2009

A Longitudinal Examination of How Hospital Provision of Home Health Services Changed after the Implementation of the Balanced Budget Act of 1997: Does Ownership Matter?

Tiang-Hong Chou
Virginia Commonwealth University

A Longitudinal Examination of How Hospital Provision of Home Health Services Changed after the Implementation of the Balanced Budget Act of 1997: Does Ownership Matter?

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

By

Tiang-Hong Chou
B.E., Tamkang University, 1987
M.S., Michigan State University, 1993
M.H.S.A., University of Michigan, 2006

Dissertation Director: Kenneth R. White, Ph.D., FACHE
Professor
Department of Health Administration

Virginia Commonwealth University
Richmond, Virginia
December 2009

ACKNOWLEDGEMENTS

I want to thank many people who helped me throughout the doctoral study period. First, I would like to express my deepest appreciation to the members of my dissertation committee. Without their guidance and instructions, I would not have accomplished this journey. I am so thankful to Dr. Kenneth White, chair of my dissertation committee, for his continuing encouragement and support of my work since I entered the PhD program. Working with him has been an invaluable learning experience for me, not only on how to be a capable researcher, but also how to be a good scholar and a person with a warm heart. I would like to thank Dr. Michael McCue for the academic guidance and assistantship he provided for the entire study course. I have also benefited greatly from the fundamental research concepts he taught me. I would like to extend my gratitude to Dr. Dolores Clement, who helped me draft the study proposal. Without her advice and encouragement, I might not have taken the bold step to complete this study. My sincere appreciation also goes to Dr. Leslie Stratton for her excellent suggestions to the study analysis and a detailed review of the draft. The pilot study conducted in her class inspired me to undertake this study.

I would also like to acknowledge a number of faculty and staff for their great help with my study here at Virginia Commonwealth University. I really appreciate Drs. Stephen Mick, Roice Luke, Jan Clement, Gloria Bazzoli, David Harless, Yasar Ozcan,

Kelly Devers, Carolyn Funk, Patricia Carcaise-Edinboro, and Tanvi Gautam. It is their excellence in teaching that guided the foundation for scholarly inquiry into the field of health care organization and policy research. My appreciation is extended to Beverly DeShazo for her administrative assistance throughout the whole study period as well as suggestions regarding the dissertation formatting. Many thanks go to Dr. Henry Carretta, Rochelle Clarke, Anna Lin, and Carroll George for their technical and administrative support.

I have been so blessed to share my most memorable study life with the fellow doctoral students, especially Matt Krauchunas, Anna Lin, Esther Hsieh, Reethi Iyengar, Jennifer Neimeyer, Nailya DeLellis, Mark Swofford, and Albert Liu. Their assistance without reservation enhances the core value of the doctoral program. My appreciation also goes to those friends who brightened my life in Richmond, particularly the family-like members in Ginter Park Presbyterian Church, Ken Chen's family, the Fu family, the Armbruster family, the Lai family, Hsing-Jung Chen, and Dr. Hsueh-Fen Chen.

Special thanks are given to the Mennonite Christian Hospital, which supported my study for the past two and half years. I owe a debt of gratitude to Dr. Peter Huang and my colleagues at the hospital, who not only took care of my responsibilities when I was abroad, but also were always there to encourage and pray for me.

The greatest appreciation is extended to my wife, Sophia, for her endless love and care for me and our family. I would never have accomplished the dream of doctoral studies without her sacrifice and support. Finally, I would also like to thank all family members in Taiwan for their unconditional and everlasting love and support.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

AHA ……American Hospital Association

ARF…… Area Resource File

BBA……...Balanced Budget Act of 1997

BBRA ……Balanced Budget Refinement Act of 1999

CMI …….Case Mix Index

CMS ……..Centers for Medicare and Medicaid Services

CON……Certificate of Need

COTH……Council of Teaching Hospitals

CPI…….Consumer Price Index

DRG……..Diagnosis Related Group

EOL……End-of-Life

FIPS…….Federal Information Processing Standard

FP……...For-Profit

FTE……..Full-Time Equivalent

HCRIS…….Healthcare Cost Report Information System

HCO……..Health Care Organization

HMO……Health Maintenance Organization

HRSA……..Health Resources and Services Administration

HH……Home Health

HHA……Home Health Agency

HOS……..Hospice

IPS……..Interim Payment System

LPN……...Licensed Practical Nurse

LTC……Long-Term Care

MedPAC…….Medicare Payment Advisory Commission

MSA……Metropolitan Statistical Area

NAHCH……...National Association of Home Care and Hospice

NCSL……..National Conference of State Legislatures

NFP……Not-For-Profit

NH……..Nursing Home

PAC……Post-Acute Care

PET……Population Ecology Theory

PPO……Preferred Provider Organization

PPS……..Prospective Payment System

RDT……...Resource Dependence Theory

RN……..Registered Nurse

SAC……Subacute Care

SCHIP……..State Children Health Insurance Program

SNF……Skilled Nursing Facility

TCE……..Transaction Cost Economics

ABSTRACT

A LONGITUDINAL EXAMINATION OF HOW HOSPITAL PROVISION OF HOME HEALTH SERVICES CHANGED AFTER THE IMPLEMENTATION OF THE BALANCED BUDGET ACT OF 1997: DOES OWNERSHIP MATTER?

By Tiang-Hong Chou, Ph.D.

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

Virginia Commonwealth University, 2009

Dissertation Director: Kenneth R. White, Ph.D., FACHE.
Professor, Department of Health Administration

By using a natural experiment approach and longitudinal national hospital data, this study sheds light on the objective functions of hospitals with different ownership forms by comparing their relative reductions in HH provision after the implementation of the BBA. The empirical findings reveal that for-profit hospitals behave differently as compared to public and private nonprofit hospitals, due to their different operational objectives. While the response of for-profit hospitals is consistent with the profit-maximizer model, both public and private nonprofit ownership types behave consistently in accordance with the model of two-good producers whose objective is to maximize market outputs for meeting the health care needs of the community, given the

break-even requirement. This finding provides support for the tax exemption the United States government has granted private nonprofit hospitals.

Although the response patterns of the nonprofit ownership types are in general similar, this study found that, contrary to expectation, religious hospitals were more likely than secular nonprofit hospitals to have reduced HH provision after the BBA. Further studies are needed to explore the difference in operational behaviors between these two ownership types.

Built on previous related studies and applying a more comprehensive set of independent and control variables with improved data sources, this study is able to examine the effects of certain organizational and market factors on hospital offering of HH care pre-BBA and the change in the provision of HH care in the six years following the implementation of the BBA. Hospital proportion of Medicare patients, hospital size, total profit margin, case mix index, elderly density in the market are found to be positive determinants of a hospital's likelihood of offering HH care. However, these organizational and market factors, in general, play a non-significant role in influencing hospitals' changes in HH care provision after the implementation of the BBA. In the study, explanations and implications of these finding are discussed. Finally, potential limitations to this study and opportunities for future research are addressed.

CHAPTER 1: INTRODUCTION

The Study Problem

The primary goal of this study is to shed light on how the objective functions of hospitals with different ownership types differ by comparing their responses to changes in payment policies following enactment of the Balanced Budget Act of 1997. This Act created a natural experiment by imposing differential financial incentives on hospitals with different ownership types. Of particular interest is the change in hospital provision of one particular post-acute care service: home health care.

During the period 1980 to 1997, the number of hospital-based post-acute care (PAC) services in the United States increased dramatically. Two major reasons for the increase were: (1) to meet the needs of the growing elderly population, and (2) to respond to the 1983 implementation of prospective reimbursement in the form of Diagnosis Related Groups (DRGs) in the hospital sector for patients covered by Medicare. DRGs created major pressure on hospitals to shorten hospital stays and contain costs (Morrisey, Sloan, and Valvona, 1988; Shortell, Gillies, and Devers, 1995; Kane, Kane, and Ladd, 1998:35).

Hospital provision of PAC services—such as home health (HH) or nursing home (NH) care—is viewed by many researchers and managers as an effective integration strategy for hospitals (Hughes and Renehan, 2005; Robinson, 1994; Dansky, Milliron, and Gamm, 1996). By integrating with PAC facilities and providing PAC services on its

own a hospital would not only ensure the smooth transfer of patients to PAC facilities and reduce lengths of stay and related costs (Chiu, 1995), but it would also bring in revenues from sources other than acute care. This strategy was especially successful as PAC services were not included in the prospective payment either by public payers (Medicare and Medicaid) or private payers (private LTC insurance companies or out-of-pocket payers). Consequently, the percentage of hospitals having a NH unit rose from 9 percent in 1972 to 21 percent in 1990 (Robinson, 1996). The number of total Medicare-certified HH agencies (HHAs) increased from 2,924 to 10,444 between 1980 and 1997 (NAHCH, 2008). The ratio of the number of Medicare-certified hospital-based HHAs to the number of total Medicare-certified HHAs grew from 12.3 percent in 1980 to 30.1 percent in 2000 (NAHCH, 2008).

However, this hospital diversification/integration strategy was seriously challenged by the enactment of the Balanced Budget Act of 1997 (BBA). This Act resulted in a reduction in Medicare payments for hospital-based PAC services, particularly HH care.

Most researchers and managers agree that the BBA dramatically changed the environment in which HHAs operate (Horwitz, 2005a; Fennell and Campbell, 2007). While profitable or potentially profitable prior to passage of the BBA, most HH services have become unprofitable since the implementation of the BBA. Studies have reported that many hospitals started dropping HHAs after the BBA (Paone and Mullen, 2005, Horwitz, 2005a). The number of hospital-based Medicare-certified HHAs declined from 2,698 to 2,151 between 1997 and 2000, and by 2007, there was a further decline to 1,503 (NAHCH, 2008).

The changes instituted by the BBA provide an opportunity for researchers to examine hospital-based HH services by ownership type under different reimbursement conditions. The aim of this study is to examine whether the implementation of the BBA resulted in changes in the provision of HH services among hospitals of different ownership types.

Background

Home Health Care

Although HH care has only accounted for less than 3 percent of total personal health care expenditures in the U.S. (Poisal et al., 2007), HH care serves the greatest number of people among the continuum of LTC services. In 2000, U.S. HH programs discharged about 7.2 million people. The number of patients receiving HH care at a given point of time is estimated to be 1.4 million (Feldman, Nadash, and Gursen, 2005).

The U.S. HH care industry grew rapidly in the past decades largely due to the growing number of the elderly, public funding and policy, popular demand, and technological advances that promote complicated care at home (Hughes and Renehan, 2005). Both the absolute capacity and relative importance of HH grew significantly. Between 1970 and 1997, HH expenditures increased from $0.2 billion to $34.5 billion, and the share of total health expenditures accounted for by HH rose from 0.3 percent to 3.2 percent (Levit, Smith, Cowan, Lazenby, and Martin, 2002). According to the National Association of Home Care and Hospice (NAHCH), the number of Medicare certified HHAs increased from 1,753 in 1967 to a peak of 10,444 in 1997, dropped to 6,861 in 2001, and gradually rose again to 9,284 in 2007 (NAHCH, 2008).

The vast majority of HH consumers are people age 65 or over, accounting for approximately 86 percent of total HH care recipients (NAHCH, 2008). As the population continues to age, the need for HH care is projected to grow (Hughes and Renehan, 2005). In addition, some scholars have suggested that HH care is preferred over institutional care because home care is not only less costly but also more comfortable and accommodating, and more able to foster the greatest possible independence from the perspective of the care recipients (Bodenheimer and Grumbach, 2009).

Hospital Provision of Home Health Services

Social expectations have been rising that U.S. hospitals and healthcare systems would become more integrated, seamless, patient-centered, efficient, and cost-effective organizations (Shortell et al., 1995; Institute of Medicine, 2001, Evashwick, 2005; Griffith and White, 2007). Although general short-term community hospitals serve people of all ages and with all types of diagnoses and conditions, a significant fraction of patients they treat are older adults and people with chronic conditions. People age 65 or over account for about 12 percent of the U.S. population, but they represent about 46 percent of inpatient admissions. It is common that elderly patients often need PAC following their discharges from the hospital (Paone and Mullen, 2005).

As mentioned earlier, hospital provision of HH services has been viewed by many researchers and managers as an effective integration or diversification strategy for hospitals to adapt for survival under prospective payment reimbursement based on DRGs. For hospitals, to own or provide in-house HH services afforded control over the process for discharging patients to PAC, thus reducing the uncertainty of managing patients'

length of stay. The number of hospital-based Medicare-certified HHAs increased dramatically from 359 in 1980 to 2,698 in 1997. During the same period, the ratio of the number of hospital-based Medicare-certified HHAs to the number of total Medicare-certified HHAs grew from 12.3 percent to 25.8 percent (NAHCH, 2008).

The Balanced Budget Act of 1997

The Balanced Budget Act (BBA) of 1997 was enacted to control the growth of Medicare spending and to offer Medicare beneficiaries additional choice for care through private health plans (MedPAC, 2000). The BBA affected Medicare reimbursement payments for hospital inpatient and outpatient services as well as PAC services such as HH and NH care. For hospital inpatient services, the Act froze base payment in fiscal year 1998 and reduced updates in subsequent years. The BBA also enacted a new policy intended to limit early transfer of patients from hospitals inpatient to PAC settings. The BBA lowered the adjustment for indirect medical education to teaching hospitals, reduced the adjustment received by hospitals that treat a disproportional share of low-income patients, and lowered capital payment rates for hospitals (MedPAC, 2000).

With respect to hospital outpatient services, the BBA created a new prospective payment system (PPS) that pays predetermined amounts for services that are similar clinically and in their use of resources (Centers for Medicare and Medicaid Services, 2009c). The hospital outpatient PPS went into effect on August 1, 2000.

The Act transformed Medicare PAC reimbursement payment from a retrospective cost-based system to a system of fixed daily rates (Feldman, Nadash, and Gursen, 2002). The new policy mandated that NHs receive a case-mix-adjusted, all-inclusive per diem

rate for each Medicare resident starting on July 1 of 1998. A classification system was designed to assign each Medicare resident into one of the 44 different resource utilization groups (RUGs) on which NHs are reimbursed. The per diem rates cover all services including medications, laboratory tests, supplies, and rehabilitation therapies (Angelelli, Gifford, Intrator, Gozalo, Laliberte, and Mor, 2002). In other words, while DRGs are used for the reimbursement of hospital inpatient care, RUGs are used to pay for care provided by NHs for Medicare beneficiaries. Therefore, RUGs have had a financial impact on NHs similar to the effect DRGs have had on hospitals since the mid-1980s. In addition, prior to the BBA, hospital-based NHs received higher payment rates from Medicare than did their freestanding counterparts. The differential payment scheme was gradually eliminated in a three-year period (Angelelli et al., 2002). That is, for hospitals providing NH care, NH PPS (RUGs) was phased in beginning July 1, 1998, and became fully implemented in July 1, 2001.

Similarly, the BBA significantly changed Medicare payment to HH programs. The BBA also mandated that a PPS should be developed for the reimbursement of HH services rendered to Medicare beneficiaries. However, while the new system was being developed, an Interim Payment System (IPS) was put in place to control the growing expenses of HH care. The IPS was phased in beginning October 1997 for Medicare HH reimbursement with the start of each agency's cost reporting period. The system became fully implemented one year later. Under the IPS, HHA reimbursement was constrained by both an aggregate per-visit cost limitation and by aggregate per-beneficiary cost limits (McCall, Petersons, Moore, and Korb, 2003).

The HH PPS was not established until the fourth quarter of 2000. Effective October 1, 2000, the HH PPS replaced the IPS for all HH agencies. While the IPS did not take into account the clinical condition of a beneficiary, the new HH PPS adjusted for health conditions and care needs of the beneficiary. Similar to the mechanism used in the NH and hospital inpatient/outpatient PPSs, the HH PPS also adjusted for geographic differences in wages for HHAs across the country. The adjustment for clinical characteristics and service needs of the beneficiary is referred to as case-mix adjustment. The HH PPS provides HHAs with payments for each 60-day episode of care for each beneficiary. If a beneficiary is still eligible for care after the end of the first episode, a second episode can begin; there are no limits to the number of episodes a beneficiary who remains eligible for the HH benefit can receive. In addition to the case-mix adjustment, a special outlier provision exists to ensure appropriate payment for beneficiaries who have the most expensive care needs (Centers for Medicare and Medicaid Services, 2009b). These adjustments, which were not present in the IPS, were made to ensure that all beneficiaries, even the sickest, have access to HH services for which they are eligible. In short, HH reimbursement is a little more generous under HH PPS than under the IPS.

Because of the issues that were illuminated by the excessive payment reductions resulting from the BBA, the Medicare, Medicaid, and SCHIP Balanced Budget Refinement Act (BBRA) of 1999 was passed by Congress to lessen the financial impacts brought about by the BBA on healthcare providers including hospitals, NHs, and HHAs. In general, BBRA softened payment reductions, extended periods for implementing payment-cutting policies, or placed a moratorium on service caps with the intention that

these cost control policies would not cause harm to beneficiaries' access to high-quality health care. It was estimated that the amount of payment increase resulting from the BBRA totaled $6.8 billion, $2.7 billion, and $1.3 billion for the hospital, NH, and HH sectors, respectively (U.S. Department of Health and Human Services, 1999).

The timeline of the implementation of the related HH payment policies mandated by the BBA discussed above is shown in Figure 1. In this study, years 1997 through 2003 are selected to form the study period since the reimbursement policies of interest occurred and took effect during this period. At the end of 2003, the Medicare Modernization Act of 2003 was enacted that created a policy environment different from the study period for operations of hospitals and HHAs. Thus, the years between 1997 and 2003 are used for the comparison of hospital provision of HH services.

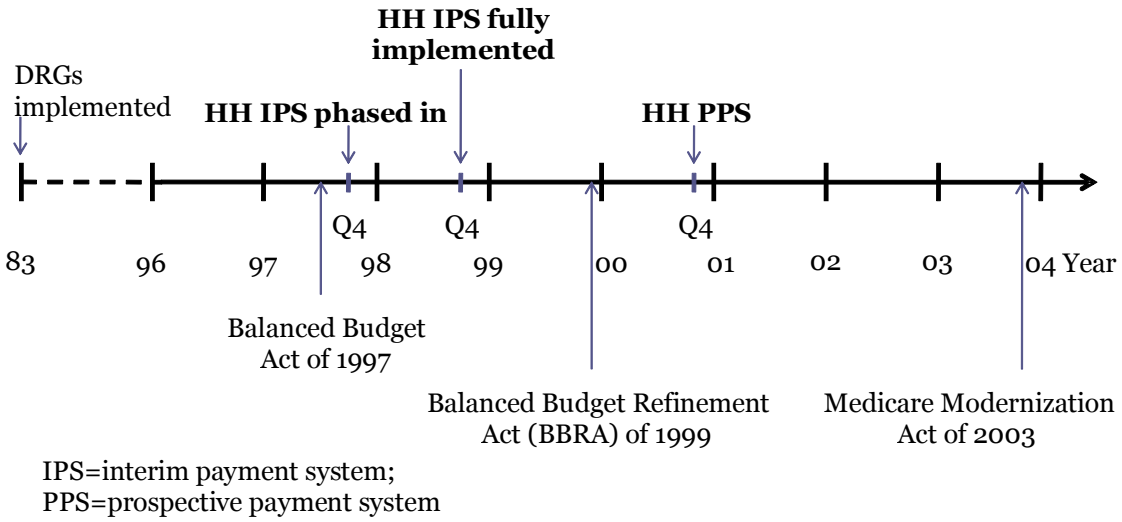

Figure 1. The Timeline of the Implementation of the BBA Policies Related to Home Health

HH Agencies in the Post-BBA Era

Medicare has been the major payer for HH services, accounting about 30 percent of total HH revenues, followed by Medicaid which contributed about 20 percent of total HH revenues in 2000 (Hughes and Renehan, 2005). Thus, the expectation of HHAs for continued and increasing Medicare reimbursement was seriously eroded by the BBA that transformed a cost-based, fee-for-service payment system to the restricted schemes for Medicare HH payment. After the implementation of the BBA, HHAs had to bear the financial risk of taking care of Medicare patients with certain probabilities that the care provided to a Medicare patient would cost more than the reimbursement rates for that patient. HHA statistics show that roughly one-third of all Medicare-certified HHAs closed in the three years following the implementation of the BBA. The number of all Medicare-certified HHAs declined from 10,444 in 1997 to 7,152 in 2003, a reduction of 31.5 percent (NAHCH, 2008).

Issues Raised by the BBA Concerning Hospital Provision of Post-Acute Care

As described earlier, the strategy used by hospitals to diversify into or integrate with PAC services was seriously challenged by the enactment of the BBA. After the BBA, a decline of hospital-based HHAs was reported. The reduction in the number of hospital-based HH programs raises critical questions concerning the continuum and access of care and the availability of PAC beds after acute-care hospitalization (MedPAC, 2000; Angelelli et al., 2002; McCall, Petersons, Moores, and Korb, 2003; Bodenheimer and Grumbach, 2009). The growing demand for HH, coupled with fewer hospital-sponsored HHAs, raises the potential issue of access of hospital patients to

needed HH services. Therefore, it is important to examine which organizational and market factors would be related to hospitals' decisions to reduce their LTC provision in facing tightened reimbursements.

If hospitals of different ownership forms react to the changing reimbursement environment differently based on their mission and goals and this translates into their respective objective functions, this raises the question, "Does ownership matter as hospitals reevaluate their HH programs post-BBA?" If yes, "which ownership types are more or less likely to stop provision of HH services following implementation of BBA?"

In addition, decisions on service provision are important strategic issues for health care organizations (Porter and Teisberg, 2006). Health care organizations (HCOs) should consider multiple factors in deciding to provide or drop a particular service. A comprehensive examination of the provision and change of HH services by hospitals needs to take these factors into account.

Purpose of Study and Research Questions

The specific aim of this study is to shed light on the objective function of hospitals by examining how they change their provision of HH services in response to a change in financial incentives, and to explore the relevant factors that influence hospital provision of HH services. Specifically, this study is intended to answer the following two questions:

1) What were the relative changes in hospital provision of HH care among public, religious nonprofit, secular nonprofit, and for-profit hospitals after the implementation of the BBA?

2) What are the organizational and market factors that are associated with hospital provision of HH care before and after the BBA?

In this study, public hospitals refer to those hospitals owned and operated by government including state, county, and city governments. For-profit hospitals are private, investor-owned hospitals controlled on a for-profit and tax-eligible basis by an individual, partnership, or a profit-making corporation. Nonprofit hospitals are defined as nongovernment hospitals controlled by tax-exempt organizations, including religious organizations, community hospitals, cooperative hospitals, hospitals operated by fraternal societies, and so on (American Hospital Association, 2009a).

One unique aspect of this study is the further division of nonprofit hospitals into religious and secular hospitals which, in theory, may have different motivations and operation behaviors. Religious hospitals, such as Catholic hospitals, play an important role in the U.S. health care system for the capacity and volume of care they provide as well as the type of populations they serve. For instance, religious hospitals account for approximately 14 percent of total hospital beds in the U.S. (calculated from the 2007 American Hospital Association survey file). Religious hospitals are also expected to offer more services to vulnerable populations such as the poor and the uninsured in their communities due to their charitable purposes. Given the uniqueness of religious hospitals and the limited literature exploring the potential differences between religious hospitals and other ownership types, it is worth separating religious from secular nonprofit hospitals in health service research.

Significance of the Current Study

Ownership type may influence the objective function of the institution and hence its response to change in the health care market. The implementation of the BBA provides an opportunity for researchers to examine how for-profit, religious nonprofit, secular nonprofit, and public hospitals operating hospital-based HHAs responded to a new national policy. Differential responses might suggest different underlying motives, objectives, or operating utility models for hospitals with different ownership structures.

As discussed above, the BBA changed the financial condition in which HH services operate. While HH services were generally profitable prior to the BBA, they became relatively unprofitable after the BBA. Therefore, the relative change of hospital provision of HH services among hospitals with different ownership structures would help identify the role financial incentives play in the decision to offer such services.

The answers to these questions have several important implications. First, the general public should be interested in knowing whether health care providers such as hospitals of all kinds are indeed operating on a for-profit basis. This issue is particularly relevant in a time of health care reform. For example, when commenting on the 2009 U.S. health reform proposed by President Obama and Congress, Dr. Marcia Angell argues that "We are the only advanced country in the world that has chosen to leave health care to the tender mercies of a panoply of for-profit businesses, whose purpose is to maximize income and not to provide health. And that's exactly what they do" (Public Broadcasting Service, 2009). This study should be able to shed light on this comment by revealing the objectives of U.S. hospitals.

From the perspective of policymakers, it is important to know whether there were undesirable changes in the capacity of hospital-based HHAs after the implementation of the BBA. A significant reduction in the number of hospital-based HHAs can lead to a serious problem of PAC accessibility for needed patients. Policy makers may also be interested in knowing how other factors influence provision of HH services and how these other factors may interact with the BBA in determining hospital provision of HH services. As the population ages, the importance of HH services will continue to rise. Thus, the change in the capacity of HH services resulting from a particular policy like the BBA should be a major interest to policy makers. In addition, this study provides an examination of the issue of interest for an extended period of time. Most of the previous studies on the change in services brought about by the BBA focused on the period from1997 to 2000. Very few published studies have explored the issue beyond 2000. A study considering a longer period of time gives policy makers more information regarding the profound and dynamic impact of the BBA.

