (Williamson, 1985). Although the concept of efficiency is critical to the transaction cost theory, the relevant literature does not elaborate on it. It has been maintained that transaction cost considerations are essential in defining the efficient boundaries. Organizations are assumed to choose governance structures through which efficiency goals may be realized. If this argument is sustained, hospitals that choose either hierarchy, hybrid, or market arrangement should be considered as equally efficient. In other words, the hospitals in each group should be considered to have selected the most efficient governance. However, there is no information to confirm whether the three groups are in fact equally efficient. Further research should derive valid indicators to compare the efficiency of hospitals with different modes of SNF integration. Data Envelopment Analysis (DEA) may serve as a good evaluative tool for this purpose.

Measurement Issues

Transaction cost theory has been criticized for neglecting the social aspects of economic transactions (Granovetter, 1985). Transaction cost theory concerns itself solely with efficiency, neglecting other important factors that may contribute to organizations' decisions. For example, a community hospital's board composition may affect decisions about vertical integration. The following variables also may be considered for future research. First, patient characteristics may be good indicators of transaction frequency. For example, if hospitals care for more patients with functional disabilities, the hospitals

are probably more prone to undertake SNF integration. Therefore the proportion of functionally disabled patients may be used as a frequency indicator. By the same token, a hospital with a higher proportion of patients diagnosed in the top ten Drags requires more transfers for subacute care. Second, even though Williamson asserts that accounting data are unlikely to suit the needs of transaction cost studies, consideration can be given to including financial data (e.g., production costs). The HCFA Discharge Data is a source of hospitals' financial performance.

Study Design

Using a cross-sectional design, a study can show only an association, not causality, between economic factors and a hospital's decision about SNF integration. It would enhance the understanding of patient transactions if causality could be disclosed. Causality can be established better if the dependent variable is measured at a later time than are the independent variables. This can be achieved by adopting a lagged panel design.

Conclusions

According to the findings, this study has successfully explained, by using Williamson's transaction cost economics, why and how hospitals vertically integrate skilled nursing care facilities. Nationwide, over one third of hospitals expand their boundaries by providing skilled nursing care; over half of hospitals still rely on the spot market when discharging patients to nursing care; and fewer than 10% of hospitals choose hybrid arrangements. The selection of SNF integration mode is found to be

contingent on three dimensions of transaction, as claimed by Williamson. In the presence of perceived uncertainty in the nursing home market, of specific investment in SNF services, and of the expected volume of transactions, hospitals have to decide among levels of vertical integration to minimize transaction costs as well as production costs in providing skilled nursing services. As assessed by Bacharach's (1989) criteria, transaction cost economics can be applied to the health care sector to explain and predict hospitals' make-or-buy decisions. This study has made a unique contribution to validating the applicability of transaction cost economics to the health care field. The results of this study not only enrich the body of theoretical knowledge, but also shed light on practical management and policy making.

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Appendix A

Literature: Pair Comparison of Governance Forms

Authors	Type of Industry	Governance Forms	Uncertainty	Asset specificity	Frequency/ Scale economies
Monteverde & Teece (1982)	Ford and GM, transactions across different firms (backward)	Hierarchy vs. Hybrid	NA	- engineer efforts + - specific/generic +	- firm size +
Anderson & Schmittlein (1984)	Electronic products (forward)	Hierarchy vs. Hybrid	NA	- the evaluation of sale performance +	- firm size +
Masten (1984)	Aerospace industry a single firm (backward)	Hierarchy vs. Hybrid	- complexity +	- design spec. - site spec. +	NA
Walker & Weber (1984)	Automobile industry, a single firm (backward)	Hierarchy vs. Hybrid	- volume uncertainty +	- changes in specifications - technological improvements	- production costs savings +
Palay (1981)	Railroad industry shipper and its carried cars (backward)	Hierarchy vs. Hybrid	NA	- design and handling +	NA

Note. + = significant in positively direction; NA = not applicable

Appendix B

Literature: Three Types of Governance Forms

Authors	Type of Industry	Governance Forms	Uncertainty	Asset Specificity	Frequency/ Scale Economies
Rangan et al. (1993)	Survey of 5 industries (forward)	Hierarchy vs. Hybrid vs. Market	- demand uncertainty +	- sales expertise +	NA
Klein et al. (1990)	Survey of 6 industries (forward)	Hierarchy vs. Hybrid vs. Market	- diversity - volatility (Hybrid +)	- human spec. + - physical spec. (durable products)	- volume +
Walker & Poppo (1991)	the assembly division of a firm (backward)	Hierarchy vs. Hybrid vs. Market	- supplier market competition (Hybrid +)	- equipment + - labor uniqueness + -investment in technology	NA
Joskow (1985)	Electric firm and coal mining (backward)	Hierarchy vs. Hybrid vs. Market	NA	- site/location +	NA

Note. +: significant in positively direction; NA: not applicable

Vita