For hospital managers, this study offers empirical evidence showing how hospitals in their ownership sector responded to the BBA in provision of HH care compared to other ownership types. It also analyzes hospital decisions about HH services post-BBA, as well as identifies other key factors associated with those decisions.

In addition, this study is a first attempt to adopt a multi-theoretical framework for exploring how hospital provision of HH services changed post-BBA. As will be discussed later, this study integrates theoretical perspectives from economics, resource dependence theory, transaction cost economics, institutional theory, and population

ecology. Hence, a multi-theoretical model for identifying the potential behavioral difference among hospitals with various ownerships including the religious and secular nonprofits was developed and tested. The conceptual model contributes to the possibility of revealing a comprehensive set of strategic considerations and market factors influencing hospitals' decisions to provide HH services before and after the implementation of the BBA.

Overview of Conceptual Framework

Based on the assumption that hospitals should consider multiple factors in addition to financial incentives in deciding whether or not to offer or discontinue certain services, and in responding to changes in the environment, this study adopts a conceptual framework based on a number of major constructs drawn from economic models and several organization theories. Specifically, economic models of nonprofit organizations proposed by Weisbrod (1988) as well as resource dependence, institutional, population ecology perspectives and transaction cost economics are applied to form the conceptual framework and to guide the development of study hypotheses.

Weisbrod's models focus on the underlining objectives and resulting behaviors of nonprofit organizations. He suggests that nonprofit organizations may be "for-profits in disguise" whose objectives and behaviors are not different from their for-profit counterparts. Weisbrod also posits that a nonprofit institution can be a "two-good producer" which offers mission and revenue goods at the same time. The last model Weisbrod proposes is "inefficient profit maximizers" in which nonprofits have the same objectives while they differ in behaviors from for-profit organizations. These models

provide a relevant framework for studying the objective function of hospitals with different ownership forms. This study argues that the two-good model, inefficient profit maximizer model, and a mission-good-only model fit religious, secular, and public hospitals, respectively. These models thus are used to predict the behaviors of hospitals of certain ownership types in changing HH care provision after the BBA.

Hospitals' changes in HH provision in response to the implementation of the BBA can be viewed as a typical example of organizations' reactions to changes in the environment. Resource dependence, institutional and population ecology theories and transaction cost economics are organization theories commonly applied to the examination and prediction of the interaction between the organization and its environment. Each theory provides a unique set of constructs referring to specific hospital considerations closely associated with hospitals' likelihood of changing HH provision in response to the major reimbursement reduction for HH services brought about by the BBA. These considerations can be understood as filters that carry over or filter out the need for or desire of hospitals to change HH provision post-BBA. The objectives of hospitals predicted by the ownership models can be viewed as a prism that differentiates the responses of hospitals with different ownership forms to the implementation of the BBA. A simplified conceptual model based on the discussion is shown in Figure 2.

Scope and Approach

In this study, the population includes all U.S. non-federal, acute-care general hospitals that operate in the 50 states and District of Columbia. The sample used for analysis is

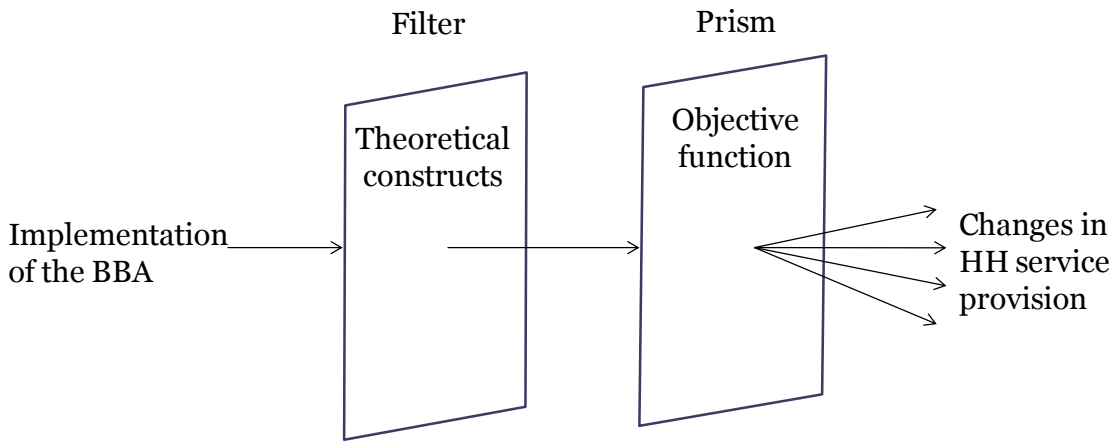

Figure 2. A Conceptual Model of Hospitals' Changes in HH Provision Post-BBA

composed of hospitals reporting to the American Hospital Association (AHA) Annual Surveys of hospitals between 1997 and 2003. The unit of analysis is an individual hospital in a particular year in the study period.

This analysis applies a study design comparable to a natural experiment where the implementation of the BBA serves as an intervention, and public hospitals serve as the control group, and other ownership types of hospitals are study groups. With this design, the changes in HH provision among the ownership types are compared. The econometric approach applied for data analysis is difference-in-difference estimation with a data form of independently pooled cross-sections. This analytical approach has been used by researchers to conduct policy evaluations.

The study data are formed by merging relevant datasets with needed information in the years of study. The datasets employed include AHA annual survey files, Centers for Medicare and Medicaid Services (CMS) hospital cost report files, CMS case-mix index files, and Area Resource Files (ARF). These datasets are created and maintained by

public or professional institutions to facilitate health services research and have been widely used. However, data management and cleaning efforts are needed before the merged data can be analyzed because there are missing values as well as outliers in the original datasets.

This study reports descriptive statistics and correlations of major study variables. Bivariate and multivariate analyses of the relationships of interest are presented. The predicted probability of offering HH services for hospitals with four different hospital ownership types is then plotted overtime. Finally, results of hypothesis testing and implications of the findings are discussed.

Conclusion and Outline of Remaining Chapters

This chapter introduces the study conducted in this dissertation. The background of hospital provision of HH care, the nature of the BBA, and the possible impact of the BBA on the provision of HH are described. Research aims and questions are proposed in exploring the objective functions of hospitals with different ownership types and the factors associated with their changes in HH provision post-BBA. Also, the rationale and importance of conducting this study are explained. Finally, the theoretical framework, focus and methods adopted are briefly summarized.

Chapter 2 will provide an overview of the literature on how objective functions of organizations can be measured. The literature on relationships between hospital ownership and service provision, hospital changes in PAC service provision (in particular, HH care) after the BBA, and determinants of hospital provision of PAC services are also reviewed in the second chapter. In Chapter 3, the description of the multi-theoretical

framework is presented, as well as a brief description of each theoretical perspective. Hypotheses are proposed based on theoretical constructs and existing empirical evidence. In Chapter 4, the research design, description and sources of data are presented. This chapter provides variables and measurements used in the study, as well as the econometric analysis plan. Results in narrative and tabular form are presented in Chapter 5. The last chapter provides the conclusion of hypothesis testing and policy implications of this study. Finally, potential limitations and future suggestions are discussed.

CHAPTER 2: LITERATURE REVIEW

This chapter reviews previous empirical studies aimed to explore objective functions of hospitals and the relationship between the implementation of the BBA and hospital provision of HH care. The first section discusses the measures used by previous studies to study the objective function of the healthcare organization (HCO). Discovering objective functions of hospitals is the primary interest of this study. Thus, the selection and application of a valid measure that can reflect the objectives of hospitals are critical to this study. The second section briefly summarizes the findings concerning the effect of hospital ownership on service provision. This dissertation hypothesizes that hospitals of different ownership types have different objectives, as reflected by providing different types of services. The third section synthesizes the existing evidence showing the change in utilization, outcomes, and hospital provision of certain PAC services after the implementation of the BBA. The fourth section specifically discusses some primary findings concerning the initial changes in utilization and hospital provision of HH care post-BBA. The last section reviews the factors found by researchers to be associated with hospital provision of PAC services. Some of these factors provide insights in formulating some of the study measures and can be reevaluated by the results of this study. The empirical findings reviewed in this chapter provide an important foundation on which this study can be built and extended.

Measurement of the Objective Function of Health Care Organizations (HCOs)

In this study, a HCO's objective function is defined as the organization's goal in terms of profit orientations. The objective function of a for-profit HCO is to maximize its profit. On the other hand, a nonprofit HCO's objective function should reflect its considerations other than profit. However, this statement of objective function about nonprofits is often arguable. Health economists have proposed many different models to explain the behaviors and underlying objectives of nonprofit HCOs (Newhouse, 1970; Pauly and Redisch, 1973; Hansmann, 1980; Weisbrod, 1988).

The continuation of the argument about the objective function of nonprofit HCOs among different theoretical models may be in part because HCOs' objectives in general cannot be directly observed. Thus, researchers have applied a number of approaches to measure HCOs' observable behaviors that may reflect their objective functions. For example, Lindrooth and Weisbrod (2007) use the patient average length of stay (LOS) as an indicator of the extent to which a hospice is intended to maximize profit under a Medicare flat fixed payment scheme. The Medicare hospice reimbursement method creates an incentive encouraging maximization of patient LOS. Thus, hospices operating on a for-profit basis should have a strong incentive to selectively admit patients with longer expected LOS, and admit patients sooner after a hospital discharge. The study found that for-profit hospices are significantly more likely than religious nonprofit hospices to admit patients with longer, more profitable, expected LOS. In terms of the timing of admission, no significant difference between the two ownership types was found.

An HCO's objective function may be viewed as a parallel to the utility function of an individual. In this regard, the approach used by Lindrooth and Weisbrod (2007) is similar to that applied by Meyer, Viscusi, and Durbin (1995) who used the length of time (in weeks) that an injured worker receives workers' compensation to study the response of workers to the change in financial incentives brought about by new worker compensation laws. Meyer and colleagues (1995) studied the change of injured workers' compensation and injury duration after the implementation of new workers' compensation policies in the states of Michigan and Kentucky. The policies increased maximum weekly benefits of workers' compensation, creating an incentive for high-earning individuals to lengthen their injury duration and benefit amount. After controlled for worker age, marital status, gender, industry, and severity of the injury, results show that the increase in injury duration is greater for high-earning workers than for low-earning workers by 16.2 percent and 20.3 percent in Kentucky and Michigan, respectively. The difference in compensation duration increase in Kentucky is significant at the 0.05 level.

In a recent stream of studies, Weisbrod and colleagues applied managerial rewards or compensation structures in revealing the objective functions of hospitals of different ownership types (Roomkin and Weisbrod, 1999; Ballou and Weisbrod, 2003; Erus and Weisbrod, 2003). For example, Ballou and Weisbrod (2003) employed the data collected in 1992 to compare the compensation schemes of CEOs among governmental, religious nonprofit, secular nonprofit, and for-profit hospitals. They found not only significant differences in these aspects between for-profit hospitals and other nonprofit hospitals

(including governmental hospitals), but also clear contrasts among religious, secular, and governmental nonprofit ownership forms.

Compared to for-profit hospitals, nonprofit and public hospitals as a whole paid significantly more base salary (except for public hospitals that paid insignificantly fewer base salary) and less bonus, had lower ratio of bonus to base salary, lower probability of offering bonus incentives and rewarding financial performance, and higher probability of rewarding quality of care for their CEO compensation. Compared to secular nonprofits, religious nonprofits paid significantly more base salary, had lower probability of offering bonus incentives but higher probability of rewarding care quality. Religious hospitals paid significantly more salary, and had higher probability of offering bonus incentives as well as rewarding care quality, as compared with their governmental counterparts. Finally, compared to public hospitals, secular nonprofit hospitals paid significantly more base salary and bonus, had higher bonus to base salary ratio, and higher probability of offering bonus incentives. The authors concluded that there are indeed differences in objective functions and/or constraints among the institutional forms, reflecting by their contrasting CEO compensation schemes. The paper thus calls for a more general model that differentiates the objective functions of nonprofit hospitals in the three ownership forms.

Some researchers have also employed quality indicators of HCOs as a reflection of accomplishing objectives of organizations (Grabowski, 2001; Chou, 2002; Spector, Selden, and Cohen, 1998; Harrington, Zimmerman, Karon, Robinson, and Beutel, 2000). This approach is based on the assumption that health care providers such as hospitals or nursing homes are able to take advantage of asymmetric information by only meeting the

minimum requirement of quality of care in order to minimize operating costs and maximize profits. Therefore, a HCO with a nonprofit objective may differentiate itself from other profit-maximizing counterparts by providing higher quality of care to the patients/clients it serves. For example, Chou (2002) applied the data from 1984, 1989, and 1994 National Long-Term Care Survey to investigate the hypothesized difference in care quality between for-profit and nonprofit nursing homes. Results of the analysis show that the difference became clear when the situation of asymmetric information is present. For those cases without a spouse and child visit within 1 month after admission, nonprofit NHs had significantly fewer cases in death, dehydration, and urinary tract infection, as compared with for-profit homes. In addition, for the residents who are cognitively unaware, nonprofit NHs had significantly fewer cases in dehydration and urinary tract infection. Interestingly, these two ownership forms did not differ significantly in these quality indicators when there were not the asymmetric situations specified above, except that nonprofit status is associated with fewer deaths for cognitively unaware and aware residents alike.

In addition, Hansmann, Kessler, and McClellan (2002) examined whether the rates of exit from the hospital industry differed across the various forms of hospital ownership in response to the decrease in demand for acute care. They found that over the 1985-1994 period, for-profit urban hospitals are the most responsive to reduction in demand through exiting from the industry, followed by their non-federal public and religious nonprofit counterparts, while secular nonprofits are significantly the least responsive of the four ownership types.

Finally, researchers commonly view the provision of certain types of services as a commitment to particular populations (LeBlanc and Hurley, 1995; White, Begun, and Tian, 2006), strategic goals (Porter and Teisberg, 2006), and operational objectives (Horwitz, 2005a; Clement, White, and Valdmanis, 2002) of HCOs. Horwitz and Nichols (2007: 1) support this approach by arguing that "investigating service offerings is particularly useful because, in a highly regulated industry in which managers are constrained in their attempts to maximize profits (e.g., it is difficult and sometimes illegal to turn away low-paying patients), managers have some freedom to open or close a service as a way to increase profits."

The application of the change in provision of services as an indicator of hospitals' objective functions should be advantageous to other approaches presented above for several reasons. First, LOS and quality of care are sometimes beyond the control of hospitals. These indicators may reflect patient conditions more than hospitals' objectives. Second, HCOs' managerial compensation schemes, particularly the compensation for nonprofit hospital CEOs, have been closely scrutinized by governmental agencies and the society in recent years. Therefore, managerial compensation may no longer be a valid measure of the objective function of nonprofit hospitals. Finally, hospital rates of exit from the industry in response to the decline of acute care demand may depend directly on performance rather than operating objectives. Also, hospital closure is a much serious and complicated corporate decision than the adjustment of a service mix. The former is faced with more constraints and usually takes much longer to decide. Thus hospital

closure may not be an indicator of hospitals' objectives as sensitive as the change in service provision.

Following the argument discussed above, this analysis employs the change in the provision of HH services to measure hospitals' objectives. Specifically, the probability of dropping HH services provision is compared across different ownership forms of hospitals before and after the implementation of the BBA. Since different ownership types within the nonprofit sector are seldom compared, this study extends the knowledge gained from the existing studies by examining the change in provision of HH care among hospitals with different incentives, including public, religious, non-religious (secular) nonprofit, and for-profit hospitals post-BBA.

Hospital Ownership and Service Provision

Ownership Effects on Types of Service Provision

Researchers have found empirical evidence that ownership type affects hospital provision of certain services (White and Begun, 1998/99; Horwitz, 2005a). In a study exploring urban hospital adoption of AIDS/HIV-related services, LeBlanc and Hurley (1995) found a strong ownership effect. Public urban hospitals were 3 times, 4.1 times, and 5.7 times more likely to fully invest in HIV/AIDS-related services than private not-for-profit, for-profit, and church-owned urban hospitals, respectively.

Additionally, White and Begun(1998/99); White, Cochran, and Patel (2002); and White, Begun, and Tian (2006) found that, after controlling for relevant market, organizational, and demand factors, Catholic hospitals were more likely than for-profit hospitals to offer services that represent a commitment to social justice (e.g., indigent

care), compassionate care (e.g., patient support groups, social workers, nursing homes, and pastoral care), end-of-life care (e.g., hospice, pain management, and palliative care), or societally stigmatized services (e.g., HIV/AIDS) for vulnerable populations. Also, Catholic hospitals were more likely to provide end-of-life and compassionate care services than other not-for-profit hospitals, and more likely than public hospitals to provide end-of-life and stigmatized services.

Horwitz (2005a) compared hospital provision of profitable and unprofitable services among different ownership types from 1988 to 2000. During the study period, after controlling for other factors, public urban acute-care hospitals were consistently and significantly more likely than their for-profit counterparts to provide psychiatric emergency services which are widely recognized as an unprofitable service. On the other hand, for-profit urban acute-care hospitals were consistently and significantly more likely than their public counterparts to provide open-heart surgery which has been classified as a highly profitable service. Nonprofit urban acute-care hospitals consistently fell between their public and for-profit counterparts in the probability of providing the two mentioned services across the period of study.

Ownership Effects on Hospital Response to Payment Policy Change

At least two studies have shown that hospitals with different ownership forms respond differently to health care payment policy change in providing uncompensated care. Davidoff, LoSasso, Bazzoli, and Zuckerman (2000) found that Medicaid and Medicare payment generosity increased uncompensated care provision in nonprofit and public hospitals. Expanded Medicaid eligibility reduced provision of uncompensated care

by public and for-profit hospitals, but did not affect the provision of uncompensated care by nonprofit hospitals. Medicaid HMO penetration was found to be associated with a decrease in uncompensated care provision by nonprofit hospitals, but not with public or for-profit hospitals. Additionally, Bazzoli, Lindrooth, Kang, and Hasnain-Wynia (2006) found that the decline in Medicaid payments that resulted from the BBA reduced uncompensated care provision in safety-net hospitals which were largely comprised of public and religious hospitals.

The BBA and PAC

Implementation of the BBA and Change in Hospital Provision of PAC

A number of studies have explored the change in hospital provision of PAC such as HH and NH care after the implementation of the BBA. The Medicare Payment Advisory Commission (MedPAC) (2002) reported to Congress that 20 percent of hospital-based NHs exited the market by 2000, due to the implementation of the BBA. Similarly, a decline in the number of hospital-based HHAs after the BBA was also reported. Between 1997 and 2000, the number of hospital-based Medicare-certified HHAs decreased from 2,698 to 2,151 (a 20 percent decrease) (NAHCH, 2008).

One study done by Angelelli, Fennell, Hyatt, and McKenney (2003) researched rural hospital provision of and change in provision of PAC after the BBA between 1997 and 2000. The results of this study suggest that the percentage of rural hospitals having a hospital-based or freestanding NH generally remained the same. The percentage providing HH care declined slightly from 67 percent to 61 percent. From 1997 to 2000, rural hospitals in general became more aggressive in ensuring the continuum of health

care (from acute care to PAC). In general, hospitals in rural areas are faced with more difficulties in transferring discharged patients because there are relatively fewer PAC resources nearby (Angelelli et al., 2003). The aged population may also be more prevalent in rural areas. This phenomenon points out that regional characteristics, such as the percentage of elderly in the population and the location (rural/urban) of hospitals could be important factors that influence hospitals' decisions/strategies concerning the provision of PAC services.

Impacts of the BBA on PAC Utilization and Outcomes

McCall, Korb, Petersons, and Moore (2003) employed Medicare beneficiary data in the first six months of fiscal year (FY) 1997 and the first six months of FY 1999 to study the change in the use of post-hospital care services after the BBA. Specifically, the study includes Medicare data in five DRGs, including stroke (DRG 014), Chronic obstructive pulmonary disease (DRG 088), heart failure (DRG 127), hip fracture (DRG 210), and Diabetes (DRG 294). The study also examined whether the number of adverse outcomes had risen, as measured by hospital readmissions, emergency room visits, and death. Their findings suggest that utilization of rehabilitation and LTC hospitals increased after the BBA, while expenditures of post-hospital care for the beneficiaries in the five DRGs dropped an average of $454 per discharge. In addition, only five quality categories with significantly worse adverse outcome out of possible 90 indicators were observed. Another study done by Kilgore, Grabowski, Morrisey, Ritchie, Yun, and Locher (2009) showed similar results, which found that Medicare hospice utilization rates and costs

increased post-BBA. Also, there was no discernable difference in mortality rate in Medicare cancer patients before and after the BBA.

The BBA and Home Health Care Utilization and Provision

Impacts of the BBA on Home Health Industry

A number of empirical studies have been conducted to investigate the initial impact of the BBA on HH utilization. By using a 1 percent sample of Medicare fee-for-service beneficiaries, McCall, Komisar, and Petersons, and Moore (2001) compared HH utilization and expenditures among three time periods: (1) FY 1997 (October 1996-September 1997), the 12 months prior to the beginning of the IPS; (2) FY 1998, the 12 months during the IPS was phased in; and (3) FY1999, the 12 months after the IPS was fully implemented. Results show that use of Medicare HH services dropped dramatically post-BBA. From FY 1997 to FY 1999, total Medicare reimbursements for HH visits decreased by more than 50 percent. Also, payments per enrollee declined by half over this period. HH payments per user were found to decline by 37 percent annually. HH users per 1,000 beneficiaries and the number of visits per user dropped 21 percent and 41 percent, respectively.

McCall and colleagues continued to conduct a multivariate analysis applying regression techniques to examine the same issue (McCall, Petersons, Moore, and Korb, 2003). By controlling for relevant factors such as beneficiary demographic characteristics, prior medical care utilization, community characteristics, supply of HH resources, substitutes for HH care, and state historical Medicare/Medicaid health care and HH use, the authors analyzed the incidence of HH use in the Medicare beneficiaries and the

utilization of HH among the Medicare HH users. Results show a 22 percent decline in the incidence of using HH services post-BBA. Stronger reductions were found in the incidence of use for beneficiaries age 85 and older, those in states with high historical Medicare HH use, and those with dual (Medicare and Medicaid) eligibility. The study also showed a 39 percent drop in the number of visits per user. More intensive reductions in the number of services were found in high historical Medicare use states as well as for those age 85 and older, nonwhites, females, those using for-profit agencies, and those treated for certain diagnoses including diabetes, skin ulcers, heart failure, and cerebrovascular diseases. Less intensive reductions were associated with hospital-based agencies.

Likewise, Kilgore and colleagues (2009) found that HH utilization rates and costs among Medicare cancer patients dropped substantially after the BBA, partly because the BBA shifted some of the cancer patients to hospice. However, significant reduction in total Medicare costs after the BBA was also noted.

Implementation of the BBA and Change in Home Health Care Provision among Hospitals of Different Ownership Types

Horwitz (2005a) has done research intended to reveal the objectives of hospitals with public, nonprofit, and for-profit ownerships. More specifically, the study tested whether hospital ownership types specialize in services based on profitability. The study based largely on the data of non-federal, urban, acute-care, general hospitals in the AHA files from 1988 to 2000. In the study, the author examined 34 services which were categorized into three groups based on general probability: (1) profitable services, (2)

unprofitable services, and (3) services with variable profits during the study period. The classifications of the service profitability were a result of efforts including reviews of peer-reviewed medical and social science literature, MedPAC and Prospective payment Assessment Commission reports to Congress, trade publications, business magazines, and newspaper reports. The author also conducted interviews with hospital administrators and doctors to get the qualitative evaluation of relative service profitability. The various sources yielded relatively similar results (Horwitz, 2005b). Of particular interest here is the result regarding the change in hospital provision of HH between the pre- and post-BBA eras. The result shows that, for all the three hospital types, the probability of offering HH services increased when the service was profitable (1988-1997) and started to decrease when the services became unprofitable (1998-2000). However, growth of HH care when it was profitable and decline of HH care when it was unprofitable were particularly dramatic among for-profits. Controlling for hospital and market characteristics, the probability of a for-profit hospital's providing HH services tripled from 17.5 percent to 60.9 percent between 1988 and 1997. During the same period, the probability increased slightly from 40.9 percent to 51.7 percent for nonprofit and from 38.1 percent to 51.9 percent for public hospitals. From 1997 to 2000, as HH care became relatively unprofitable due to the implementation of the BBA, the probability of offering HH care fell a striking 37.5 percent among for-profit, but only 7.7 percent among non-profit and 1.5 percent among public hospitals.

Horwitz and Nichols (2007) continued this stream of study by applying more sophisticated approaches to explore a related but different question: Are service provision

by hospitals of different ownership types influenced by market ownership mix? Longitudinal data from 1988 to 2005 were employed by the authors with the aim to empirically examine the conflicting theoretical perspectives about the behavior of nonprofit hospitals. Also, the authors used a number approaches to define hospital markets, including Metropolitan Statistical Area (MSA) and geographic radius. Results show that nonprofit hospitals were systematically less likely to offer unprofitable services in markets with high for-profit dominance than in other markets. The evidence is particularly clear on HH provision. When HH services were most profitable, from 1993 through 1997, nonprofit hospitals were more likely to offer them in high than in low for-profit penetration markets. However, when HH services turned less profitable, nonprofit hospitals reduced their likelihood of offering HH more dramatically in high than in low for-profit penetration markets.

This dissertation is directly related to the two studies previously mentioned, particularly the Horwitz (2005a) study. This study can be viewed as a replication and extension of the mentioned study specific to HH provision by hospitals with different ownership forms. First, this study examines the issue beyond 2000 through 2003 which is not covered in the Horwitz study. Second, this study further classifies private nonprofit hospitals into religious and secular groups which have theoretically and empirically demonstrated to be different in objectives and behaviors (Ballou and Weisbrod, 2005; Hansmann, Kessler, and McClellan, 2002). Third, the Horwitz (2005a) study may suffer from several issues. As the author indicated, missing values and observations from non-responses in the AHA are a major concern. Although the issue resulting from

missing values had been considered and addressed through reasonable efforts, sample selection biases could occur given the fact that a significant portion of hospitals did not report service provision in the AHA survey. This study addresses the issue by employing a more valid data source, as will be described in Chapter 4. Also, there may be issues of omitted variables in the Horwitz study, as mentioned by the author. The study only controlled for hospital size, teaching status, geographic location, gender, race, household income, and age of the residents in the market. There should be other institution-specific factors such as patient case-mix, professional and financial capabilities that determine the provision of HH care. In addition, other relevant market factors such as the HH resource in the local market should also be taken into account. This study thus strengthens the finding by including more relevant organizational and market factors proposed by a number of organization theories which will be discussed in the next chapter.

Other Determinants of Hospital Provision of PAC

In addition to the research mentioned earlier in this chapter, several studies have been conducted to examine factors associated with hospital provision of or diversification to PAC (Wheeler, Burkhardt, Alexander, and Magnus, 1999), nursing home services (Chiu, 1995; Lucente, 2006), and home health services (Xu, 2000).

Subacute Care

The study conducted by Wheeler and colleagues (1999) applied cross-sectional, time series data from 1985 through 1991 and a Heckman two stage model to examine the factors associated with hospital provision of subacute care (SAC) as well as the size of the care measured by the number of total subacute beds in the hospital. Results show that

the number of subacute care beds in private, acute-care general community hospitals was significantly and positively associated with nonprofit status, system affiliation, hospital size, nursing staff to bed ratio, total expenses to bed ratio, competition, per-capita income in the county, growth in hospital size, and having swing beds. Also, in the face of higher financial risks, for-profit hospitals tended to have more SAC beds compared to nonprofit hospitals.

The authors found that the size of hospital SAC was significantly and negatively associated with financial risk, the number of physicians to beds ratio, occupancy rate, being in a rural area, and outpatient revenue proportion. Additionally, in the situation of higher cash flow, for-profit hospitals tended to have fewer subacute care beds relative to their nonprofit counterparts. Finally, Wheeler and colleagues did not find a significant association between the size of SAC and cash flow as well as proportion of population age 65 or over in the county.

Nursing Home Services

Chiu (1995) and Xu (2000) applied conceptual models drawn from transaction cost economics and the same analytical models to examine the linkage between hospitals and nursing home and home health services, respectively. Applying the same conceptual and analytical models, Lucente (2006) also investigated whether the considerations of providing NH care differed before and after the implementation of the BBA.

Using a sample composed of all non-federal, acute-care general hospitals in the 1990 AHA survey file, Chiu (1995) found that hospitals located in areas with high hospital occupancy or had a higher proportion of total discharges contributed by

Medicare patients were more likely to have a hospital-based NH. However, larger hospitals were slightly but significantly less likely to provide its own NH care, compared to smaller hospitals. Other factors included in his analytical model are not significant determinants of hospital provision of NH care. These factors include NH beds to elderly population ratio, the number of geriatric services, availability of HH care and swing beds, affiliation with HMO/PPO, state CON stringency, system membership, rural locality, ownership, the interaction terms between Medicare discharges and hospital size, and between poor people proportion and the number of beds to elderly population ratio.

Lucente (2006) examined determinants of hospital integration of NH care before (FY 1994/1995) and after the BBA (FY 2000/2001). Basically the author found similar determinants in these two time periods. Significant and positive predictors of hospital integration of NH care in both periods include the ratio of SNF beds to elderly population, hospital occupancy rate, geriatric service provision, a rural location, Medicare discharge proportion, hospital case mix index, and hospital size. On the other hand, significant and negative predictors in both periods contain average length of stay in the market, nursing staff to beds ratio, state CON, and teaching status. However, the provision of NH care was significantly and negatively associated with the proportion of elderly in poverty and system membership only in the post-BBA period. The most dramatic change is observed: while for-profit hospitals were more likely than nonprofits to integrate with NHs before the BBA, they became less likely than their nonprofit counterparts to provide in house NH care after the BBA.

Home Health Care

Finally, Xu (2000) employed the non-federal, acute-care general hospitals included in the AHA survey files of 1993, 1996, and 1997 to explore the determinants of hospital arrangement of offering HH care. The results from a model contrasting a hierarchy (providing hospital-based HH care) with a market (depending on external freestanding HHAs) arrangement suggest that hospital size, Medicare discharge proportion, provision of geriatric services, provision of rehabilitation services, provision of NH care, rural locality, system member, being in west states, and nonprofit ownership (vs. public ownership) are significantly and positively associated with hospital provision of HH care. On the other hand, teaching status and for-profit ownership (vs. public) are significantly and negatively associated with hospital adoption of an in-house HHA. Non-significant determinants include HMO/PPO contract, HMO penetration, hospital occupancy rate, for-profit HHA proportion in a county, SNF beds relative to elderly population, HH supply relative to elderly population, hospital's experience in offering social support services, and imbalanced demand over supply of HH services in the market.

The major empirical findings of the studies specific to hospital provision of PAC services discussed in this chapter are summarized in Table 1.

Table 1. Summary of Determinants of Hospital Provision of PAC Services

Construct	Determinant	Effect	Type of Service (Reference)
Hospital Ownership types			
Ownership	NFP (vs. FP)	Positive	HH (Xu, 2000)；HH:1988-94; 1998-2000 (Horwitz, 2005a); SAC (Wheeler et al, 1999); NH, post-BBA (Lucente, 2006)
		Negative	HH:1994-97 (Horwitz, 2005a) ; NH, pre-BBA (Lucente, 2006)
		Non-significant	NH (Chiu, 1995)
	Public (vs. FP)	Positive	HH (Xu, 2000); HH:1988-94; 1998-2000 (Horwitz, 2005a)
		Negative	HH:1988-94; 1998-2000 (Horwitz, 2005a)
		Non-significant	NH (Chiu, 1995)
	NFP (vs. public)	Positive	HH (Xu, 2000); HH:1988-1997 (Horwitz, 2005a)
		Negative	HH:1998-2000 (Horwitz, 2005a)
	Catholic	Positive	EOL: compared to public, FP, and other NFP (White et al., 2002)
Interaction of ownership and financial factors/market			
BBA	NFP x BBA (vs. public)	Negative	NH, HH (Horwitz, 2005a)
	FP x BBA (vs. public)	Negative	NH, HH (Horwitz, 2005a)
For-profit market	NFP*high FP market (vs. low FP market)	Positive	NH, HH: 1993-1997 (Horwitz & Nichols, 2007)
		Negative	NH, HH: 1997-2000; HOS (Horwitz & Nichols, 2007)
	FP x high FP market (vs. low FP market)	Positive	NH, HH: 1993-1997 (Horwitz & Nichols, 2007)
		Negative	NH, HH: 1997-2000 (Horwitz & Nichols, 2007)
Cash flow	FP x Cash flow	Negative	SAC (Wheeler et al, 1999)
Financial risk	FP x Financial risk	Positive	SAC (Wheeler et al, 1999)
Other hospital characteristics			
Resource munificence; transaction frequency	Size	Positive	HH (Xu, 2000); SAC (Wheeler et al, 1999); EOL (White et al., 2002) ; NH (Lucente, 2006)
		Negative	NH (Chiu, 1995)
Access to financial capital	System affiliation	Positive	SAC (Wheeler et al, 1999); HH (Xu, 2000)
		Negative	NH, post-BBA (Lucente, 2006)

Table 1 (continued)

Construct	Determinant	Effect	Type of Service (Reference)
		Non-significant	NH (Chiu, 1995); NH, pre-BBA (Lucente, 2006)
Financial performance	Cash flow	Non-significant	SAC (Wheeler et al, 1999)
	Financial risk	Negative	SAC (Wheeler et al, 1999)
	FP x Cash flow	Negative	SAC (Wheeler et al, 1999)
	FP x risk	Positive	SAC (Wheeler et al, 1999)
Access to other resource	#Physician/#bed	Negative	SAC (Wheeler et al, 1999)
	#RN+LPN/#beds	Positive	SAC (Wheeler et al, 1999)
		Negative	NH (Lucente, 2006)
	Expenses/#beds	Positive	SAC (Wheeler et al, 1999)
Transaction uncertainty	Occupancy rate	Positive	NH (Lucente, 2006)
		Negative	SAC (Wheeler et al, 1999)
		Non-significant	HH (Xu, 2000)
Asset/transaction specificity	#Type of geriatric services	Positive	HH (Xu, 2000); NH (Lucente, 2006)
		Non-significant	NH (Chiu, 1995)
	# Type of rehabilitation services	Positive	HH (Xu, 2000)
	# Type of social/support services	Non-significant	HH (Xu, 2000)
	Provision of NH	Positive	HH (Xu, 2000)
	Provision of HH	Non-significant	NH (Chiu, 1995)
Transaction frequency	% Medicare discharge/patient days	Positive	HH (Xu, 2000); NH (Chiu, 1995); NH (Lucente, 2006)
	% Medicare discharge x hospital size	Non-significant	NH (Chiu, 1995)
	HMO/PPO contract	Non-significant	NH (Chiu, 1995); HH (Xu, 2000)
Market factors			
Market demand, transaction uncertainty	Rural area	Positive	HH (Xu, 2000); NH (Lucente, 2006)
		Negative	SAC (Wheeler et al, 1999)
		Non-significant	NH (Chiu, 1995)
	Competition	Positive	SAC (Wheeler et al, 1999)
	Per capita income	Positive	SAC (Wheeler et al, 1999)
	%Elderly in poverty	Negative	NH, post-BBA (Lucente, 2006)
		Non-significant	NH, pre-BBA (Lucente, 2006)
	Elderly %	Non-significant	SAC (Wheeler et al, 1999); HH (Xu, 2000)

Table 1 (continued)

Construct	Determinant	Effect	Type of Service (Reference)
	Imbalanced demand over supply of HH services	Non-significant	HH (Xu, 2000)
Transaction frequency	HMO penetration	Non-significant	HH (Xu, 2000)
Transaction uncertainty	Area hospital occupancy rate	Positive	NH (Chiu, 1995)
	# NH beds/elderly population	Positive	NH (Lucente, 2006)
		Non-significant	NH (Chiu, 1995); HH (Xu, 2000)
	% poor person x (# NH beds/elderly population)	Non-significant	NH (Chiu, 1995)
	#RN/LPNs employed by HHAs/elderly population	Non-significant	HH (Xu, 2000)
	# For-profit HHAs/total HHAs in market	Non-significant	HH (Xu, 2000)
	Hospital average LOS	Negative	NH (Lucente, 2006)
Control variables	Teaching hospital	Positive	EOL (White et al., 2002)
		Negative	HH (Xu, 2000); NH (Lucente, 2006)
	Growth rate (in beds)	Positive	SAC (Wheeler et al, 1999)
	Availability of swing beds	Positive	SAC (Wheeler et al, 1999)
		Non-significant	NH (Chiu, 1995)
	Outpatient revenue/total revenue	Negative	SAC (Wheeler et al, 1999)
	State CON stringency	Negative	NH (Lucente, 2006)
		Non-significant	NH (Chiu, 1995)
	Located in west states	Positive	HH (Xu, 2000)

CHAPTER 3: THEORETICAL FRAMEWORK

Since the 1980s, health care environment has been in turmoil and full of rapid changes and uncertainties. In order to survive in the dynamic environment, HCOs such as hospitals must be able to respond to these changes appropriately. Various economic and organizational theories have provided useful tools in understanding the motivation for certain decisions HCOs make in response to the change in the environment.

This chapter proposes a conceptual model using multiple theories to study the change in HH care provision by hospitals with different ownership structures in response to the implementation of the BBA. The depiction of the conceptual model is followed in turn by a brief description of each theoretical perspective. Major constructs derived from each theory will then be discussed and applied to propose relationship between the constructs and the issue of interest and to develop the study hypotheses.

Integrated Theoretical Perspectives

Multiple theoretical perspectives are applied to examine hospital decisions regarding provision of HH services. Each theoretical viewpoint provides distinctive explanations to various motives of organizations to provide HH care or not. Multiple theoretical approaches have been commonly used in health services research (e.g., D'Aunno and Zuckerman, 1987; Westphal, Gulati, and Shortell, 1997; Zinn, Weech, and Brannon, 1998; Walston, Kimberly, and Burns, 2001; Roggenkamp, White, and Bazzoli,

2005). The rationale for combining multiple theoretical perspectives in studying the question is that, as many researchers have suggested, no single theoretical perspective currently existing can fully explain health care organizational responses to and their performances under certain environmental forces or contingencies (Stiles, Mick, and Wise, 2001; Luke and Walston, 2003). Hence, a multiple-theoretical approach may give researchers a more comprehensive picture of the issue of interest.

Various views in terms of using multiple theoretical approaches in health services studies are observed. Some researchers suggest an "either-or" proposition while others argue for an "X and Y" thinking (Shortell, 1997). The former proposition views different theoretical perspectives as competing arguments while the latter views them as complementary frameworks which are adopted in this study.

The Conceptual Model

Organizational scholars recognize that organizations have diverse goals. Organizational goals may serve cognitive, motivational, symbolic, or justification purposes (Scott and Davis, 2007). In some cases, these goals may be competing within an organization. For example, Daft (2001) distinguishes official goals (e.g., mission statements) from operative goals. Official goals provide legitimacy (symbolic functions). Operative goals provide decision guidelines and criteria of performance (cognitive functions), employee development (motivational functions) (Daft, 2001), and explain and defend organizational decisions and behaviors (justification functions) (Weick, 1969). Additionally, Shortell, Zukoski, Alexander, Bazzoli, Conrad, and Hasnain-Wynia (2002) suggested that most organizations have multiple motives for engaging in certain types of

activities. They point out that these motives may be of an instrumental nature, a legitimacy nature, and/or an altruistic nature.

There are numerous motives or goals associated with hospital provision of PAC services. Wheeler et al. (1999) suggested that the objective functions of hospitals in diversifying into sub-acute care include minimizing financial risk, maximizing financial returns or profits, and providing socially valuable services. Giardina, Fottler, Shewchuk, and Hill (1990) indicated that the benefits hospitals may gain from LTC diversification (their discussion was based on the pre-BBA context) include: (1) offsetting revenue loss from declining/more stringent acute care payments, (2) taking advantage of the profitability and growth of the LTC market, (3) meeting the incentive to discharge patients as quickly as possible, (4) increasing revenue from charges for ancillary services such as rehabilitation, (5) achieving economies of scale, (6) establishment of a referral network, and (7) improving their public image. Giardina and colleagues thus concluded that entering the LTC market would help hospitals meet both their financial goals and their stated missions such as meeting health care needs of their communities.

Following the arguments and approaches used in previous research, this study integrates a number of major concepts from health economics, resource dependence, transaction cost economics, institutional theories, and population ecology to explore the issue of interest and to develop hypotheses. This study basically assumes that hospitals' decisions regarding the provision of HH services are based on multiple organizational considerations and related market factors posited by these theories.

The conceptual model illustrated in Figure 3 basically suggests that hospitals' decision to offer HH services and their responses to policy changes regarding HH services (such as the BBA) are not determined by only one particular factor. Instead, hospitals' decisions in providing HH services are based on a number of concerns or contexts.

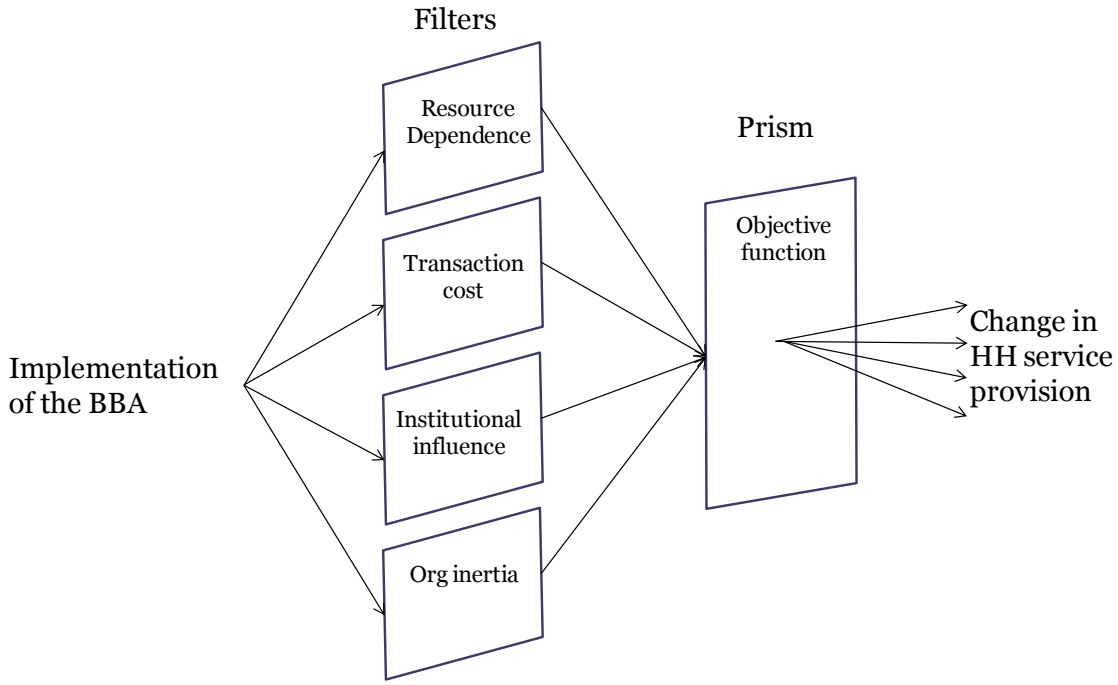

Figure 3. The Conceptual Model

This multi-theoretical model provides a comprehensive set of organizational considerations or contexts related to hospitals' decisions concerning whether they should change the provision of HH services in response to the payment reduction brought about by the BBA. Each organizational consideration or market context pointed out by the theoretical perspectives can be viewed as a filter or prism which differentiates, filters out,

or carry over certain considerations in hospitals' decision to offer HH care after the BBA, contributing to the different behaviors or decisions hospitals take or make concerning the provision of HH care post-BBA. Specifically, this study considers the objectives of hospitals with different ownership forms to be a prism that differentiates the responses of hospitals in the change in HH care provision to the implementation of the BBA. In addition, the constructs proposed by the organization theories act as filters that bring about or remove certain considerations for hospitals in response to the change in the reimbursement environment.

In the following sections, each of the theoretical concepts or arguments relevant to hospitals' decisions on the provision and change in provision of HH services is discussed. The major points of the discussion are summarized in Table 2. Hypotheses to be tested are proposed after each of the theoretical discussions.

Economic Perspectives

The basic assumptions of economic theories lie in scarcity of resources and rational decision making (Folland, Goodman, and Stano, 2004). Decision makers (i.e., consumers and producers) are rational in terms of "making choices that best further one's own ends given one's resource constraints" (Folland et al., 2004). This implies that a rational actor always behaves based on his/her self interest and calculation of consequences. In economic analysis, the goal of consumers is to maximize their own utility while the objective of producers/firms is profit maximization.

Table 2. Theoretical Premises and Implications for Hospital Decision Regarding the Provision of HH Services

Basis of Comparison	Economics	Resource Dependence	Transaction Cost	Institutional	Population Ecology
Basic premise	Organization decisions are established to maximizing self-interest/utility	Organization decisions are shaped by internal resource availability and external actors who control critical resources	Organization decisions are established to minimizing transaction cost	Organization decisions are shaped by institutional environments/ pressures	Organization structure and change are shaped by internal inertia and evolving environments
Organizational goal	Utility/profit maximization Efficiency	Maintaining autonomy Obtaining resource for survival	Minimizing transaction cost Efficiency	Pursuing legitimacy for survival	Adaptive survival
Role of managers in decision making	Organizations exercise active choice	Organizations exercise active choice	Organizations exercise active choice	Organizations do not exercise active choice	Organizations do not exercise active choice Individual adaptive ability is limited
Type of organizational change	Intentional	Intentional	Intentional	Unintentional Environmentally induced	Unintentional Environmentally induced
Environment	Pre-BBA: Inpatient payment was reduced by DRGs, hospitals need to create new sources of revenues in order to be profitable Post-BBA: HH payment was cut by BBA and become unprofitable	Medicare patients/ revenues are critical resources to hospitals DRGs created hospitals' need to connect acute care and HH care to ensure the care for Medicare patients, resulting in the increase in hospital dependence on PAC	As hospitals' need to transfer patients to limited number of HH settings increases, transfer uncertainty and complexity rises, bringing up overall transaction cost.	As population ages, provision of HH care is considered more necessary and legitimate As more hospitals offer/drop HH, isomorphic pressure increases.	DRGs/BBA required hospitals to bear financial risk of patient care, creating an environment that threatens the survival of hospital

Table 2 (continued)

Basis of Comparison	Economics	Resource Dependence	Transaction Cost	Institutional	Population Ecology
Hospital view HH provision as a mean for	Achieving mission Maximizing profit Optimizing efficiency	Maintaining autonomy/reducing dependence on other PAC facilities in discharging Medicare patients	Reducing transaction costs in discharging Medicare patients to HH facilities	Conforming to social pressure for offering HH and gaining legitimacy to operate	Adapting to the reduced payment environment
Rationale for offering HH care	HH services are profitable Generating additional revenues Meeting bottom line Fulfilling mission Enhancing competitive advantage	Controlling patient source and managing patient need Reducing dependence on other HH facilities Managing threats from government policy such as DRGs	Managing transaction uncertainty and complexity Reducing transaction costs Ensuring efficient operation	Meeting the requirement from authoritative organizations Meeting social expectation Conforming to other hospitals offering HH	Being pushed to offer HH otherwise will be selected out by the environment and policy Inertia to change (post-BBA)
Rationale for not offering HH care	HH services are unprofitable and financially risky Lack of slack resource	Lack of financial and personnel capabilities	Transferring patients to HH facilities in the market involves minimal transaction costs	Conforming to peer hospitals not offering HH	Inertia to change
Key predictor of HH care provision	Ownership form Competition Profitability of service Economies of scope	Resource dependence Resource uncertainty Resource availability Organization constraints	Transaction uncertainty, frequency, and complexity	Coercive pressure Normative pressure Mimetic pressure	Organizational inertia Environmental adaptation and selection

Therefore, from the perspective of economics, economic actors have free choices among goods or inputs in maximizing their utilities or profits but under certain constraints. The human nature of rationality and self interest and the market opportunities (i.e., choice of goods or inputs) and constraints (induced by income, prices, and market demands) contribute to the efficient allocation of limited resources in a society through perfect competition.

Among the market factors discussed above, economists view price as the most critical signal to economic behavior. The change of price is referred to an "invisible hand" in guiding all market and economic activities. A perfectly competitive market will reach its equilibrium in terms of demand and supply through the price dynamic (Folland et al., 2004). The use or allocation of resources is thought to be the most efficient at the point of equilibrium where the market supply meets the market demand.

According to economics, producers such as firms and hospitals will reduce the output of a good/service when the price of the good/service drops, holding other things equal. The producer will then redirect the resources or inputs saved from the production reduction of the good/service to the production of other goods deemed profitable. By doing this the producer expects to efficiently allocate his/her limited resources and attempts to make up the revenue reduction due to the decreased price and production of the original good, thus maintaining or increasing his/her profit.

These economic perspectives provide a sound explanation for the growth of hospital-based PAC services after the implementation of DRGs in 1983. For hospitals, the implementation of DRGs represented a dramatic change of economic environment

(healthcare market) where they operate. It signifies the reduction of reimbursement and prices for the acute care services hospitals provide. Thus hospitals started to limit their acute care services (e.g., reducing lengths of stay) while at the same time expand or diversify into other profitable services such as NH and HH services. On the other hand, as long as other important factors are not major concerns, one may expect that profit-maximizing hospitals would reduce their PAC provision after the payment reduction of PAC services resulting from the BBA.

Behaviors of Hospitals with Different Ownerships

From the perspective of economics, for-profit hospitals should behave exactly like profit-maximizing firms (Wheeler and Clement, 1990). They should do whatever it takes to make profit and distribute the profit to owners or shareholders. However, traditional economic perspectives may tell only part of the story of the overall hospital behavior. One of the unique aspects of the U.S. hospital sector is its mixed ownership types (Stevens, 1999). For-profit, public/government-operated, and private nonprofit hospitals operate simultaneously in the health care market. Theoretically and by definition, nonprofit hospitals should have objectives different from those held by their for-profit counterparts.

Health economists have long been interested in the objective functions and behaviors of HCOs of different ownership forms. Weisbrod (1988) proposed three conceptual models for describing the objective functions and behaviors of nonprofit HCOs, which may or may not differ systematically across ownership forms in responding to the change in price/financial incentives. The first model suggests that

nonprofit HCOs are "for-profits in disguise." That is, nonprofits are in fact acting to maximize profit and behaving like for-profits. From this view, the argument concerning for-profit HCOs discussed above can be applied to all hospitals including for-profit and nonprofit hospitals. Certain empirical evidence supports this argument by showing that for-profit and nonprofit hospitals have similar cost or revenue behaviors (Sloan, 2000).

The second model holds that nonprofits are pursuing/producing two kinds of goods, i.e., mission goods (or M-goods) and revenue goods (or R-goods) at the same time. Providing R-goods generates revenues necessary for nonprofit HCOs to fulfill their missions by providing as many M-goods as possible, subject to a budget constraint. In other words, nonprofits have to at least break even in order to be sustainable in the long run. In this regard, nonprofits will take a balanced position of producing M- and R-goods. Nonprofit HCOs might remain in the production of M-goods even though these goods are not profitable, as long as there are sufficient R-goods. On the other hand, nonprofits may not be as sensitive as for-profits in responding to reduced financial incentives in the production of M-goods.

The third model proposed by Weisbrod holds that nonprofits are inefficient profit maximizers. Because of the non-distribution constraint held on nonprofit organizations, there is a lack of incentive for managers in nonprofit HCOs to operate efficiently although their underlying intentions are profit-oriented. Based on this argument, nonprofits will behave differently from for-profits in reacting to changing financial incentives or prices of services, not because they are mission-driven, but because they are inefficient in making the change.

These conceptual models of nonprofit HCOs are particularly relevant to nonprofits except for public HCOs. Public hospitals, with a mission to ensure equal access to needed care, play a critical role in the healthcare safety net, providing care to the uninsured and to minority populations. Among the three hospital ownership types (public, for-profit, and nonprofit), public hospitals may be least vulnerable to changes in the economic/financial environment because public hospitals are products of government policy or intention. The sustainability of a public hospital depends more on political decisions than financial considerations. A public hospital can survive even operating at a financial loss and is backed up by public budgets when it meets public/policy purpose (Harrington, Woolhandler, Mullan, Carrillo, and Himmelstein, 2002).

In addition, the goals and services of public HCOs are regulated directly by law or established by sponsoring governmental agencies, thereby being much less flexible in operation compared to their private nonprofits. Thus, a more appropriate model for describing the objective and behavior of public HCOs may be a M-goods-only (i.e., mission-focused) model, in which the objective of public hospitals is to meet social needs only, regardless of the profitability of the services provided.

Finally, the U.S. private nonprofit hospitals can be further classified into two sub-categories, religious (or faith-based) and secular nonprofit hospitals. The former may fit more closely into the two-good model while the latter may fit more closely into the inefficient profit maximizer model proposed by Weisbrod. These propositions will be further discussed in the hypothesis section.

Figure 4 illustrates the conceptual model for describing the objectives and relative positions of hospitals of the four ownership types in the continuum of profit maximization versus mission orientation. Based on the model, each ownership type will be discussed relative to other types and hypotheses developed for empirical testing.

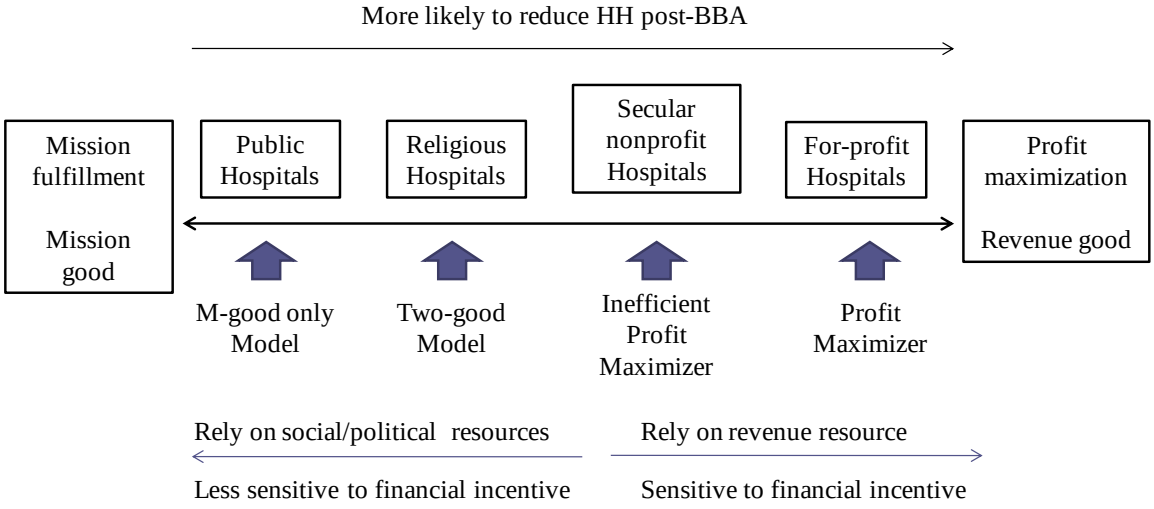

Figure 4. A Conceptual Model of the Objective Function of Four Major Ownership Forms of Hospitals

For-Profit versus Public Hospitals

It is quite straightforward to predict for-profit hospitals' response to the BBA. Due to their focus on profit-maximization, other things being equal, for-profit hospitals would aggressively increase provision of HH services when HH business is profitable, and would leave the business when it becomes unprofitable (Harrington et al., 2002).

In discussing organizational change, population ecology theory (PET) posits that organizations, rather than making active or strategic changes, are relatively inertial structures which are difficult to change (Hannan and Freeman, 1984; Hannan and Carroll,

1995). There are two types of structural inertia: internal inertia and external inertia. The former includes organization internal policy, vested interests, and sunk costs. The latter includes public policies and legitimization of organization activities. Applying this perspective to the change in hospital provision of HH services post-BBA, one could expect that public hospitals may have greater inertia to change provision of HH services when compared to for-profit hospitals because public hospitals are directly constrained by public policies.

These arguments are consistent with the findings in Horwitz (2005a) who reported the change in hospital provision of HH services as HH care turned unprofitable due to the BBA. After controlling for related factors, Horwitz found that the probability of offering home health care fell a striking 37.5 percent among for-profit, 7.7 percent among non-profit, and only 1.5 percent among public hospitals. Based on the discussion above, the following hypothesis is proposed:

Hypothesis 1a: For-profit hospitals were more likely than public hospitals to reduce HH services after the implementation of the BBA.

Private Nonprofit Hospitals versus For-profit Hospitals

Private nonprofit hospitals differ from for-profit hospitals in that their goal is not to maximize profits. Instead, nonprofit hospitals usually have unique missions such as charity, religious/evangelical purposes, meeting community health needs, and teaching/research. Also, unlike a for-profit hospital, nonprofit hospitals are subject to the nondistribution constraint (Spector, Selden, and Cohen, 1998; Chou, 2002; Lindrooth and Weisbrod, 2007). In other words, they cannot distribute their profits (Folland, Goodman,

and Stano, 2004). Thus, they must use profits in ways other than distributing them to shareholders. For example, a nonprofit hospital may use profits to provide or support services which are not profitable but are important to the fulfillment of its mission (Wheeler and Clement, 1990). Further, nonprofit hospitals enjoy tax-exempt status from the IRS in exchange for the provision of a certain amount of community benefit. Therefore, nonprofit hospitals should have more slack resources and higher social or legal obligations than for-profit hospitals have to provide unprofitable care like HH services post-BBA. This is also consistent with the PET argument regarding greater external inertia faced by nonprofit hospitals than by for-profit hospitals. That is, nonprofits are directed by the external requirements for providing community benefits and constrained by internal requirements for offering mission services. Hence, nonprofit hospitals are in a less flexible position to change their HH provision after the implementation of the BBA compared to for-profit hospitals. Thus,

Hypothesis 1b: For-profit hospitals were more likely than nonprofit hospitals to reduce HH services after the implementation of the BBA.

Private Nonprofit Hospitals versus Public Hospitals

However, all private hospitals must meet the break-even bottom line to stay in business. Hence, nonprofit hospitals must be concerned with profits even if profits provide little utility to the hospital (Hirth, 1999). If nonprofit hospitals are not as efficient as their for-profit counterparts, or they are equally efficient but cannot break-even under certain market environments, nonprofit hospitals will not have more slack resources than for-profit hospitals to offer unprofitable services. In this case, one may expect that

nonprofit and for-profit hospitals would respond similarly regarding their provision of HH services after the BBA. That is, although private nonprofit hospitals may not as sensitive as for-profit hospitals, they would be more sensitive than their public counterparts to the change of the Medicare payment environment. Thus,

Hypothesis 1c: Private nonprofit hospitals were more likely than public hospitals to reduce HH services after the implementation of the BBA.

Religious versus Secular Nonprofit Hospitals

Most of the religious hospitals were originally founded to provide charity care for the vulnerable populations in their communities and, as such, have carried forward their missions of social justice. Religious hospitals are the private, nonprofit providers that are most similar to public hospitals in purpose. Religious hospitals are directly governed by their affiliating denominations as public hospitals are guided by governments. Both governments and religious denominations usually have established particular non-profit goals and guiding rules for their affiliated hospitals to meet certain social needs.

In addition, as public hospitals receive funds from governmental agencies, many religious hospitals receive direct financial support from their sponsoring denominations. In this sense, both public and religious private hospitals could behave similarly following a policy change that reduces economic incentives to provide a particular service.

However, like other private nonprofits, religious hospitals are easily subject to a break-even requirement given the fact that financial resources supported by their denominations are usually limited. They rely in large part on their revenues or profits

through providing revenue goods (R-goods). Therefore, religious hospitals fit perfectly with the two-good model suggested by Weisbrod.

With respect to secular private nonprofit hospitals, they may behave in accordance with the model of an inefficient profit maximizer. Secular private nonprofits usually operate independently without regulatory governance in addition to general public policies or regulations. Moreover, many secular nonprofit hospitals may not have regular financial resources besides revenues from operations and service provision. In other words, they are faced with higher self-sustaining pressure compared to their religious and public counterparts. As market competition intensifies and the payment environment tightens, secular hospitals may need to be as profit-oriented as their for-profit counterparts. However, secular hospitals may not be able to be as efficient as for-profit hospitals due to the non-distribution constraint discussed earlier.

From the perspective of population ecology theory, religious hospitals may have greater internal inertia with church-introduced policies and support which are absent in secular nonprofit hospitals. Therefore, religious hospitals could be more reluctant to change their provision of HH services post-BBA. Thus,

Hypothesis 1d: Secular nonprofit hospitals were more likely than religious nonprofit hospitals to reduce HH services after the implementation of the BBA.

Resource Dependence Theory

Resource dependence theory (RDT) holds that every organization is resource dependent to certain extent. In other words, no organization is entirely self-sufficient, nor

any organization can control all of the resources necessary for survival. Hence, the exchange of resources with other organizations is inevitable and critical to organizational survival. As Pfeffer and Salancik (1978) indicated, "Resource dependence perspective looks at how an organization interacts with others and its environment to obtain critical and often uncertain resources through exchange."

Resources in the environment are always limited or sometimes scarce. If the resource critical to a particular organization is controlled by other organizations, uncertainty and dependence are induced, thus making the focal organization vulnerable. In this case, the survival of the organization is dependent on certain organizations that dominate or control the key resource. As resource dependence theorists argue, this interdependence between organizations is a fundamental determinant and predictor of organizational behavior and performance (Pfeffer and Salancik, 1978).

The resource dependence perspective assumes that organizations and managers to certain degree can actively and strategically arrange their environment to reduce unwanted reliance and enhance the likelihood of survival (Aldrich and Pfeffer, 1976). According to RDT, organizations' dependence on other organizations does not necessarily result in risks for the organization (Pfeffer and Salancik, 1978). Nevertheless, an organization may face difficulties to obtain the resources necessary for its operation and survival when resources become scarce and/or the organizations that control key resources become undependable, unpredictable or more demanding.

Hospital Dependence on Post-Acute Care

Medicare patients and revenues are critical resources for hospitals' survival. DRGs encouraged hospitals' to arrange acute care-PAC connections to ensure the care of Medicare patients after hospital discharge and to avoid readmission, resulting in hospitals' dependence on PAC services (Kane, Kane, and Ladd, 1998). In this situation, according to RDT, hospitals have two major strategic options, namely buffering and bridging strategies. Buffering strategies are employed by organizations to protect their technical core (Thomson, 1967; Oliver, 1991). One of the key buffering approaches would be growth by integrating PAC services into a hospital's service provision list. By providing its own PAC services, a hospital is able to control in large part the process of care and transfer of patients between acute care and post-acute care settings.

On the other hand, bridging strategies entail the development and management of a dyadic relationship between a focal organization and other organizations. For example, instead of providing HH services itself, hospitals can have long-term contracts with outside HHAs for patient transfer and the coordination of care.

As noted earlier, the BBA has tightened the reimbursement rates of Medicare for HH care. However, different hospitals have different proportions of Medicare patients, and as a result have received distinct degrees of reduction in reimbursement payment from the BBA. As discussed above, a hospital's reliance on PAC for discharging elderly patients has been an essential driver for hospitals to adopt a HH agency. Medicare beneficiaries are the major users of HH care and a significant portion of them are likely to require HH care after an inpatient discharge. A relatively higher proportion of

Medicare patient days would impose greater pressure on a hospital's discharge- planning activities as well as hospital reliance on PAC. Thus, the greater the Medicare inpatient day proportion in a hospital, the greater the need or reliance of the hospital on HH services. The following hypotheses are posited:

Hypothesis 2a: Hospitals with higher proportions of Medicare inpatient days were more likely than those with lower Medicare inpatient day proportions to provide HH services.

Hypothesis 2b: Hospitals with higher proportions of Medicare inpatient days were less likely than those with lower Medicare inpatient day proportion to reduce HH services after the implementation of the BBA.

Hospital Financial and Professional Capability to Provide HH Care

Nevertheless, providing HH services entails financial and professional/personnel capabilities which may not be present in every hospital. Hospitals without such capabilities may need to rely on bridging strategies in order to coordinate necessary HH care. The resources particularly important for HH care provision include capital and nursing resources. One factor that may directly influence hospital offering of HH care is the financial status of hospitals. Hospitals with better financial status (e.g., higher profit margins) may have more resources to provide services in addition to acute care services which are the core business of general hospitals. Also, HH services are provided largely by nursing professionals without whom a hospital may experience difficulties in offering or maintaining HH services. Nursing capability in a hospital can be reflected through the nursing density (e.g., the fraction of total FTEs accounted for by nursing staff) in the

hospital. Hospitals with higher nursing density should have more nursing capability than do those with lower nursing density. Therefore, one could expect that a hospital with a lower financial margin and lower nursing density may be less likely to have hospital-based HH services and more likely to discontinue HH programs after the BBA. Hence:

Hypothesis 3a: Hospitals with less financial ability were less likely than those having more financial ability to provide HH services.

Hypothesis 3b: Hospitals with less financial ability were more likely than those having more financial ability to reduce HH services after the implementation of the BBA.

Hypothesis 4a: Hospitals with higher nursing density were more likely than those with lower nursing density to provide HH services.

Hypothesis 4b: Hospitals with higher nursing density were less likely than those with lower nursing density to reduce HH services after the implementation of the BBA.

A conceptual display of the relationships proposed in hypotheses 2 through 4 is illustrated in Figure 5.

Transaction Cost Economics

Transaction Cost Economics (TCE) draws on concepts from economics and contract law to form a theoretical model explaining how organizations provide the most efficient exchange in response to market failure (Williamson, 1975; 1985). While neoclassical economics basically posits that the market is the most efficient governance

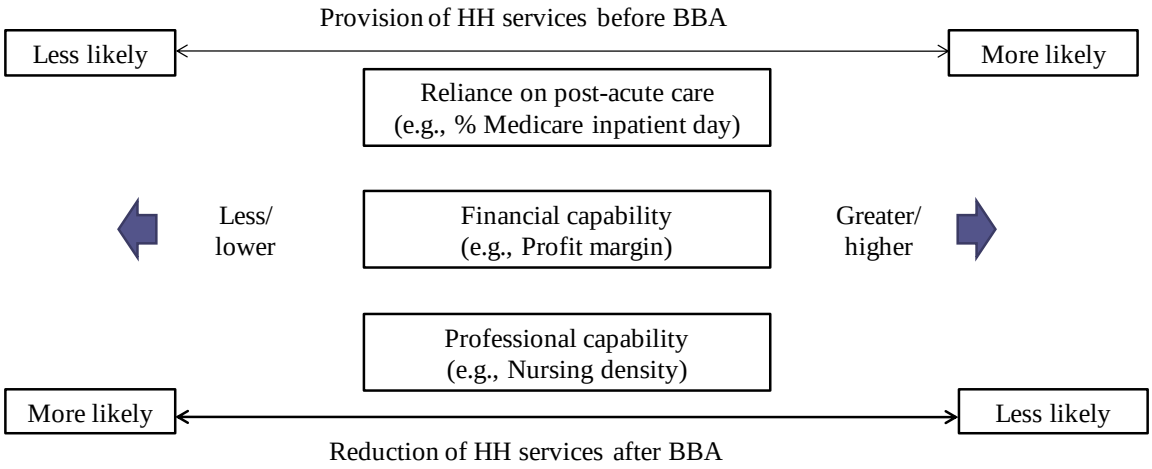

Figure 5. The Conceptual Illustration of the Relationships in Hypotheses 2-4

structure for guiding exchanges through the price mechanism, contracts, and competition, TCE argues that in some circumstances organizations will do a better job at the exchange relationship.

TCE emphasizes the transaction and suggests that the characteristics and scopes of transactions determine the desirable transacting form and organizational boundary. The theory points out that transaction forms include "spot market", "hybrid arrangement", and vertical integration. In a spot market, exchange buyers purchase goods or services directly from suppliers in the market without the establishment of any prior relationships. A hybrid arrangement for exchange refers to developing a mid- or long-term relationship through a contract or joint venture arrangement with suppliers to guide exchanges. In the final transaction form, vertical integration, buyers ultimately gains permanent control over the supplier, i.e., to internalize the transaction. Vertical integration is also characterized as "hierarchy." TCE suggests that the design and the boundary of an

organization are the result of the organization's continuing process of "make or buy" decisions.

TCE views organizations as boundedly rational and opportunistic. Not any negotiation and contract are perfect, and organizations cannot anticipate all the circumstances of every contract, due to their bounded rationality. This issue could be largely reduced, however, if organizations were always truthful and willing to fulfill fairly the agreement signed even the contract is not perfect. Yet organizations can be opportunistic, that is, seeking their self-interest with guile, risks can thus arise from contracts. In these cases, transaction costs will inevitably occur as organizations try to seek necessary information, monitor and enforce contracts, ensure exchanges, and resolve conflicts or the failure of contracts. These factors can contribute to the failure of the market. If transaction costs related to a certain transaction are too high, organizations tend to internalize the transaction, that is, to make the services or goods within the organization instead of buying them from the market.

In addition to the human characteristics mentioned above, Williamson (1985) argues that a high level of transaction uncertainty, asset specificity, and frequency will contribute to the exchange process preferring organization to market. Under these conditions, hierarchical arrangements, in spite of higher fixed costs in general, will result in overall lower transaction costs than markets. It is because disagreements involved with transactions can be enforced and opportunism can be reduced through "managerial fiat" (Williamson, 1975).

Transaction cost economics is particularly useful in describing the fundamental basis and behavior of organizations in the case of market failure. Since health care systems or the hospital sector deviate significantly from the perfectly competitive market assumed by classic economics and indeed operate in the environment characterized as market failure, TCE is insightful in studying health care organizations (Stiles, Mick, and Wise, 2001). In addition, the delivery of health care can be viewed as the composition of transactions among providers, patients, payers, and suppliers. Transaction cost economics is a relevant theoretical lens in studying transactions among parties. In this light, hospital provision of PAC services can be considered as a hospital's intent and action to better organize its transactions related to the provision of care. TCE has been commonly applied by health services researchers to study the linkage between hospitals and provision of NH care (Chiu, 1995; Lucente, 2006), HH care (Xu, 2000), and LTC (Angelelli et al., 2003).

As discussed earlier, the implementation of DRGs induced the need of hospitals to coordinate the continuum of care from acute to post-acute care services. Coordination involves administrative costs that are not directly related to the production of health care services. Hence, the concept of transaction costs in TCE offers a useful framework in understanding the issue regarding coordination costs in hospitals.

In theory, hospitals can simply refer patients needing PAC to HHAs in the market (i.e., buying from the market), they can also establish some types of contracts or joint venture with these HHAs to coordinate the care process (i.e., hybrid arrangement), or they can set up and provide their own HH services (i.e., make the service through

hierarchical arrangement). According to TCE, hospitals with higher transaction uncertainty, frequency or quantity, and transaction complexity entail higher transaction costs related to the coordination between acute and post-acute continuum of care, thus being more likely to provide HH services themselves (Williamson, 1985; Stiles and Mick, 1997).

Transaction Uncertainty

According to TCE, as transaction uncertainty increases, organizations tend to "make" the product or service they need instead of "buy" it from a market place (Williamson, 1975; Scott and Davis, 2007). Therefore, hospitals facing greater PAC transfer uncertainty should provide their own HH services rather than depending on the services provided by other HHAs. If a hospital is located in a healthcare market with few HHAs relative to the size of the elderly population, the hospital may be faced with higher transaction uncertainty. In other words, in a hospital market where HH capacities are limited and many Medicare patients discharged by hospitals need HH services, it may be hard for hospitals to develop long-term and stable relations with HHAs. In this situation, provision of a hospital's own HH services may be preferred because it not only makes hospitals able to ensure Medicare patient resources but also reduces hospitals' dependence on other HHAs and maintains hospitals' autonomy. Both TCE and RDT are drawn upon to predict that:

Hypothesis 5a: Hospitals in markets with fewer HH services relative to PAC-needing patients were more likely than those in markets with less limited facilities to provide HH services.

Hypothesis 5b: Hospitals in markets with fewer HH services relative to PAC-needing patients were less likely than those in markets with more services to reduce HH services after the implementation of the BBA.

Transaction Frequency

With respect to transaction frequency, a larger hospital or a hospital with a higher proportion of Medicare patients may need to interact with PAC facilities on a more frequent basis and thus experience higher transaction costs. As Chiu (1995) pointed out, a hospital with a greater number of Medicare patient days is likely to have more transactions with PAC facilities such as nursing homes and home health agencies. Larger hospitals in general have higher numbers of Medicare patient days. Also, larger hospitals generally have a greater proportion of Medicare patients and provide more services. Xu (2000) empirically revealed that hospital size is associated positively with hospital provision of HH care. It can thus be expected that larger hospitals would be more likely than their smaller counterparts to provide their own HH services and would be less likely to reduce HH care when HH turns unprofitable. Thus:

Hypothesis 6a: Larger hospitals were more likely than smaller hospitals to provide HH services.

Hypothesis 6b: Larger hospitals were less likely than smaller hospitals to reduce HH services after the implementation of the BBA.

Transaction Complexity

Finally, hospitals having patients with more complex medical conditions may face greater transaction complexity when it comes to coordinating the care their patients need

following release from acute care wards. For hospitals, discharging a patient with more complex medical conditions to a HHA tend to involve more coordination between the hospital and the HHA, thus driving up transaction complexity as well as transaction costs. In health services research, a case-mix index (CMI) is often used to measure the average medical complexity of the patients for an individual hospital. A CMI may also be related to average length of stays, contributing to the pressure on a hospital to discharge patients in a timely basis, thus influencing the pressure on hospitals to integrate HH care. Hospitals with higher CMIs tend to have longer average length of stays, thereby having to work harder to make patient discharge as smooth as possible in order to make beds available for new patients. Also, a hospital with a higher CMI may be more likely to provide HH services because these more medically complex patients are likely to need post-acute care following discharge. The greater transaction complexity could drive up the need of hospitals to provide and maintain their own HH services, thus:

Hypothesis 7a: Hospitals with higher CMIs were more likely than those with lower CMIs to provide HH services.

Hypothesis 7b: Hospitals with higher CMIs were less likely than those with lower CMIs to reduce HH services after the implementation of the BBA.

A conceptual display of the relationships proposed in hypotheses 5 through 7 is illustrated in Figure 6.

Institutional Theory

Institutional theory emphasizes that organizations not only are influenced by competitive and efficiency-based forces, but also are shaped by widely-held beliefs and

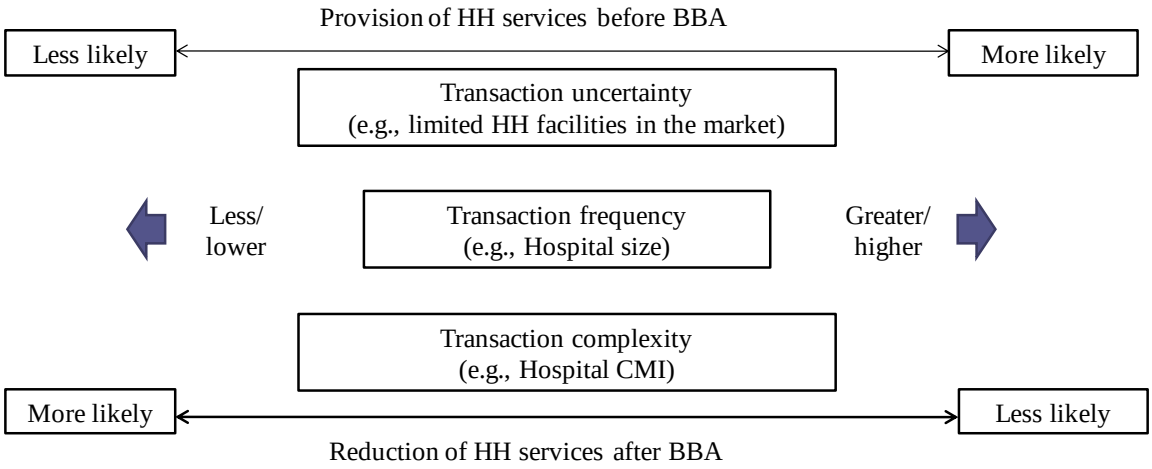

Figure 6. The Conceptual Illustration of the Relationships in Hypotheses 5-7

rule systems in their professions and societies – both in how they structure themselves and how they perform their works (Scott and Davis, 2007).

The basic premises of institutional theory explain why organizations within sectors adopt similar structures, practices, and procedures. According to institutional theorists, organizations do so to increase their legitimacy (Meyer and Scott, 1983). Institutional theory views organizations as adaptive organisms reacting to the characteristics and commitments of participants and to pressures or influences from the external environment (Selznick, 1948). However, organizations do so not because of active/strategic choices, but by unintentionally conforming to environmental pressures. A certain set of factors largely composed of cultural-cognitive (e.g., common beliefs and values), normative (e.g., professional standards and certification), and regulative elements (e.g., rules, law, and sanctions) are thought to form the institutional

environment, providing meaning to organizational life and creating pressures for organizations to perform in conforming to these accepted values, standards, and rules.

Institutional perspectives emphasize that organizations face environments characterized by norms, rules, and requirements that the organizations must conform to in order to receive legitimacy and social support (Scott and Davis, 2007). The pressures of institutional environments often have the effect of directing organizations' attention away from task performance and efficiency/effectiveness. That is, organizations may be attempting to seeking rational or economic goals (e.g., maximizing efficiency, effectiveness, and profits, minimizing costs, or fulfilling mission) while in fact they are conforming to the institutional constraints (Luke and Walston, 2003).

Coercive Pressures

From the perspective of institutional theory, an organization's behavior is influenced by certain institutional forces including coercive pressures, normative pressures, and mimetic pressures (DiMaggio and Powell, 1983). First, coercive pressures are usually expressed through the forms such as requirements or regulations from governments or sponsoring institutions. As mentioned previously, both governments and sponsoring churches may consider provision of necessary HH services as one of their major missions or duties, thus imposing more requirements or policies on their affiliated hospitals to offer HH services. In this regard, one may observe public and religious hospitals to be less responsive than their secular and for-profit counterparts to reduce HH care due to the implementation of the BBA. This discussion is in accordance with the hypotheses 1a to 1d proposed earlier.

Normative Pressures

Another source of institutional forces is normative pressure resulting from social or professional norms. Hospital provision of HH care can be considered an action hospitals take to conform to environmental requirements when they are located in an area with a substantial elderly population. In an area having higher elderly density or higher growth rates of the elderly population, social norms for hospitals to provide better continuum of care should be greater. Hence, one would expect that hospitals in areas with higher elderly density or higher growth rates of the elderly population would have a higher probability of offering their own HH services and a lower probability of cutting these services after the BBA. Also, a higher density of elderly people or a growth rate in the elderly population in a market creates greater dependence of hospitals on Medicare patients, HH agencies, as well as a higher frequency and volume of elderly patients needing transfers to HH care settings. Thus:

Hypothesis8a: Hospitals located in areas with higher proportions of elderly population were more likely than those in areas with lower elderly proportions to provide HH services.

Hypothesis 8b: Hospitals located in areas with higher proportions of elderly population were less likely than those in lower elderly proportion areas to reduce HH services after the implementation of the BBA.

Hypothesis 9a: Hospitals located in areas with higher elderly population growth rates were more likely than those in areas with lower rates to provide HH care.

Hypothesis 9b: Hospitals located in areas with higher growth rates of elderly population were less likely than those in areas with slower rates to reduce HH services after the implementation of the BBA.

Mimetic Pressures

Mimetic isomorphism is the third institutional mechanism influencing organizations to adopt similar practices. Researchers have demonstrated spillover effects brought about by for-profit HCOs on nonprofit HCOs (Horwitz and Nichols, 2007), and vice versa (Grabowski and Hirth, 2003). If a for-profit hospital is located in a market occupied by public and nonprofit hospitals, it may be faced with greater mimetic pressure brought about by its non-profit neighboring counterparts. On the other hand, it is plausible that a nonprofit hospital located in a for-profit dominant market may exhibit behaviors similar to its for-profit neighbors, thus:

Hypothesis 10a: Nonprofit hospitals located in markets with higher proportions of for-profit hospitals were more likely than those in markets with lower proportions to reduce HH services after the implementation of the BBA.

Hypothesis 10b: For-profit hospitals located in markets with higher proportions of nonprofit hospitals were less likely than those in markets with lower such proportions to reduce HH services after the implementation of the BBA.

A conceptual display of the relationships proposed in hypotheses 8 through 10 is illustrated in Figure 7.

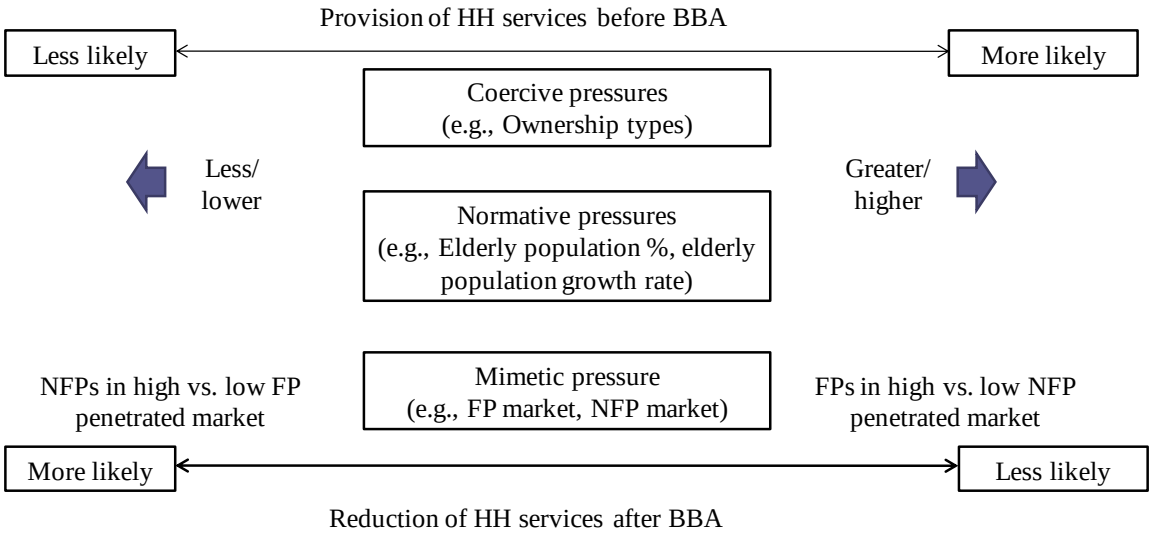

Figure 7. The Conceptual Illustration of the Relationships in Hypotheses 8-10.

The hypotheses stated above are summarized in Table 3 with the major factors hypothesized to be associated with hospital provision and change in provision of HH care before and after the BBA. Expected directions of the relationships of interest are also shown in the table.

Table 3. Summary of the Study Hypotheses and the Expected Results

Hypotheses	Determinants of hospital (change in) provision of HH care	Expected Sign	
		Likelihood of offering HH	Likelihood of continuing HH post BBA
Economics-Ownership			
H1a	FP vs. Public		(-)
H1b	FP vs. NFP		(-)
H1c	NFP vs. Public		(-)
H1d	Secular vs. Religious NFP		(-)
Resource Dependence			
H2a~H2b	Level of hospital dependence on post-acute care-% Medicare inpatient days	(+)	(+)
H3a~H3b	Hospital financial capability-Hospital profit margin	(+)	(+)
H4a~H4b	Professional capability-Nursing density	(+)	(+)
Transaction Cost			
H5a~H5b	Uncertainty-Limited HHAs	(+)	(+)
H6~H6b	Frequency-Hospital size	(+)	(+)
H7a~H7b	Complexity-Hospital CMI	(+)	(+)
Institutional Theory			
H8a~H8b	Normative pressure-Elderly population %	(+)	(+)
H9a~H9b	Normative pressure-Elderly population growth rate	(+)	(+)
H10a	Mimetic pressure-FP market		NFP hospitals (-)
H10b	Mimetic pressure-NFP market		For-profit hospitals (+)

(+) means positive association; (-) means negative association

CHAPTER 4: METHODOLOGY

This chapter outlines the methodologies used to examine how hospital provision of HH services changed after the implementation of the BBA. This chapter first discusses the research design, followed by a discussion of study sample, data sources, and variable measurement. Some issues encountered in the process of data management and the methods used to address these issues are also described. Finally, the econometric/statistical approach used to analyze the data is presented.

Research Design

This study can be viewed as a natural experiment in which the BBA is the intervention. Of particular interest is whether or not the reduction of hospital-based HH services after the BBA differs for religious, secular nonprofit, or for-profit hospitals as compared with public hospitals which serve as the control group in the analytical model. A natural experiment approach is very relevant for policy evaluation (Meyer, 1995).

More specifically, this study applies a time series non-equivalent control group design which is a quasi-experiment design in nature (Polit and Beck, 2004: 185-186). In this study, however, there is only one data-collecting point (i.e., 1997) in the pre-BBA period while there are six data-collecting points (years 1998 through 2003) in the post-BBA period. The conceptual illustration of this research design is depicted in Figure 8.

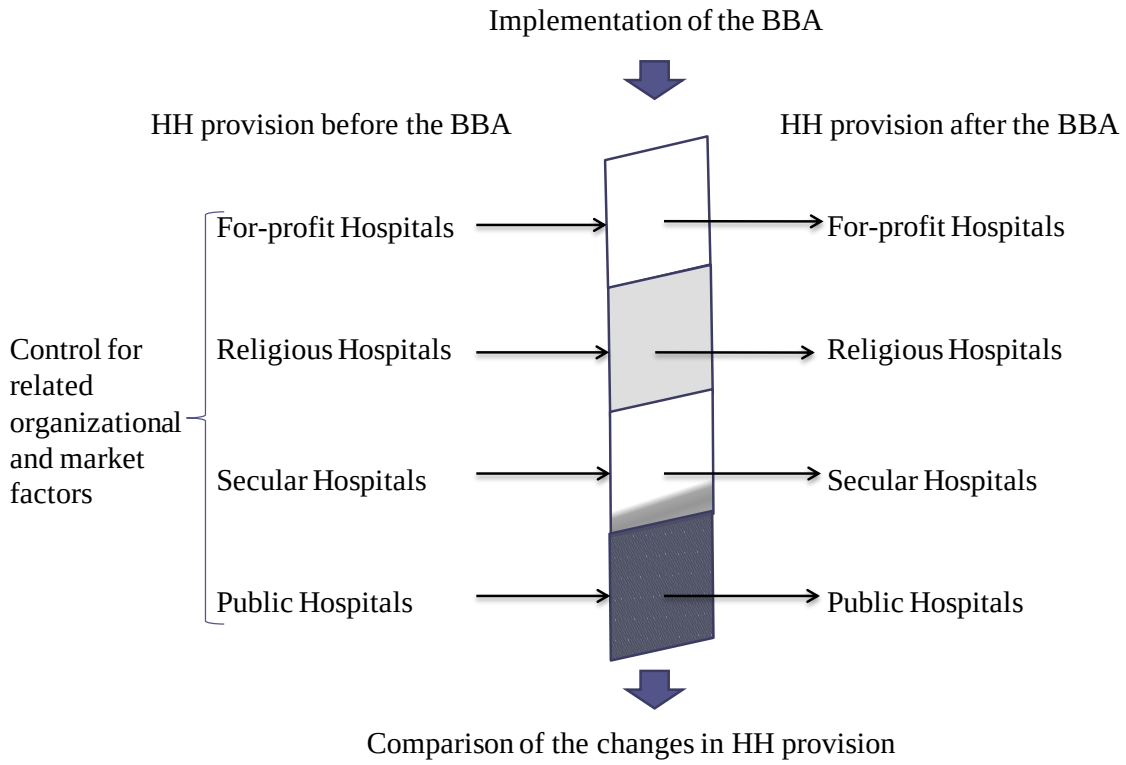

Figure 8. A Conceptual Diagram of the Research Design

As shown in Figure 8, the intervention of the natural experiment is the implementation of the BBA. Although the new reimbursement policies are universally applied to all HH agencies, hospital managers in different ownership forms should respond to the BBA differently due to their different operational objectives. For example, in the face of the BBA, for-profit hospitals may feel under greater pressure to reduce HH provision in order to avoid the loss of profit. In contrast, public and nonprofit hospitals may not perceive a need to reduce HH provision since financial incentive is only part of their objective equations. In this situation, four treatment groups with different expected responses to the intervention are naturally formed. Hence, the responses of any two

groups can be compared with one serving as the study group and the other as the control group.

The core interest of this study is whether the changes in HH provision from the pre-BBA to the post-BBA years among the hospitals with different ownership types are different. As in a true experimental context, this question can be answered by comparing the changes in HH provision between any two hospital groups. However, this study did not control the assignment of hospitals into the treatment groups. That is, there is no random assignment in this natural experiment, thus the four treatment groups are not equivalent. Direct comparison among the groups can cause biases. Therefore, statistical controls for relevant organizational and market factors affecting hospitals are necessary.

Internal Validity

There are several benefits as well as potential issues associated with the study design applied. One major benefit of a natural experiment approach is that the issue of endogeneity (reverse causality between dependent and independent variables) can be largely avoided. This is because the intervention (i.e., the implementation of the BBA) was not determined by whether a particular hospital provided HH care or not. It is the BBA that affects hospitals' decisions to continue or to stop offering HH care, among other things. Scholars have suggested that natural experiments can provide strong evidence regarding the effect of an intervention on outcomes of interest if the comparison is thoughtfully designed to achieve equivalence between treatment and control groups (Polit and Beck, 2004:191).

In addition, this study design should be able to control for the threats to internal validity including testing, instrumentation, and regression to the mean. These threats are commonly present in longitudinal research. First, the threat of testing occurs when hospitals changed their HH provision because of the report of the data regarding HH provision in the baseline year (i.e., 1997). This is not likely to happen because this study uses a retrospective approach. No real experiment was actually conducted at the time of data reporting and collection, thus there is no artificial influence of researchers on hospitals' reporting of the data used. Also, the collection of the data used in this analysis was on a routine basis without any purpose specific to the study of HH provision.

Second, the issue of instrumentation arises when there are unwanted changes in characteristics of the measuring instrument or in the measurement procedure (Singleton, Straits, Straits, and McAllister, 1988: 203). This is unlikely to occur in this study, either. As will be discussed in the data section, the collection instruments and procedures of the data applied had been relatively consistent and stable across time. No significant change in these aspects during the study period is observed. Also, the data for a particular variable across years are drawn consistently from one particular data source or a mix of two data sources to ensure the consistency of data across time.

Third, the threat of regression to the mean usually increases when cases are selected for study based on their extreme performance in the baseline period and thus the results of the following measurements tend to regress to the mean, resulting in a bias. For this situation to be applicable here, hospitals would have to have been selected into the

analysis because they offered or did not offer HH care. This is obviously not the case here since all hospitals with data available are included in the analysis.

However, by applying the time series nonequivalent control group pretest-posttest design, this study may be faced with the threats to internal validity including history, selection, maturation, and attrition. These threats arise largely because nonequivalent groups are employed. There may be significant differences in development trends (e.g., growth in hospital size, tendency of financial performance, etc.), hospital closure, likelihood of being included in the analysis, and the external policy or regulatory environments among different hospital ownership groups. Most of the selection and maturation issues may be addressed through controlling for relevant organizational and market factors in the analytical model. However, if certain characteristics mentioned above are unable to be controlled for and are important to the hospital decisions to offer or not to offer HH care, biases will occur.

There are several notable sources of threats to internal validity for which it may not be possible to effectively control. First, there might be history threats present in this study. Since the BBA may not be the only policy that affects HH reimbursement payments in the study period, other policies might also have similar effects which could potentially impact the relationship of interest. Nevertheless, the BBA is widely recognized to be the single, most influential federal health care policy enacted in the study period that directly impacted HH reimbursement payments. Thus, the reduction of payments and profitability for HHAs in this period should be largely attributable to the BBA. Other researchers have applied the same assumption to the evaluation of the impact of the BBA (McCall,

Petersons, Moore, and Korb, 2003). In addition to the BBA representing the major federal health care reimbursement policy, states might have enacted their own reimbursement policies as well in the study period. An analytical model including state dummies is conducted in order to control for the effects of state policies. However, this approach controls for only differences among states throughout the study period but not state changes in related policies across time period. Ideally this issue can be addressed through including all the interaction terms between the state and year dummy variables. Yet this can result in a very tedious model in which 300 additional interactions terms need to be included. Although the effects could be a potential limitation to this study, they should be minor since it is unlikely that a large number of states enacted major policies significantly changing HH reimbursement schemes in this time period.

Selection threats are the second concern to the internal validity of this study. Although a number of organizational and market factors supposed to be associated with hospital provision of HH care are controlled for in the analysis, selection biases can occur if the hospitals not included in the sample are significantly different from those in the sample in characteristics important to this study. Fortunately, this issue should be minor since the AHA survey has high coverage and response rates. As will be described later, this study includes all the hospitals which are in the study population category and reported to the AHA surveys in the study period. Thus, the representativeness of the sample should be satisfactory. Nevertheless, some observations in the data have missing values or outliers in a number of independent variables. Sample selection biases can be present if the observations with missing values or outliers in the key variables are omitted.

This issue is addressed through the application of data imputation techniques and the inclusion of dummy variables indicating observations with missing values or outliers for each major variable with a significant number of missing values or outliers.

Third, there might be attrition or mortality threats resulting from the reduction in the number of sample hospitals over time due to closure or non-response. If the hospital closure or non-response is associated systematically with ownership types and the likelihood to continue or discontinue HH provision, the results could be biased. Fortunately, the degree to which this is an issue can be examined and is addressed by including a dummy variable indicating those observations from hospitals reporting to AHA in some early years but not seen in later years.

External Validity

There might be anticipatory or expectancy effects of hospitals in response to the BBA which is a threat to external validity. For instance, some hospitals offering HH services might discontinue HH care as the Act was being proposed and discussed before 1997. Also, some hospitals might have decided not to adopt a HH agency due to the anticipated reduction in HH reimbursement payment before the Act was implemented. These effects can result in an under estimation of the overall effect of the BBA on the reduction in hospital-based HH provision. Unfortunately, these effects are hard to empirically evaluate. However, these anticipated effects may not significantly impact the relationship of interest since the total number of hospital-provided HH agencies kept growing in 1995, 1996, and 1997, and started declining only in 1998. Therefore, this study should be able to reveal the relationship of interest to a satisfactory degree.

Construct Validity

Threats to construct validity in this study may be minor since a natural experiment occurs in a natural setting without artificial intervention and manipulation of the study process. Thus, most of the threats to construct validity such as demand traits, experimenter expectancy, novelty effects, compensatory rivalry/equalization effects, and instrument issues may not exist. However, efforts are still needed to obtain adequate operationalization of the construct, clearly-defined measures that reflect all properties of construct, and representativeness of variables.

Econometric Approach and Model Specification

Following the work of Meyer, Viscusi, and Durbin (1995) who applied a natural experiment to examine the changes in workers' injury duration after changes in workers' compensation policies, this analysis applies the approach of independently pooled cross-sections across time. Specifically, a difference-in-difference analysis is employed to test the hypotheses. In this study, the unit of observation is an individual hospital in a particular year. A logit model is used to estimate the following equation:

$$hhprov_{i,\,year} = F[\beta_0 + \beta_1 profit_{i,\,year} + \beta_2 religious_{i,\,year} + \beta_3 secular_{i,\,year} + B_4 Y_{98\text{-}03} + B_5(profit_{i,\,year} \times Y_{98\text{-}03}) + B_6(religious_{i,\,year} \times Y_{98\text{-}03}) + B_7(secular_{i,\,year} \times Y_{98\text{-}03}) + B_8 X_{i,\,year} + B_9(X_{i,\,year} \times Y_{98\text{-}03}) + \beta_{10}(profit_{i,\,year} \times nfp\_market_{i,\,year}) + \beta_{11}[(religious_{i,\,year} + secular_{i,\,year}) \times fp\_market_{i,\,year}] + B_{12}[(religious_{i,\,year} + secular_{i,\,year}) \times fp\_market_{i,\,year} \times Y_{98\text{-}03}] + B_{13}(profit_{i,\,year} \times nfp\_market_{i,\,year} \times Y_{98\text{-}03}) + B_{14} Z_{i,\,year} + \varepsilon_{i,\,year}$$

Where:

Logit model $F(x) = 1/(1+e^{-X})$ = probability of offering hospital-based HH care

$hhprov_{i,\,year}$ represents whether a hospital provided its own HH care in a particular year.

$profit_{i, year}$, $religious_{i, year}$, and $secular_{i, year}$ represent the ownership types, i.e., for-profit, religious nonprofit, and secular nonprofit, of hospitals, while public hospitals serve as the reference category.

$Y_{98\text{-}03}$ is a set of dummy variables representing the years 1998 to 2003 (post-BBA), while the year 1997 is the base group (pre-BBA).

$X_{i, year}$ is a vector of independent variables indicating relevant organizational and market factors in addition to the ownership variables.

$nfp\_market_{i, year}$ and $fp\_market_{i, year}$ indicate the degree to which a hospital market is dominated by nonprofit and for-profit hospitals, respectively, in a particular year.

$Z_{i, year}$ is a vector of control variables.

$\varepsilon_{i, year}$ is the error term of the model.

These variables will be discussed in detail in the section "Variables and Measures." The coefficients of most interest to this project are coefficient vectors B_5~ B_9 and B_{12}~ B_{13}. For example, hypothesis 1 states that, other things being equal, for-profit hospitals as a whole are more likely than their public counterparts to reduce the provision of HH services after the implementation of the BBA. If this hypothesis is supported, all of the coefficients (i.e., B_5) of the interaction terms of the for-profit hospital dummy (using public hospitals as a base group) and year dummies (yr98~yr03, using yr97 as a base group) should be negative, meaning that for-profit hospitals had a greater reduction in HH provision after the BBA compared to public hospitals. It should be noted that this study applies difference-in-difference estimation with independently pooled cross-sections across time rather than a panel approach. Hence, the result should not be

interpreted as the difference in the likelihood of dropping hospital-based HH care after the BBA between a typical individual hospital of a particular ownership form and a typical hospital in the base group. Instead, the result should be understood as the difference in the likelihood of reducing HH services after the BBA between the whole group of the hospitals in a particular ownership form and the whole base group. The expected signs and relationships of the coefficients in the analytical model are summarized in Table 4.

Table 4. The Expected Coefficients for the Testing of the Hypotheses

Hypotheses	Determinants of hospital (change in) provision of NH and HH care	Expected Coefficient
H1a	FP vs. Public	$B_5<0$
H1b	NFP vs. FP	$\|B_6\|$ and $\|B_7\| < \|B_5\|$; $B_6, B_7 <0$
H1c	NFP vs. Public	B_6 and $B_7<0$
H1d	Secular vs. Religious NFP	$\|B_6\| < \|B_7\|$
H2a~H9a	Other organizational and market factors derived from organization theories	$B_8>0$
H2b~H9b		$B_9>0$
H10a	Mimetic pressure-NFP in FP market	$B_{12}<0$
H10b	Mimetic pressure-FP in NFP market	$B_{13}>0$

The model specified above is able to explore the relationship between the implementation of the BBA and the relative change in HH care provision among hospitals of different ownership types over time. Including the year dummy variables and the interaction terms with year dummy variables makes the model relatively flexible and

capable of detecting any potential time pattern concerning the change in HH provision without assuming a particular pattern of change over time.

Since the dependent variable is a simple binary variable, a logit or probit model for examining HH provision is relevant for analyzing the data. The statistical analysis applies the logit model since it is widely applied in health research. The result of logistic regression can be interpreted through odds ratios which are familiar to health science researchers and can be easily constructed using the coefficients of the independent variables (Hosmer and Lemeshow, 2004).

There may be heteroskedasticity in the model because the probability of offering HH care in a hospital is unlikely to be independent across time (Horwitz, 2005a). For example, if a hospital provided HH services in 1997, the hospital should be more likely than those not provided to offer HH care in the following years. Therefore, the issue of potential heteroskedasticity is addressed through a cluster-robust-VCE (variance-covariance matrix of the estimators) estimator where the observations from a particular hospital are treated as a cluster (Baum, 2006: 138). By applying the cluster-robust-VCE estimator, the estimates of the coefficients are not affected but the standard errors can be corrected.

Study Population and Sample

The population of this study includes all U.S. non-federal short-term, acute-care general hospitals operated in the 50 states and the District of Columbia. The sample used for this study is composed of the short-term, acute-care general hospitals included in the AHA annual survey data sets of 1997 through 2003. Because federal

government-sponsored hospitals such as VA hospitals, military hospitals, and hospitals in the Indian reservations are intended to meet the health care needs of very specific population groups, these federal hospitals are excluded from this study. However, non-federal public hospitals such as state, county, and city hospitals serve the general public. As such, they are included in the study sample as are all private hospitals. In this study, short-term, acute-care general hospitals include those non-federal hospitals that provide "general medical and surgical services" in the AHA survey.

Figure 9 graphically illustrates the relationship between the population and the sample to be studied using the data in 1997 as an example. According to AHA, over 6,500 hospitals are surveyed annually, including AHA registered hospitals as well as non-registered hospitals which are identified with help from state and local associations, Medicare and Medicaid centers, national organizations and governmental bodies (AHA, 2009b). The response rate of the survey is also high, around 85 percent (AHA, 2006). The representativeness of the sample to the population should be acceptable.

Figure 9 only shows the sample in one year, the number of hospitals included in the AHA survey and in the sample of each year is listed in Table 5. It can be seen from the table that the sample size in each year slightly declined over the study periods.

Data Source

Data are drawn from a variety of sources for this study. The source of data for hospital characteristics largely comes from the American Hospital Association (AHA) Annual Survey of Hospitals datasets of 1997 through 2003. Financial indicators and the case mix index for hospitals are from hospital cost report datasets and case mix index

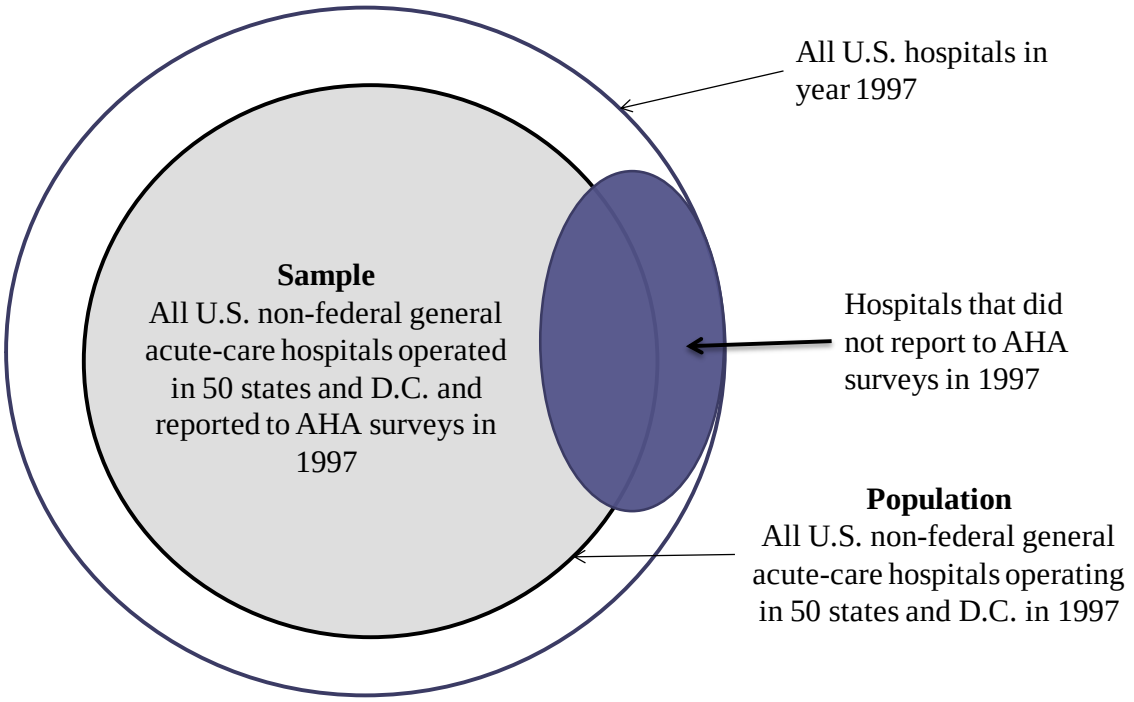

Figure 9. The Population and Sample of a Particular Year (e.g., 1997) in the Study Period

Table 5. Numbers of Hospitals in the Data Source and in the Sample by Year

Year	Number of hospitals in the AHA data file	Number of hospitals in the sample	Number of hospitals in HCRIS data file
1997	6,299	4,810	6,056
1998	6,247	4,772	6,053
1999	6,116	4,703	6,019
2000	6,044	4,661	5,894
2001	6,003	46,27	5,823
2002	6013	4,600	5,721
2003	6,008	4,608	4,803
Total	42,730	32,781	40,396

files released by the Centers for Medicare and Medicaid Services (CMS). Market data at the county level are derived from the Area Resource File (ARF) datasets of 2006 and 2001 (including related data in the study years). The information regarding state

Certificate of Need (CON) regulations is obtained from the website of the National Conference of State Legislatures.

The AHA annual surveys provide probably the most comprehensive data for the U.S. hospitals. The survey started in 1946, made a significant expansion of the datum elements collected in 1980, and has been largely stable in content since then (AHA, 2009b). The survey data file provides information concerning hospital structure, facilities and services, utilization, staffing, financial status, location, and community benefit. The AHA data file currently contains more than 1,000 data items. However, most of the financial data reported by participating hospitals are not shown in the publicly released files. The strengths of the AHA survey data include its stable, regular, consistent administration of the survey, and the comprehensive scope as well as high coverage and response rates. These benefits make them a relatively trustworthy data source for hospital-related research.

However, the AHA data file has certain weaknesses. The survey is entirely based on self reports from voluntarily participating hospitals, making it hard to ensure data quality. Although the response rate is generally high and AHA staff has made an effort to validate the data, missing values and outliers in many variables still can be found in the dataset. There may be also inconsistency in the report of data of a particular hospital across time if the hospital staff responsible for reporting data changes. Thus, a careful check and thoughtful management of the data are needed in using the AHA data files.

The CMS's hospital cost report files (also known as Healthcare Cost Report Information System, HCRIS, datasets) are publicly available data sources providing

comprehensive sets of financial information of Medicare-certified hospitals. All Medicare-certified hospitals are required by the CMS to submit annual cost reports. The HCRIS datasets have very detailed pieces of hospital financial data, including the revenues and costs of hospital-based health care facilities such as skilled nursing facilities, HHAs, hospice, and renal facilities, etc. The CMS has made a reasonable effort to ensure that the data provided are up-to-date, accurate, complete, and comprehensive at the time of disclosure (CMS, 2009a). One potential issue with the HCRIS data is that the reporting period of each hospital in the annual file is not identical, making it sometimes hard to compare a particular financial indicator across hospitals.

The CMS also provides hospital case-mix index (CMI) annual files through its website. A hospital's CMI is computed and provided by CMS every year based on the DRGs undergone in the hospital. According to the CMS (2005), a hospital's CMI represents the average diagnosis-related group (DRG) relative weight for that hospital. It is calculated by summing the DRG weights for all Medicare discharges and dividing by the number of discharges.

The Area Resource File is currently created and maintained by the Health Resources and Services Administration (HRSA), U.S. Department of Health and Human Services. The ARF is a collection of data from more than 50 sources, including the American Medical Association, AHA, US Census Bureau, CMS, Bureau of Labor Statistics, National Center for Health Statistics, and so on. It is a database containing more than 6,000 variables for each of the nation's counties. The basic county-specific Area Resource File (ARF) is the nucleus of the overall ARF System. The ARF contains

information on health facilities, health professions, measures of resource scarcity, health status, economic activity, health training programs, and socioeconomic and environmental characteristics (HRSA, 2009). These data have been widely used by health researchers, planners, and practitioners to study the nation's health care delivery system and factors that may impact health status and health care in the U.S. Thus, that this study defines a hospital's market to be the county where the hospital is located. This definition of market-related measures has been commonly applied by other health services researchers (Alexander and Morrisey, 1989; Chiu, 1995).

Finally, the National Conference of State Legislatures (NCSL) website provides information on state CON regulations used in this study (NCSL, 2009). On the NCSL website, states with CON programs, dates of programs, as well as state CON information contacts and websites are listed. There is also information on states with CON programs by different types of facility such as HHAs, acute care hospitals, long-term care, and so on. The information on whether a particular state had a HH agency CON program in the study period is used in this study as a control variable.

Data Management

Data Integration

Several steps are taken to integrate the separate data files into a final sample with all the data needed for this analysis. The process used to combine these data sources is illustrated in Figure 10. First, yearly files with the necessary data from each of the AHA, ARF, CMI, and HCRIS files are created, separately. Unused variables in the AHA files of 1997 to 2003 are removed from each of the seven original AHA files. Data in the ARF

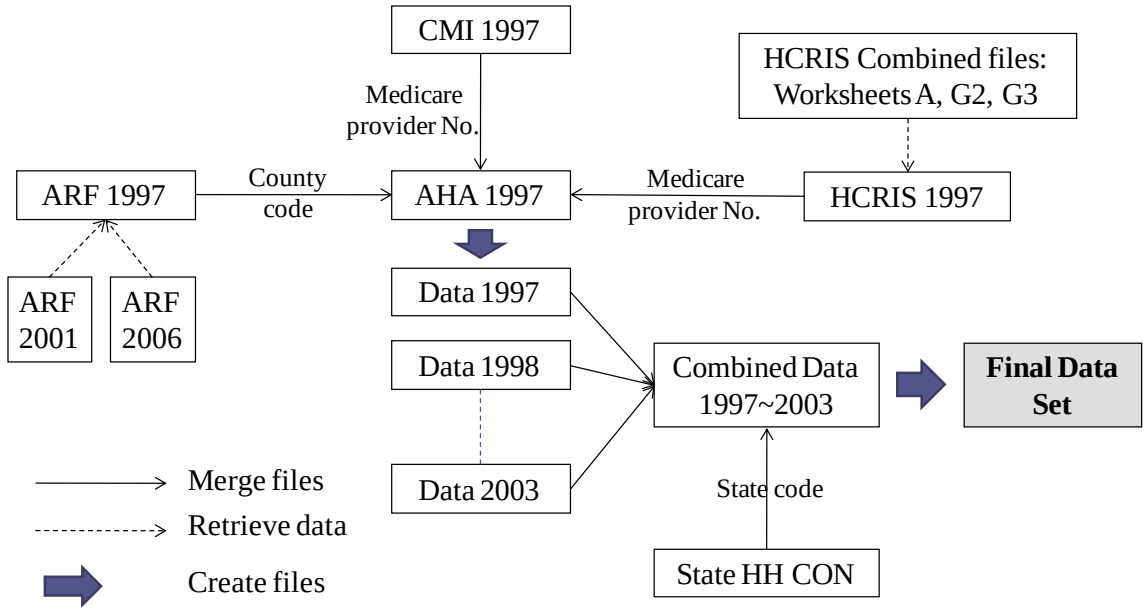

Figure 10. Data Sources and the Process of Data Integration

yearly files are retrieved from the 2001 and 2006 ARF files. The two files include most of the data needed in the 7-year period except for the information regarding three items: (1) number of population age 65 and over in the county for year 2000, (2) per capita income in the county for year 2000, (3) number of HH agencies in the county for years 1998 and 1997. The missing variables in the first and second items are created by using the mean of the values in 1999 and 2001 for each item. The missing variables in the third item are created by using proportional interpolation between the values of 1999 and 1994. The rationale behind these solutions is that the statistics in each item are quite consistent with a certain trend pattern across the years. Then seven yearly ARF files with data used in the analysis are created.

All the necessary data associated with hospital financial reports for the study time period can be found in three HCRIS worksheet files, including worksheets A, G2, and G3.

Each of the worksheet files contains hospital cost report periods covering 1996 through 2003. Yearly data needed are retrieved from each worksheet file. The selection of the yearly data is based on the criterion that the report period covers the first day (i.e., 1st of January) of the year. For example, the data for year 1997 are selected if the data are in a report period that covers January 1, 1997. The use of this criterion is based on the fact that most hospitals have a fiscal year from October 1 to September 30 of the following year. The fiscal year of 1997 usually covers the January 1, 1997. Thus, the criterion used is in general be in accordance with the fiscal year period used in other data sources. The hospitals respectively retrieved from the three HCRIS worksheet files for a particular year are the same. The yearly data of the three files are then merged to form a yearly HCRIS data file. The number of hospitals in each yearly HCRIS data file is listed in Table 5.

The second step is to merge these separate yearly files to form a combined yearly data file. The AHA yearly file serves as the master file in the merging process. For example, 1997 ARF, CMI, and HCRIS files are merged with the 1997 AHA file. To merge the HCRIS and CMI files with the AHA file, Medicare provider ID number is used as the merge variable. In merging the ARF and AHA files, the merge variable is the Federal Information Processing Standard (FIPS) state and county code. The result is the creation of a 1997 data file.

After the seven yearly data files are created, the third step is to join these yearly files to form a combined data file with all data for the seven years. The last step in the

process is to merge the combined data file with state HH CON file in order to create a final dataset for the analysis.

However, after examining the data in the final dataset, almost 1,000 observations with a blank in the Medicare provider ID are identified. Since the Medicare provider ID is a key variable used in the merging process, this blank may cause unexpected errors in the process. Therefore, an effort was made to match Medicare provider ID numbers to those hospitals with missing values in the yearly AHA datasets. This work was done through tracking the Medicare provider ID for each hospitals included in the sample through another hospital ID, the AHA hospital ID, which is a unique number for each hospital in the AHA dataset. This step resulted in a dramatic reduction of the number of hospitals in the sample with a blank in Medicare provider ID to 52. The number of observations in the sample with a blank in Medicare provider ID was decreased from more than 800 to 139. Since some hospitals indeed do not have a Medicare provider ID (communication with Kimberly Garber, AHA staff, 8/31/2009), probably because they are not Medicare-certified hospitals, these hospitals and observations are removed from this study. Thus, the final sample size becomes 32,642.

Data Cleaning

As expected, many observations with missing values and/or outliers are observed as shown in Table 6. The following steps were taken to deal with these issues:

Step 1: One observation has a total FTE equal to zero and another one has a zero RN FTE, which are unlikely to be correct. These two outliers were replaced by the mean of the values of the same hospital in other years (i.e., the hospital mean).

Table 6. The Numbers of Observations with Missing Values and/or Outliers

Variable	# of obs with missing values in original data	# of obs with outliers	# of obs with missing values after filling in the hospital mean	Missing dummy variable
CMI	1,587		486	cmi_d
County population	171		168	pop_d
Elderly population	171		168	
Elderly population growth rate	171		168	
Number of HHAs	171		168	
Unemployment rate	171		168	
Per capita income	171	114	280	income_d
Medicare inpatient days	1		0	
Hospital net income	3,384		659	Used to calculate hospital total profit margin
Hospital patient revenue	3,519		695	
Hospital other revenue	3,919		759	
RN FTE	0	1	0	Used to calculate nursing FTE %
Hospital total FTE	0	35	0	
Medicare %	0	7	0	
Nursing FTE %	0	5	0	
Hospital total profit margin	773	776	773	margin_d

Step 2: One observation has a missing value in Medicare inpatient days. The hospital mean was imputed for the missing value.

Step 3: 1,587 observations have a missing value in CMI. Since the CMI of a hospital does not vary dramatically across years, the hospital means were first calculated and imputed, reducing the number of observations with a missing value to 486. A dummy variable was created to indicate those observations that still have a

missing value. Then the mean of the variable calculated from the total sample (i.e., the sample mean) was imputed for these observations. The dummy variable (cmi_d) is included in the analytical model to control for potential bias caused by the imputation.

Step 4: 171 observations were founded to have missing values in the items from the ARF files, such as county population, elderly population, number of HH agencies in the county, and so forth. Based on the fact that these statistics in general do not fluctuate significantly in the study period, the hospital means were used to impute for each item, decreasing the number of observations with a missing value to 168. A dummy variable, pop_d, was created to indicate those observations that still have a missing value. Then the overall sample mean of each item was calculated and imputed for these observations.

Step 5: More than 3,000 observations have missing values for hospital net income, patient revenue, and other revenue. The imputation of the hospital means results in a reduction of the number of observations with missing values in hospital net income, patient revenue, and other revenue to 659, 695, and 759, respectively.

Step 6: A ratio variable, hospital total profit margin, was created by dividing net income by the sum of patient revenue and other revenue. This calculation resulted in 773 missing values. In addition, three values are greater than one which is unreasonable. Recoding these outliers as missing resulted in 776 observations with a missing value in this variable. The hospital means were first calculated and imputed, reducing the number of observations with a missing value to 763. A

dummy variable, margin_d, was created to indicate those observations that still have a missing value. Then the sample mean was calculated and imputed for these observations.

Step 7: Seven observations have a Medicare inpatient day percentage over 100 percent which should be incorrect. Thus, these outliers were replaced by the hospital means.

Step 8: Five observations have a nursing FTE ratio greater than one which is abnormal. These outliers were replaced first by the hospital mean, then by the sample mean.

Step 9: For the per-capita income variable, 171 observations have a missing value and 168 observations have a value equal to zero which is unreasonable. After filling with hospital means, there still are 280 observations with either a missing value or a zero. Thus, these outliers and missing values were replaced by the entire sample mean and a dummy variable, income_d, is created to indicate these observations.

The methods applied to manage the missing variables, missing values and outliers are summarized in Table 7.

Variables and Measures

Dependent Variables

The dependent variable, HH provision, is whether a hospital provided HH care of its own in each of the years 1997 through 2003. Two pieces of information from the HCRIS and AHA files are used to create this variable. First, the variable is coded as “1”

Table 7. Methods Used to Address Missing Variables, Missing Values, and Outliers

Variable	Problem	Action taken
County population 65+ in 2000	Missing variable	Created by using the mean of the values in 1999 and 2001
County per capita income in year 2000	Missing variable	
# of HH agencies in county in 1998 and 1997	Missing variable	Created by using the proportional interpolation of the values in 1999 and 1994
Medicare inpatient days	Missing value	Imputed by using the mean of the values of the same hospital in other years
Hospital FTE	Outlier	Replaced by the hospital mean of the values in other years
Hospital RN FTE	Outlier	
CMI	Missing value	Imputed by using the mean of the values of the same hospital in other years. A dummy variable is created to indicate those observations still having a missing value; then the sample mean is imputed for those observations.
County unemployment rate	Missing value	Imputed by using the mean of the values of the same hospital in other years. A dummy variable is created to indicate those observations still having a missing value; then the sample mean is imputed for those observations.
County population	Missing value	
County elderly population	Missing value	
County elderly population growth rate	Missing value	
Number of HH agencies in county	Missing value	
County per capita income	Missing value and outlier	Imputed by using hospital means. A dummy variable is created to indicate those observations still having a missing or a zero value; then the sample mean is imputed for those observations.
Hospital net income	Missing value	Imputed by using the mean of the values of the same hospital in other years
Hospital patient revenue	Missing value	
Hospital other revenue	Missing value	
Medicare/total inpatient days	Outlier	Replaced by the hospital mean
Nursing FTE/Total FTE	Outlier	Replaced first by the hospital means, then by the sample mean
Hospital total profit margin	Missing value and outlier	Imputed or replaced first by hospital means. A dummy variable is created to indicate those observations still having a missing value; then the sample mean is imputed for those observations.

if a hospital had a nonzero HH revenue data as reported in the HCRIS file in a particular year. However, many hospitals are missing HH revenue. Most of these hospitals might not provide HH care, but some might simply fail to report their HH revenue. Also, in the data merging process, there are 3,179 observations belonging to hospitals included in the AHA files but not in the HCRIS file. In consequence, these observations do not have information regarding their HH revenue not because they did not provide HH care, but simply because there are no associated data in the HCRIS file. As such, the information regarding HH provision in the AHA file is used as supplementary information. Specifically, for those observations not identified with a HH revenue, if the corresponding hospital reported to the AHA that it provided or owned HH services, the variable is also coded as "1". Otherwise, the variable is coded as "0".

According to the AHA annual hospital survey, HH care is defined as services providing nursing, therapy, and health-related homemaker or social services in the patient's home. The AHA survey asks hospitals to report whether HH services are provided through one or some of the following arrangements: (1) my hospital or its subsidiary; (2) my health system (in my local community); (3) my network (in my local community); and (4) a formal contractual arrangement or joint venture with another provider that is not in my system or network (in my local community). In measuring the objective function of the hospital, the first arrangement category should be the most relevant since in this arrangement the financial responsibility of the HH services is directly borne by the hospital.

The rationale behind the use of the HCRIS as the major source and the AHA as the supplementary source of the information for the dependent variable is that, in general, the HCRIS information is more reliable than that in the AHA file. As mentioned earlier, the HCRIS data come from hospital cost reporting which is required by CMS, while the AHA data are based on voluntary reports from hospitals. Altogether, the AHA and HCRIS data are inconsistent for around 14 percent (3,623/25,500) of the sample, after excluding those observations belonging to hospitals present only in the AHA but not the HCRIS files or those having a missing value in HH provision in the AHA files.

Independent Variables

There are a number of independent variables of particular interest to this study. The first set of independent variables includes ownership indicators identifying public (Public), religious not-for-profit (Religious), secular private not-for-profit (Secular), and for-profit (For-profit) hospitals, respectively. In the analytical models the omitted public ownership type serves as the reference group. The second group of independent variables contains year dummies (year'98~year'03) used to capture the responses of hospitals as regards HH provision after the implementation of the BBA. Each year dummy is coded as "1" if an observation is from a particular year of interest. For example, yr00 is coded as "1" if an observation is from the year 2000 and as "0" otherwise. As mentioned earlier, most of the BBA reimbursement policies were phased in or were implemented in 1998 or later. Although HH IPS began being phased in the third quarter of 1997, it was not fully implemented until October 1998. Hence, year 1997 was about 1 year before the

implementation of HH reimbursement policies mandated by the BBA and is used as a baseline year for comparison.

The third set of independent variables comprises interaction terms between the ownership dummies and the year dummies. The inclusion of these interaction terms in the model is to reveal the change in the likelihood of an ownership form to offer hospital-based HH care following the implementation of the BBA relative to public hospitals.

The fourth group of independent variables is composed of organizational factors drawn from related organizational theories, which are considered to be associated with hospital provision of HH services. The measures of these organizational factors are discussed below.

The variable Medicare represents the percentage of total patient days in a hospital contributed by Medicare patients. This factor measures the dependence of the hospital on PAC such as HH care. Medicare discharges are most likely to demand HH services and a certain proportion of Medicare patients will need HH care following the discharge. Thus, a higher proportion of Medicare patients indicates a greater dependence on PAC. Here, a proportion of Medicare inpatient days rather than a number of Medicare inpatient days is employed, because the number of Medicare inpatient days also reflects hospital size. Larger hospitals usually have more resources (such as discharge planners) to deal with the transfer need, reducing their reliance on PAC. A proportional measure takes this aspect into account and isolates it from the effect of hospital size. In addition, inpatient days instead of discharges are used since inpatient days indicate the extent to which

patients need care which is important in considering potential needs for PAC. As discussed in Chapter 3, the coefficient to this variable is expected to be positive.

The total profit margin ratio (Margin) of hospitals in the corresponding years measures hospitals' financial ability to provide HH services. Here a hospital's total profit margin is calculated by dividing total net income by total revenue (i.e., both from operating as well as non-operating revenues) of the hospital in a particular period. A total profit margin ratio rather than operating margin ratio is employed to represent the overall financial resources the hospital has to offer, or to continue to offer, HH care in a financially pressing time period. Total profit margin may be more relevant for all hospitals since nonprofit hospitals may receive contributions or donations for providing unprofitable services. A total profit margin ratio takes this part of non-operating revenues into account. As discussed in the previous chapter, the coefficient to this variable is expected to be positive.

Third, hospital nursing capacity is measured by nursing density (Nursing) which is the ratio of the number of nursing FTEs (including RN and LPN) to the total FTEs in a hospital and its subsidiary in a particular year. Ideally the FTE figures in the hospital unit rather than the total facility including the hospital's subsidiary should be used. However, the hospital unit figures needed for calculating the FTEs are either unavailable or incomplete in the AHA file. Hence, the FTE figures for the total facility are applied. Endogeneity may be present since a hospital with a HHA tends to have greater nursing FTEs compared to another hospital without a HHA. Yet the issue is somewhat reduced through dividing the nursing FTEs by the total FTEs of the total facility. Here, higher

nursing density indicates greater nursing capacity and expertise to provide HH services which rely largely on the nursing and related professions. The coefficient to this variable is also expected to be positive.

In addition, Hospital size measured by the number of beds set up and staffed in a hospital is applied to indicate the transaction frequency. Also, hospital size is associated positively with hospital provision of services. In general, larger hospitals are more likely than smaller hospitals to provide diverse services in house. Therefore, the coefficient to this variable is expected to be positive.

Furthermore, the variable, case-mix index (CMI), measuring the medical complexity of the overall patient condition in a hospital is used to represent the transaction complexity the hospital is faced with when transferring patients to HH care. A hospital's CMI is computed and provided by CMS based on the DRG cases treated in the hospital that year. It should be noted that the CMI may only partially account for a hospital's general complexity of its patient condition. The degree to which the CMI can represent the construct depends on the share of Medicare patients in the hospital's total patients. Yet it has been widely utilized as a relative measure among U.S. hospitals of medical utilization and complexity of patients treated. As described in Chapter 3, the coefficient to this variable is expected to be positive.

The fifth group of independent variables is composed of market factors drawn from related organizational theories, which are considered to be important for hospitals in providing HH services. The measures of these market factors are discussed below.

The variable (HHA/elderly) is employed to capture the transaction uncertainty of a hospital in transferring patients to HH agencies. The variable is the inverse of the ratio of the number of elderly people to the number of HHA in the county. Chiu (1995) used the ratio of the number of the elderly to the number of total nursing home beds in the county to measure transaction uncertainty in the linkage between hospitals and NHs. Here, a greater ratio of the number of elderly people to the number of HHA in the county could lead to a higher overall HH utilization rate in the local market, thus increasing the challenge for a hospital to discharge or transfer a patient to a HH setting. However, some counties had no HHA in one or some of the years in the study period. In this case, the ratio can be infinity, resulting in a missing value. To avoid this possibility, an inverse of the ratio is employed. Yet, the result regarding this variable should be interpreted in the opposite way in order to get the relationship between HH provision and transaction uncertainty. For example, a positive coefficient to this variable mean as transaction uncertainty increases, hospitals will be more likely to reduce HH care provision. According to the discussion presented in Chapter 3, the coefficient to this variable is expected to be negative.

The variables used to measure normative pressures on hospitals concerning provision of HH services are the percentage of elderly population in a county in a particular year (Elderly) and the growth rate of the elderly population in a county during the study period (Growth). The former is the ratio of the number of the people age 65 or over to the total population in the county. The elderly population growth rate in a year is defined as the ratio of the increase in the elderly population in the past year to the elderly

population in the previous year (in percentage). For example, the growth rate in year 2000 is calculated by [(change in county elderly population from years 1999 to 2000)/ county elderly population in 1999]*100. A greater proportion and growth rate of elderly in the county may imply a stronger social perception and expectation that HH care is needed. In a community with a stronger social expectation of such kind, existing health providers such as general community hospitals may be faced with more social pressure in order to provide HH care. Thus, the coefficients to these two variables are expected to be positive.

The last two independent variables are for-profit market (FP market) and not-for-profit market (NFP market). The former is defined as the percentage of the number of total general hospital beds accounted for by for-profit general hospitals in the county; the latter is the percentage of the number of total general hospital beds accounted for by nonprofit and public general hospitals in the county. The two measures indicate the degree to which a market is dominated by for-profit or nonprofit hospitals. These variables are used to reveal the potential influence of a dominant ownership type on the hospital group with a different ownership form. Horwitz and Nichols (2007) also use FP and NFP markets to study the spill-over effects of hospitals in one ownership sector on the other regarding the provision of HH services. As described in the previous chapter, the coefficient to the interaction term between NFP hospitals and fp_market is expected to be negative, while the coefficient to the interaction term between FP hospitals and nfp_market is expected to be positive.

The set of organizational and market variables discussed above is followed by another group of independent variables including the interaction terms of those variables in the previous variable set and the year dummies. This set of variables is for exploring the influence of these organizational and market factors on hospital change in the provision of HH services after the implementation of the BBA. As discussed in Chapter 3, the coefficients to these interaction terms are expected to be positive except for those between HHA/elderly and the year dummies.

Control Variables

Certain factors besides those stated above are expected to impact a hospital's decision to offer HH services. Hence, these factors are employed to mitigate the interaction effect of hospital ownership type and the BBA on hospital provision of HH care. The first two factors to be controlled for are hospital system affiliation and hospital teaching status. Here, two dummy variables (System and Teaching) are created to indicate whether a hospital is a member of a health/hospital system and of the Council of Teaching Hospitals (COTH) of the Association of American Medical Colleges, respectively. Specifically, system is coded as "1" if a hospital has a system ID shown in the AHA file and as "0" otherwise. Also in the AHA file, there is a variable indicating whether a hospital is a member of the COTH. It is coded as "1" if the answer is yes, and as "0" otherwise.

Multi-hospital health systems, hospital networks or alliances, and vertically integrated healthcare system have emerged since the 1990s. The larger, diversified hospitals or health systems have sought to provide a more comprehensive continuum of

services to address the needs of patients/clients in their communities (Paone and Mullen, 2005). If there are some types of arrangement in HH care provision among the local hospitals in a system so that HH resources can be shared, one might observe lower probabilities of offering HH care among individual system-affiliated hospitals. That is, the coefficient to the variable system is expected to be negative. Also, teaching hospitals are quite different from non-teaching hospitals in types of services and their health care workforce. Hence, hospital teaching status is commonly controlled for in health services research (Horwitz, 2005a; White and Begun, 1998/1999). Based on the fact that most of the teaching hospitals are also research institutions focusing largely on tertiary acute care, it is expected that theses hospitals are less likely to offer PAC such as HH services. Thus, the coefficient to the variable teaching is also expected to be negative.

In addition, four environmental factors that could influence hospital provision of HH services are identified and controlled for in this study. The first factor is related to Certificate of Need (CON) laws or regulations in each state. States differ in CON regulations which exist to affirm whether a proposed acquisition, expansion, or creation of a healthcare facility is required to fulfill the needs of a community. Hence, in a state with CON, a hospital has to get approval from the state health department before it can construct a new major facility, acquire large/costly equipment, or expand certain services such as with HH agency (Chiu, 1995). CON may also create a binding bed constraint which can lead to different operating environments for HH agencies across states (Grabowski, 2001). Therefore, a dummy variable to be controlled for is the presence of HH CON in every state. The variable, HH CON, is coded as “1” if a HH CON program

is present in a state, and as "0" otherwise. It should be harder for hospitals located in a state with a HH CON program to establish HHAs compared to their counterparts in a state without the program. The coefficient to this variable is expected to be negative.

The second environmental factor to be controlled for is a dummy variable (*Rural*) indicating whether a hospital is in a rural area. As mentioned earlier, PAC or LTC resources and needs may be different in rural areas versus urban areas (Chiu, 1995). As described in Chapter 3, this factor (being in a rural area) should be positively related to hospitals' decisions to provide HH care. This variable is coded as "1" if the hospital is located in a metropolitan statistical area (MSA) where population is under 100,000 and coded as "0" otherwise.

The last two environmental factors to be controlled for measure the ability to pay for healthcare services in the market. Here, two variables (Income and Unemployment) are employed. The former is per capita income while the latter is unemployment rate, both in the county where a hospital is located in a particular year. The data for the two variables are directly drawn from the ARF file and are shown in $1,000 and percentage, respectively. Per-capita income in different years is inflation-adjusted to year 2000 dollar through the general Consumer Price Index (CPI) provided by the CPI inflation calculator in the U.S. Bureau of Labor Statistics website (Bureau of Labor Statistics, 2008). Hospitals located in a market with a greater ability to pay for healthcare services such as HH services are more likely to continue to offer HH services than those located in a market with limited ability to pay. Since per capita income should be associated positively with local ability to pay for health care, the coefficient to this variable is

expected to be positive. On the other hand, due to unemployment rate in the county is associated negatively with local ability to pay for health care, the coefficient to this variable is expected to be negative.

The measures and sources of the dependent, independent, and control variables discussed above are summarized in Table 8.

Analytical Process

With respect to the analysis of the data, the following steps are employed. First, descriptive statistics of and correlations between the study variables are presented. This is followed by bivariate analyses of the hospital provision of HH services by ownership types across years. These analyses provide the first glimpse of the relationships of interest to this study. Third, several model specifications with different sets of control variables are compared and a final model is selected for the primary analysis. As mentioned in the data section, many observations in the study sample have either missing values or outliers in key variables. Exclusion of these observations can cause sample selection bias. Value imputation techniques have been applied in order to keep these observations. Dummy variables indicating the observations with imputed values from the sample means are created to address the issue of sample selection bias resulting from the missing values in the independent variables. Model selection here is based on the significance of the coefficients to these missing dummy variables. Also, one model including the variable HH CON, and another one replacing HH CON with a whole set of state dummy variables are tested and compared, based on the pseudo-R^2 and a joint test of the significance of the coefficients to the state dummies.

Table 8. Study Variables, Measures, and Data Sources

Variable	Measure	Source
Dependent Variable		
HH provision	"1" if the hospital had a nonzero HH revenue in a particular year, or reported to AHA survey with ownership/provision of a HH if the HH revenue information is missing, and "0" otherwise	HCRIS & AHA (1997 ~ 2003)
Ownership		
Public	"1" for a public hospital in a particular year and "0" otherwise	AHA (1997 ~ 2003)
Religious	"1" for a religious nonprofit hospital in a particular year and "0" otherwise	AHA (1997 ~ 2003)
Secular	"1" for a secular private nonprofit hospital in a particular year and "0" otherwise	AHA (1997 ~ 2003)
For-profit	"1" for a for-profit hospital in a particular year and "0" otherwise	AHA (1997 ~ 2003)
Years (base: 1997)		
Year'98~Year'03	"1" if the observation is from the particular year and "0" otherwise	AHA (1997 ~ 2003)
Organizational Factors		
Medicare	Medicare inpatient days percentage in the hospital=[(#Medicare inpatient days)/(#total inpatient days)]*100 in a hospital	AHA (1997 ~ 2003)
Margin	Total profit margin of a hospital in a particular year=[(total net income)/(total revenue)]*100	HCRIS (1997 ~ 2003)
Nursing	Ratio of the number of nursing FTEs to the total FTEs in a hospital and its subsidiary in a particular year	AHA (1997 ~ 2003)
Hospital size	The number of beds staffed in a hospital in a particular year	AHA (1997 ~ 2003)
CMI	Case-mix index of a hospital in a particular year calculated by CMS	CMI file (1997 ~ 2003)
Market Factors		
HHA/elderly	Ratio of the number of HHAs to the number of elderly people in the county=(# HHAs) /(# elderly in 1,000) in the county	AHA (1997~2003); ARF (2006)

Table 8 (continued)

Variable	Measure	Source
Elderly	Elderly population percentage in the county in a particular year (in %)	ARF (2006)
Growth	The average growth rate of elderly population in a county in a particular year=[(#elderly in the current year-#elderly in the previous year)/ #elderly in the previous year]*100 (in %)	ARF (2006)
FP market	The proportion of the number of total for-profit hospital beds to the total hospital beds in a county in a particular year (in %)	AHA (1997 ~ 2003)
NFP market	The proportion of the number of total nonprofit hospital beds to the total hospital beds in a county in a particular year (in %)	AHA (1997 ~ 2003)
Control Variables		
System	"1" if the hospital has a health system ID and "0" otherwise	AHA (1997 ~ 2003)
Teaching	"1" if a member of council of teaching hospital of the Association of American Medical Colleges and "0" otherwise	AHA (1997 ~ 2003)
HH CON	"1" if a hospital is in a state with a HH CON program and "0" otherwise	NCSL Website http://www.ncsl.org/programs/health/cert-need.htm
Rural	"1" if the hospital's MSA code is 0 or 1, "0" otherwise	AHA (1997 ~ 2003)
Income	Per capita income in the county in a particular year (in $000)	ARF (2001 & 2006)
Unemployment	Unemployment rate in the county in a particular year (in %)	ARF (2001 & 2006)

Once a final model specification is decided, logistic regression is conducted to comprehensively test each of the hypotheses proposed previously while holding other factors constant. This offers an opportunity to examine the relation between each variable

of interest on hospital provision and the change of provision following the implementation of the BBA. Moreover, a sensitivity analysis is employed to examine the potential difference in the result between two different data arrangements for the dependent variable, hospital provision of HH services.

Finally, in order to illustrate the relationships of major interest to this study, simulated probabilities of HH provision by the four ownership types in years 1997 through 2003 based on the result of the fitted model is plotted, holding the organizational and market factors constant. The flow of the analyses is shown in Figure 11. The statistical package Stata version SE 11.0 is employed to carry out the analyses.

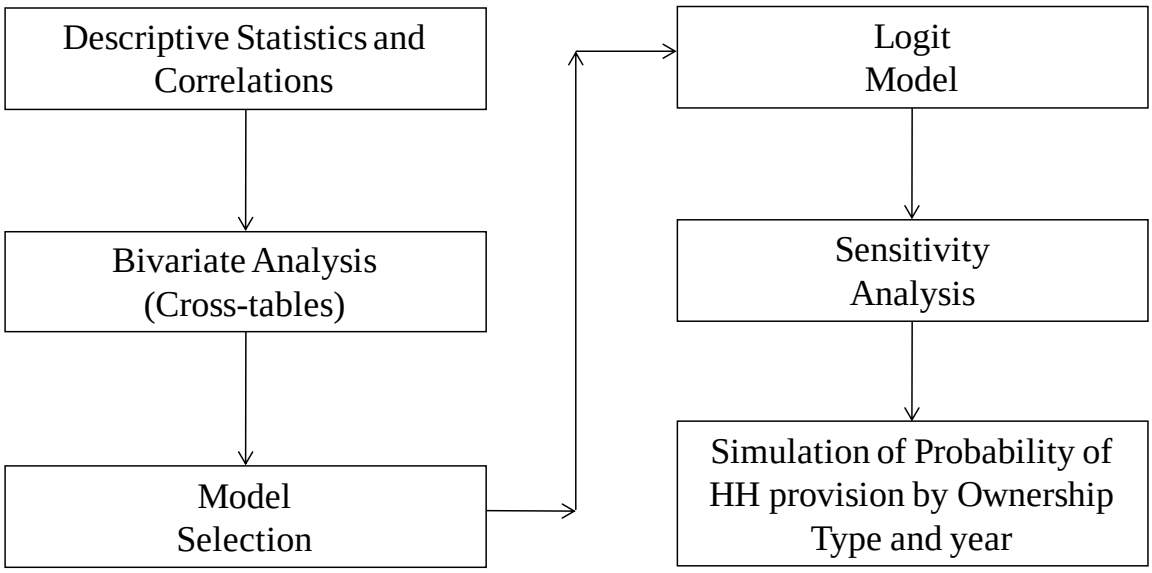

Figure 11. Analytical Process

CHAPTER 5: RESULTS

This chapter presents the results of the empirical analysis in five sections, basically following the process shown in Figure 11 described in the previous chapter. First, descriptive statistics showing characteristics of the sample and of the hospitals in each year are provided and discussed. This is followed by the presentation of results of bivariate analyses which contrast the characteristics of HH-offering and non-offering hospitals. Also, the percentages of hospitals with different ownership forms offering HH services across the study period are plotted and discussed. The third section describes the results of multivariate analyses. Before these results are presented, the decision process underlying the final model specification is described. In this section, the estimation of a full model including all the year dummy variables and the results will be presented. Each hypothesis is discussed based on the results of the full model. In order to reveal the joint effect of the post-BBA years, a reduced model replacing the dummy variables with a post-BBA variable is then estimated. While the results most relevant to the hypotheses are presented with the description of the results, the complete results of the multivariate analyses are shown in Appendix. The fourth section presents a sensitivity analysis to check the robustness of the model using different combinations of data sources for the dependent variable. This chapter concludes with a summary of the major findings.

Descriptive Statistics

Sample Statistics

The characteristics of the study sample are presented in Table 9 by showing the key statistics including the mean, standard deviation, and range (minimum and maximum values). These statistics are based on the total observations (N=32,642) included in the final dataset for this analysis. Since some hospitals are not present in some years, each hospital is not equally represented in the dataset. Hence, these statistics should not be viewed as the statistics of the hospitals in the sample. However, these statistics provide an opportunity for examining the overall soundness of the study data. Special attention is directed to the range of the values of each variable since this information can be used to identify possible outliers.

Looking first at the dummy variable indicators, slightly more than half of the sample provides HH care. Almost 50 percent of the observations belong to secular nonprofit hospitals, 25 percent public hospitals, 14 percent for-profit hospitals, and 11 percent religious hospitals. Around half of the observations belong to hospitals in health systems or in rural areas. Twenty-nine percent of the sample observations are in a state with a HH CON program, and only 6 percent of the observations are from teaching hospitals.

With respect to the continuous variables, the proportion of hospital inpatient days contributed by Medicare patients ranges from 0 percent to 100 percent with a mean of 48.8 percent for all the observations, which is reasonable. The mean of hospital total profit margin is 1.14 percent which is a bit lower if compared to 2 percent, a figure

Table 9. Descriptive Statistics of the Study Variables

Variable	Mean	Standard Deviation	Min	Max
Dependent variable				
HH provision	0.51	0.50	0	1
Ownership				
Public	0.25	0.43	0	1
Religious	0.11	0.32	0	1
Secular	0.49	0.50	0	1
For-profit	0.14	0.35	0	1
Organizational factors				
Medicare (%)	48.80	19.02	0.0	100.0
Margin (%)	1.14	10.25	-484.9	99.7
Nursing (%)	28.22	6.24	1.91	99.0
Hospital size (# of beds)	170.74	177.71	2	2,518
CMI	1.26	0.26	0.4	3.7
Market factors				
HHA/elderly (# HHAs per 1000 elderly persons)	0.32	0.37	0.0	5.1
Elderly (%)	13.90	3.94	3.0	36.6
Growth (%)	0.73	2.38	-22.8	48.9
FP market (%)	12.39	23.14	0.0	100.0
NFP market (%)	87.61	23.14	0.0	100.0
Control variables				
System	0.51	0.50	0	1
Teaching	0.06	0.24	0	1
HH CON	0.29	0.46	0	1
Rural	0.48	0.50	0	1
Income ($000 in year 2000 dollar)	25.97	7.61	8.10	90.9
Unemployment (%)	5.28	2.50	0.7	29.9

N=32,642

commonly used as the standard for the operating margin among U.S. hospitals (Zelman, McCue, Millikan, and Glick, 2003: 125). Although the range of the total profit margin is quite large, from -479.8 percent to 99.7 percent, it is not very surprising given the wide

operational and market variations among the U.S. acute-care general community hospitals. Likewise, the range of the proportion of the nursing FTEs in the total FTEs in the hospital and its subsidiary institutions is very large (from 1.91% to 99.0%), relative to its mean (28.22%) and standard deviation (6.24%). Also, a wide range (from 0.0 to 5.1) of the number of HHAs per 1,000 elderly persons in the county is observed. Further examination of the observations related to these potential outliers found no particularly unreasonable data. Also, all these potential outliers were calculated using original values rather than imputed values. Thus, these values should be acceptable. Other continuous variables such as the number of hospital beds, hospital CMI, elderly population proportion and growth rate in the county, FP and NFP hospital market penetration ratios, and county per-capita income and unemployment rate have reasonable ranges and means.

Hospital Statistics by Year, 1997-2003

In order to examine the data in a more sensible way, descriptive statistics for the study variables are presented by year. These statistics provide more key characteristics specific to hospitals included in the sample each year, revealing the change in characteristics of interest of the sampled hospitals over the study period. A test statistic (F-value) to assess whether the means of a particular variable are equal across the years is also provided. As shown in Table 10, the proportion of hospitals offering HH care decreases from 60 percent to 42 percent and this decrease is statistically significant. The composition of hospitals by ownership type is by contrast generally stable between 1997 and 2003. The mean of Medicare proportions drops significantly in 1999, but else remain consistent. The mean of hospital total profit margins declines significantly from 2.46

Table 10. Descriptive Statistics of the Study Variables, By Year

Year	1997	1998	1999	2000	2001	2002	2003
N	4,778	4,752	4,682	4,641	4,610	4,587	4,592
Statistics / Variable (F value)	Mean (Std.dev) [min,max]	Mean (Std.dev) [min,max]	Mean (Std.dev) [min,max]	Mean (Std.dev) [min,max]	Mean (Std.dev) [min,max]	Mean (Std.dev) [min,max]	Mean (Std.dev) [min,max]
HH provision (92.8***)	0.60	0.58	0.55	0.50	0.47	0.45	0.42
	(0.49)	(0.49)	(0.50)	(0.50)	(0.50)	(0.50)	(0.49)
	[0,1]	[0,1]	[0,1]	[0,1]	[0,1]	[0,1]	[0,1]
Public (1.15)	0.26	0.26	0.25	0.25	0.25	0.24	0.24
	(0.44)	(0.44)	(0.44)	(0.43)	(0.43)	(0.43)	(0.43)
	[0,1]	[0,1]	[0,1]	[0,1]	[0,1]	[0,1]	[0,1]
Religious (0.13)	0.11	0.11	0.11	0.12	0.12	0.11	0.12
	(0.32)	(0.32)	(0.32)	(0.32)	(0.32)	(0.32)	(0.32)
	[0,1]	[0,1]	[0,1]	[0,1]	[0,1]	[0,1]	[0,1]
Secular (1.09)	0.48	0.49	0.49	0.49	0.50	0.50	0.49
	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)
	[0,1]	[0,1]	[0,1]	[0,1]	[0,1]	[0,1]	[0,1]
For-profit (0.56)	0.15	0.14	0.14	0.14	0.14	0.14	0.15
	(0.35)	(0.35)	(0.35)	(0.35)	(0.35)	(0.35)	(0.36)
	[0,1]	[0,1]	[0,1]	[0,1]	[0,1]	[0,1]	[0,1]
Medicare (%) (4.46***)	49.16	48.37	47.68	49.06	48.84	49.32	49.20
	(19.02)	(18.78)	(19.15)	(19.13)	(19.01)	(18.67)	(19.36)
	[0,99]	[0,100]	[0,100]	[0,100]	[0,96]	[0,96]	[0,100]
Margin (%) (19.72***)	2.46	1.52	1.01	0.94	0.67	0.67	0.65
	(11.64)	(9.18)	(10.16)	(10.96)	(8.64)	(9.96)	(10.72)
	[-485,83]	[-196,68]	[-307,79]	[-284,76]	[-146,77]	[-391,72]	[-471,100]
Nursing (%) (20.78***)	28.71	28.63	28.46	28.24	27.69	27.70	28.10
	(6.38)	(6.41)	(6.34)	(5.88)	(6.04)	(6.06)	(6.49)
	[4.1,99.0]	[5.4, 91.3]	[1.9,80.9]	[6.9,63.5]	[5.7,83.1]	[6.5,90.9]	[5.9,84.6]
HHA/elderly (26.42***)	0.35	0.35	0.35	0.32	0.30	0.30	0.30
	(0.37)	(0.38)	(0.40)	(0.36)	(0.35)	(0.35)	(0.34)
	[0.0,4.8]	[0.0,4.7]	[0.0,5.0]	[0.0,5.0]	[0.0,5.1]	[0.0,3.6]	[0.0,3.6]
Hospital size (0.12)	171.57	170.15	170.17	170.40	172.15	171.11	169.61
	(175.09)	(174.26)	(175.74)	(177.62)	(179.90)	(179.85)	(181.73)
	[6,2518]	[6,2278]	[6,2346]	[6,2121]	[6,2112]	[2,2163]	[6,2146]

Table 10 (continued)

Year	1997	1998	1999	2000	2001	2002	2003
N	4,778	4,752	4,682	4,641	4,610	4,587	4,592
Statistics / Variable (F value)	Mean (Std.dev) [min,max]	Mean (Std.dev) [min,max]	Mean (Std.dev) [min,max]	Mean (Std.dev) [min,max]	Mean (Std.dev) [min,max]	Mean (Std.dev) [min,max]	Mean (Std.dev) [min,max]
CMI (14.11***)	1.28	1.25	1.28	1.26	1.24	1.24	1.25
	(0.25)	(0.26)	(0.25)	(0.26)	(0.26)	(0.26)	(0.27)
	[0.5,3.1]	[0.5,3.7]	[0.6,3.7]	[0.4,3.7]	[0.5,3.6]	[0.5,3.6]	[0.5,3.2]
Elderly (%) (2.47*)	13.97	14.01	13.96	13.75	13.85	13.86	13.86
	(3.95)	(3.96)	(3.93)	(3.87)	(3.94)	(3.96)	(3.94)
	[3.0,35.9]	[3.4,36.6]	[3.4,36.2]	[3.0,34.2]	[3.1,34.3]	[3.0,34.7]	[3.4,34.6]
Growth (%) (150.41***)	0.22	0.88	0.17	1.25	1.17	0.76	0.69
	(2.43)	(2.14)	(2.04)	(2.86)	(2.73)	(1.48)	(2.45)
	[-15,23]	[-12,18]	[-12,21]	[-19,38]	[-23,27]	[-8,49]	[-10,19]
FP market (%) (1.45)	12.97	12.84	12.14	12.13	11.99	12.03	12.58
	(23.36)	(23.24)	(22.89)	(22.92)	(22.99)	(23.04)	(23.55)
	[0,100]	[0,100]	[0,100]	[0,100]	[0,100]	[0,100]	[0,100]
NFP market (%) (1.45)	87.03	87.16	87.86	87.87	88.01	87.97	87.42
	(23.36)	(23.24)	(22.89)	(22.92)	(22.99)	(23.04)	(23.55)
	[0,100]	[0,100]	[0,100]	[0,100]	[0,100]	[0,100]	[0,100]
System (5.10***)	0.48	0.50	0.51	0.51	0.52	0.52	0.53
	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)
	[0,1]	[0,1]	[0,1]	[0,1]	[0,1]	[0,1]	[0,1]
Teaching (0.05)	0.06	0.06	0.06	0.06	0.06	0.06	0.06
	(0.23)	(0.23)	(0.23)	(0.23)	(0.24)	(0.23)	(0.24)
	[0,1]	[0,1]	[0,1]	[0,1]	[0,1]	[0,1]	[0,1]
HH CON (0.02)	0.29	0.29	0.29	0.29	0.29	0.29	0.29
	(0.45)	(0.46)	(0.45)	(0.46)	(0.46)	(0.46)	(0.46)
	[0,1]	[0,1]	[0,1]	[0,1]	[0,1]	[0,1]	[0,1]
Rural (0.36)	0.47	0.47	0.48	0.48	0.48	0.48	0.48
	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)
	[0,1]	[0,1]	[0,1]	[0,1]	[0,1]	[0,1]	[0,1]
Income ($000) (44.37***)	24.41	25.78	26.15	26.23	26.26	26.53	26.49
	(6.93)	(7.27)	(7.72)	(8.09)	(8.14)	(7.54)	(7.35)
	[8.1,73.7]	[8.7,76.3]	[9.3,84.3]	[9.7,90.9]	[9.5,90.4]	[10.0,81.0]	[10.1,78.7]

Table 10 (continued)

Year	1997	1998	1999	2000	2001	2002	2003
N	4,778	4,752	4,682	4,641	4,610	4,587	4,592
Statistics / Variable (F value)	Mean (Std.dev) [min,max]	Mean (Std.dev) [min,max]	Mean (Std.dev) [min,max]	Mean (Std.dev) [min,max]	Mean (Std.dev) [min,max]	Mean (Std.dev) [min,max]	Mean (Std.dev) [min,max]
Unemploy-ment (%) (272.09***)	5.39 (2.66) [1,28]	5.03 (2.59) [1,28]	4.75 (2.45) [1,30]	4.55 (2.35) [1,28]	5.17 (2.30) [1,24]	5.93 (2.29) [1,25]	6.16 (2.38) [1,24]

* p<0.05; ** p<0.01; *** p<0.001

percent to 0.65 percent, with a dramatic drop of nearly 1 percent in 1998. Wide variations in total profit margin ranges are also observed. For example, the range is [-147%, 72%] in 1998 and [-471%, 100%] in 2003. The nursing FTE proportion gradually and significantly decreased between 1997 and 2001 and slightly increased afterward.

In addition, the statistics concerning hospital size and teaching status are quite consistent across time. On the other hand, the statistics of hospital CMI and system affiliation differ significantly among the years. Generally there is a declining trend in overall hospital CMI from 1997 through 2003. During the same period, the percentage of acute-care general community hospitals affiliated with a health system increased from 48 percent to 53 percent.

In terms of the market factors, FP and NFP market penetration ratios, state HH CON requirement, and rural versus urban location generally remained consistent in the study years. Yet the context regarding the number of HHAs per 1,000 elderly persons, elderly population proportion and growth rate, county per-capita income and unemployment rate differed significantly across time. The number of HHAs per 1,000 elderly persons declined significantly across the study period. The standard deviations

and ranges were consistent across time. The mean of the fraction of elderly in the population is statistically significant different across the years, the variations are in fact small, ranging from 13.75 percent to 14.01 percent. And, the mean of the elderly population growth rate in these years differ significantly among hospitals as well as across years. Examination of the related observations reveals no special problems. In addition, the mean of the per-capita income of the counties where the sampled hospitals were located increased gradually and significantly, from $24,410 in 1997 to $26,530 in 2002 and slightly fell to $26,490 in 2003. The statistics for the county unemployment rate declined from 5.39 percent in 1997 to 4.55 percent in 2000 and then rose to 6.16 percent in 2003. No additional significant differences are observed for these factors.

Correlations among Variables

Table 11 shows the correlation coefficients between the dependent variable and independent variables as well as correlation coefficients among independent variables. The coefficients significantly different from zero at the 0.05 significance level are highlighted with a bold font. As expected, the dependent variable, hospital provision of HH care in a particular year, is significantly correlated with all the independent variables except for hospital teaching status. Public and nonprofit hospitals are positively correlated with HH provision while for-profit hospitals are negatively correlated with HH provision. Medicare proportion, hospital total profit margin, HHA availability, hospital size, CMI, elderly population proportion, NFP hospital market penetration, and rural location are positively correlated with HH provision. On the other hand, HH provision is negatively correlated with nursing FTE proportion, elderly population growth rate, FP

Table 11. The Correlation Coefficients between the Study Variables

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1.hh provision	**1.000**																				
2.public	**0.044**	**1.000**																			
3.religious	**0.047**	**-0.208**	**1.000**																		
4.secular	**0.031**	**-0.569**	**-0.354**	**1.000**																	
5.for-profit	**-0.141**	**-0.236**	**-0.147**	**-0.402**	**1.000**																
6.medicare	**0.059**	**-0.134**	**0.021**	**0.026**	**0.110**	**1.000**															
7.margin	**0.066**	**-0.012**	0.002	0.009	-0.001	0.005	**1.000**														
8.nursing	**-0.014**	**-0.074**	**-0.032**	**-0.107**	**0.274**	**0.190**	**0.023**	**1.000**													
9.HHA/elderly	**0.234**	**0.212**	**-0.047**	**-0.131**	**-0.034**	**-0.043**	**-0.015**	-0.005	**1.000**												
10.hospital size	**0.066**	**-0.187**	**0.114**	**0.117**	**-0.039**	**-0.158**	**0.057**	-0.001	**-0.207**	**1.000**											
11.cmi	**0.021**	**-0.300**	**0.160**	**0.095**	**0.091**	0.009	**0.091**	**0.104**	**-0.266**	**0.666**	**1.000**										
12.elderly	**0.110**	**0.116**	**-0.059**	**0.021**	**-0.120**	**0.091**	**-0.025**	**-0.068**	**0.157**	**-0.202**	**-0.281**	**1.000**									
13.growth	**-0.026**	**-0.034**	**-0.014**	-0.008	**0.067**	**-0.032**	**0.028**	**0.028**	**-0.094**	**-0.028**	**0.030**	**-0.215**	**1.000**								
14.fp market	**-0.074**	**-0.192**	**-0.067**	**-0.264**	**0.677**	**0.085**	0.011	**0.222**	**-0.041**	**0.058**	**0.134**	**-0.129**	**0.095**	**1.000**							
15.nfp market	**0.074**	**0.192**	**0.067**	**0.264**	**-0.677**	**-0.085**	-0.011	**-0.222**	**0.041**	**-0.058**	**-0.134**	**0.129**	**-0.095**	**-1.000**	**1.000**						
16.system	**-0.083**	**-0.278**	**0.256**	**-0.111**	**0.270**	**0.024**	0.007	**0.158**	**-0.098**	**0.133**	**0.228**	**-0.118**	**0.030**	**0.240**	**-0.240**	**1.000**					
17.teaching	-0.010	**-0.023**	**-0.013**	**0.079**	**-0.073**	**-0.126**	0.007	**-0.050**	**-0.082**	**0.533**	**0.411**	**-0.099**	**-0.070**	**-0.026**	**0.026**	**0.042**	**1.000**				
18.HH CON	**-0.092**	0.009	**-0.038**	**0.014**	0.004	**-0.033**	**-0.033**	**0.017**	**-0.139**	**0.076**	**-0.033**	**-0.101**	**0.039**	**0.022**	**-0.022**	**-0.035**	**0.023**	**1.000**			
19.rural	**0.123**	**0.305**	**-0.111**	**-0.087**	**-0.152**	0.008	**-0.019**	**-0.074**	**0.324**	**-0.468**	**-0.559**	**0.401**	**-0.064**	**-0.155**	**0.155**	**-0.201**	**-0.226**	**0.055**	**1.000**		
20.income	**-0.095**	**-0.221**	**0.079**	**0.128**	**0.020**	**-0.049**	**0.013**	**-0.013**	**-0.214**	**0.396**	**0.422**	**-0.201**	-0.009	0.008	-0.008	**0.095**	**0.262**	**-0.041**	**-0.523**	**1.000**	
21.unemploy	**-0.054**	**0.073**	**-0.026**	**-0.064**	**0.026**	-0.009	**-0.055**	**-0.020**	**-0.018**	**-0.092**	**-0.165**	**-0.056**	**-0.033**	**0.037**	**-0.037**	**-0.017**	**-0.033**	**0.154**	**0.163**	**-0.326**	**1.000**

The coefficients in bold font are significantly different from 0.0 at the 0.05 significance level.

hospital market penetration, system affiliation, presence of the state HH CON program, and per-capita income as well as the unemployment rate in the county.

All the relationships are consistent with the expectation of this study except for three variables including nursing FTE proportion, HHA availability (the number of HHAs per 1000 elderly people), elderly population growth rate, and county per-capita income. As described in the Variables and Measures section in Chapter 4, this study hypothesizes that nursing density measured by the ratio of nursing FTEs to total FTEs in the hospital and its subsidiary should be positively correlated with hospital provision of HH care. Also, HHA availability in the market, which is an inverse measure of transaction uncertainty, is expected to be associated negatively with HH provision. In addition, the normative pressure on hospitals for offering HH care (as measured by elderly population growth rate) and local ability to pay for health care (as measured by per-capital income) are expected to be correlated positively with hospital provision of HH care. Yet these two variables are correlated negatively with HH provision.

It can also be seen from Table 11 that the independent variables are correlated with each other. Although some coefficients are quite large (greater than 0.5), they show relationships in accordance with common knowledge. For example, FP hospital market penetration is highly correlated with for-profit hospital. Also, larger hospitals are very likely to be teaching hospitals and to have a higher CMI. Rural hospitals tend to have a lower CMI compared to urban hospitals. Finally, examination of the coefficients in Table 11 demonstrates that no correlations are indeed high enough to raise the issue of multicollinearity.

Results of Bivariate Analyses

Comparison of Statistics between HH-Providing and Non-Providing Hospitals

Table 12 provides a comparison of the key statistics between hospitals offering HH care (denoted by "With HH") and those not offering HH care (denoted by "W/O HH") by year from 1997 to 2003. The significant differences in means of the characteristics between the HH-providing hospital group and the HH-non-providing group are tested. It can be seen from Table 12 that HH-providing hospitals and non-providing hospitals differ significantly in most of the organizational and market characteristics. First, the ownership mix differs between the two groups in most of the years. The difference in ownership mix became even more evident in later years. In 1997, only the share of religious hospitals is found to be significantly different between the HH-providing and non-providing groups. However, the share of each ownership type is significantly different between the two groups beginning in 2000. In 2003, for example, 54.1 percent of HH-providing hospitals are secular hospitals, followed by public hospitals (26.7%), religious hospitals (12.8%), and for-profit hospitals (6.3%). For HH non-providing hospitals, only 46 percent are secular nonprofits, followed in turn by public hospitals (22.4%, less than its share in the providing group), for-profits (21%, much more than its share in the providing group), and religious nonprofits (10.6%, less than its share in the providing group).

More dramatic changes across time in the ownership mix between the two groups are observed in particular for secular nonprofit and for-profit hospitals. In 1997, the share of secular hospitals was almost equivalent between the HH-providing and non-providing

Table 12. Characteristics of HH Providing and Non-providing Hospitals, By Year

Variable	1997			1998			1999			2000			2001			2002			2003		
	With HH	W/O HH		With HH	W/O HH		With HH	W/O HH		With HH	W/O HH		With HH	W/O HH		With HH	W/O HH		With HH	W/O HH	
N	2847	1931		2770	1982		2597	2085		2340	2301		2162	2448		2045	2542		1912	2680	
Ownership																					
Public (%)	26.2	26.1		26.1	24.8		27.6	22.8	***	27.7	22.0	***	27.2	22.6	***	27.2	22.3	***	26.7	22.4	***
Religious (%)	12.7	9.3	***	12.5	9.6	**	13.1	9.5	***	13.4	9.9	***	13.6	10.0	***	12.5	10.4	*	12.8	10.6	*
Secular (%)	47.0	49.0		48.5	49.1		49.1	48.8		52.0	46.7	***	52.6	46.9	***	53.9	47.3	***	54.1	46.0	***
For-profit (%)	14.1	15.6		13.0	16.5	***	10.2	18.8	***	6.9	21.4	***	6.6	20.4	***	6.4	20.0	***	6.3	21.0	***
Organizational factors																					
Medicare (%)	50.4	47.4	***	49.6	46.6	***	48.7	46.4	***	49.8	48.4	*	49.8	48.0	**	50.4	48.4	***	50.9	48.0	***
Margin (%)	3.19	1.38	***	2.22	0.55	***	1.53	0.36	***	1.56	0.32	***	1.23	0.17	***	1.09	0.34	*	1.21	0.25	**
Nursing (%)	28.9	28.4	*	28.7	28.6		28.4	28.5		28.0	28.5	**	27.4	28.0	***	27.5	27.9	*	27.7	28.4	***
Hospital size	180	160	***	179	157	***	180	158	***	184	157	***	187	159	***	185	160	***	184	160	***
CMI	1.29	1.26	***	1.26	1.24	**	1.28	1.28		1.27	1.26		1.25	1.24		1.25	1.24		1.25	1.26	
Market factors																					
HHA/elderly	0.42	0.26	***	0.42	0.25	***	0.43	0.26	***	0.40	0.23	***	0.39	0.22	***	0.39	0.22	***	0.39	0.23	***
Elderly (%)	14.3	13.6	***	14.3	13.5	***	14.3	13.5	***	14.2	13.3	***	14.3	13.4	***	14.4	13.4	***	14.4	13.5	***
Growth (%)	0.12	0.35	**	0.88	0.89		0.13	0.23		1.26	1.24		1.17	1.17		0.64	0.86	***	0.68	0.69	
FP market (%)	13.3	12.5		12.6	13.2		10.8	13.8	***	9.4	14.9	***	9.2	14.5	***	9.0	14.5	***	9.2	15.0	***
NFP market(%)	86.7	87.5		87.4	86.8		89.2	86.2	***	90.6	85.1	***	90.8	85.5	***	91.0	85.5	***	90.8	85.0	***

Table 12 (continued)

Variable	1997			1998			1999			2000			2001			2002			2003		
	With HH	W/O HH		With HH	W/O HH		With HH	W/O HH		With HH	W/O HH		With HH	W/O HH		With HH	W/O HH		With HH	W/O HH	
Control variables																					
System (%)	47.6	48.7		49.0	51.6		47.2	54.8	***	46.4	56.5	***	45.7	57.4	***	45.7	57.6	***	46.2	57.8	***
Teaching (%)	5.3	6.7	*	5.3	6.6		5.4	6.3		6.0	5.7		6.0	5.8		5.9	5.8		5.9	6.2	
HH CON (%)	24.1	36.7	***	24.0	36.7	***	24.6	34.9	***	25.0	33.9	***	26.4	31.9	***	26.5	31.7	***	26.8	31.2	**
Rural (%)	51.1	40.9	***	51.8	41.0	***	53.4	40.4	***	54.5	41.0	***	54.9	41.8	***	55.6	42.3	***	56.6	42.0	***
Income ($000)	23.9	25.2	***	25.2	26.6	***	25.5	26.9	***	25.6	26.9	***	25.6	26.9	***	25.8	27.1	***	25.7	27.1	***
Unemployment (%)	5.29	5.54	**	4.97	5.12	*	4.67	4.84	*	4.46	4.65	**	5.10	5.22		5.78	6.06	***	6.07	6.23	*

* $p<0.05$; ** $p<0.01$; *** $p<0.001$

groups. In the same year, the share of for-profit hospitals did not differ significantly between the two groups. However, the secular ownership type took a much larger share in the HH-providing group than in the non-providing group (54% vs. 46%) in 2003. In the same year, the for-profit ownership type played a significantly smaller role in the HH-providing group than in the non-providing group (6% vs. 21%). In fact, the for-profit ownership type accounted for over 90 percent of the total difference in ownership mix between HH-providing and non-providing groups from 1997 to 2003. In other words, the role of for-profit hospitals in providing HH care became much less important after the BBA, while secular hospitals took on a significantly larger share of the HH care market post-BBA. The shares of public and religious nonprofit hospitals in the HH-providing group increased initially but declined in later years during the study period. Overall, the role of these two ownership types in the HH-providing group did not change dramatically.

Hospitals offering HH care have significantly higher percentages of inpatient days contributed by Medicare patients than have the hospitals not offering HH care. This relation is consistent across the study period. Also, the hospital total profit margin and the hospital size are greater for hospitals offering HH care than for those not offering HH care. These findings are in accordance with the expectations that larger or more profitable hospitals are more likely to offer their own HH services. Contrary to expectations, the nursing FTE proportion is significantly higher for HH-providing hospitals than for not providing hospitals only in 1997 (pre-BBA). In the post-BBA years, this figure is either comparable or significantly higher for non-HH-providing hospitals

than for providing hospitals. In addition, hospital CMI is a factor that distinguishes HH providing and non-providing hospitals only for the first two years in the study period. This may imply that CMI is no longer a critical consideration concerning HH provision in the post-BBA era.

With respect to the market characteristics, significant differences are also observed between the HH-providing and non-providing groups in most of the years during the study period. HHA availability in the local market, as measured by the number of HHAs per 1,000 elderly people in the county, is significantly higher for the HH-providing group than for the non-providing group. This relation is contradicted to the expectation. As expected, HH-providing hospitals were located in counties with higher proportions of people age 65 or over than were non-providing hospitals. However, there is no consistent pattern regarding elderly population growth rate between the HH-providing and non-providing groups. In addition, HH-providing hospitals were located in counties with lower FP hospital market penetration than were non-providing hospitals. This relationship became particularly clear after the BBA.

Differences in the key characteristics between HH providing and non-providing hospitals are also noted. System membership is a significant factor differentiating HH providing and non-providing hospitals for most of the post-BBA period. In these years, system-affiliated hospitals were significantly more represented in non-HH-providing hospitals than in HH-providing hospitals. The proportion of teaching hospitals is significantly different between the HH-providing and non-providing groups before the BBA but similar post-BBA. Moreover, HH-providing hospitals were less likely than

non-providing hospitals to be located in states with a HH CON program. On the other hand, HH-providing hospitals were more likely located in rural areas than were non-providing hospitals. Finally, in the study period, HH-providing hospitals were more likely than non-providing hospitals to be located in counties with lower per-capita income as well as unemployment rates.

Comparison of the Percentage Offering HH Services among Ownership Types

Table 13 presents the percentage of hospitals offering HH care within each ownership type across the study period. In 1997, before the BBA was implemented, more than half of hospitals with each ownership form provided HH care. The percentage of hospitals providing HH care is highest among religious nonprofit hospitals (67%), followed by public hospitals (60%), secular nonprofits (59%), and for-profit hospitals (57%). The percentage declines significantly over time for all ownership types after the implementation of the BBA. Of most interest is whether hospitals in different ownership structures differ in the reduction of HH provision post-BBA. Among the ownership types, for-profit hospitals experienced the largest drop of the percentage of offering HH care (39%) between 1997 and 2003, followed in turn by religious nonprofits (21%), public hospitals (14%), and secular nonprofits (13%).

In order to get a visual interpretation of the change in HH provision by different hospital ownership types, a graphical presentation of Table 13 is shown in Figure 12. A number of trends in HH provision can be drawn from the figure. First, the percentage of nonprofit hospitals offering HH care in general declined linearly from 1997 through 2003. However, the overall reduction range is higher for religious nonprofits than for secular

Table 13. Percentage of Hospitals Offering HH Services, By Ownership Type, 1997-2003

Ownership \ Year	1997	1998	1999	2000	2001	2002	2003	F value
Public	60%	60%	60%	56%	52%	50%	46%	15.18***
Religious	67%	64%	63%	58%	54%	49%	46%	13.64***
Secular	59%	58%	56%	53%	50%	48%	46%	23.75***
For-profit	57%	52%	40%	25%	22%	20%	18%	89.11***
Total	60%	58%	55%	50%	47%	45%	42%	92.80***

* p<0.05; ** p<0.01; *** p<0.001

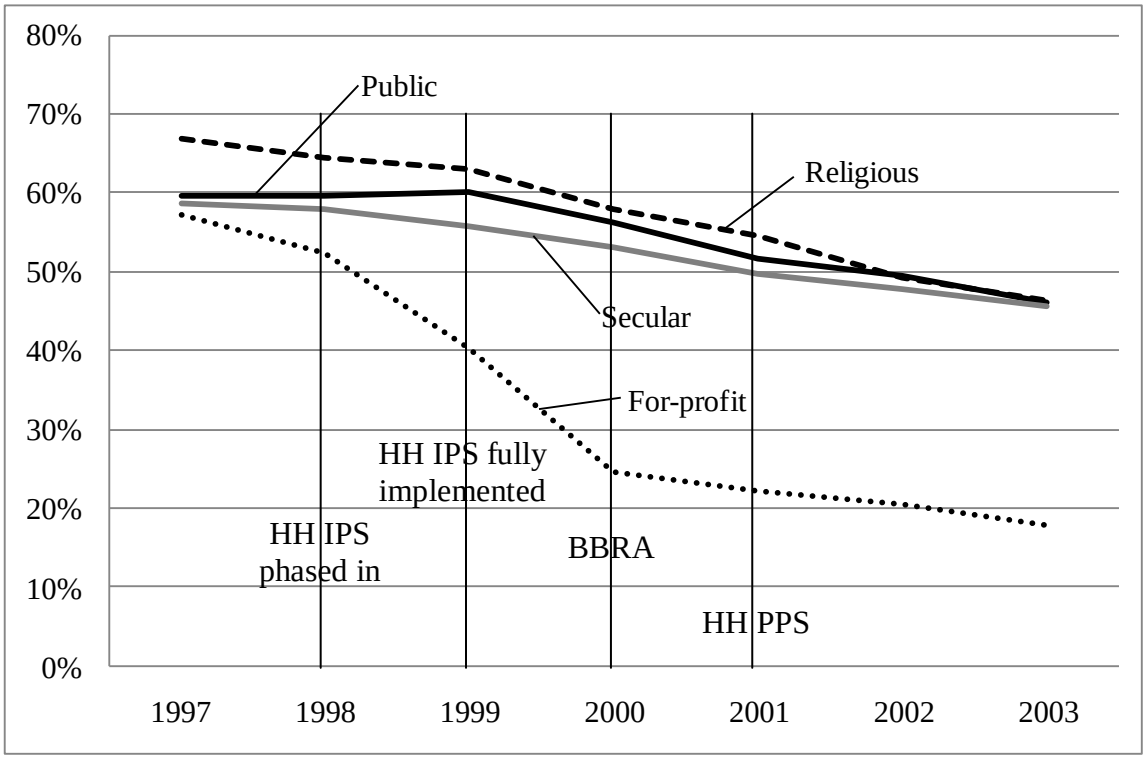

Figure 12. Hospital Home Health Trends, By Hospital Ownership Type, 1997-2000

nonprofit and public hospitals. Second, public hospitals' percentage of providing HH care started decreasing after 1999. The reduction in HH provision for public and religious hospitals was similar between 1999 and 2001. The slope of public hospitals is similar to

that of secular hospitals between 2001 and 2003. Third, the percentage of for-profit hospitals offering HH care dropped dramatically between 1997 and 2000, compared to other ownership types. However, between 2000 and 2003, the reduction by public hospitals is comparable to those of other ownership types. Finally, it can be seen from Figure 12 that for-profit hospitals overall behave very differently from public and private not-for-profit hospitals, particularly in the years 1997 through 2000.

Results of Multivariate Analyses

The bivariate analysis discussed above provides an initial understanding of the major relationship of interest. However, as mentioned in Chapters 3 and 4, there might be other underlying mechanisms influencing hospitals' decisions to offer HH care or not.
If these factors are correlated systematically with the ownership types, the results just discussed are biased. Therefore, these factors need to be controlled in order to isolate the effects of ownership types on hospital HH provision. Also, some of these factors have theoretical and practical relevance, thus meriting examination. This section presents the results of multivariate analyses taking all the relevant factors into account.

Model Selection

An appropriate model needs to be selected before the analysis is conducted. As mentioned in Chapter 4, this study is potentially subject to a number of issues including hospital closure or non-response, state policy effects, and sample selection biases due to the imputation for missing values or outliers in the independent variables. First, for testing the effect of hospital closure and nonresponse, a logit model as specified in the "Econometric Approach and Model Specification" section in Chapter 4 with the variables

listed in Table 8 plus a dummy variable (Closure) and the interaction terms of closure and year dummy variables is estimated. The results of this model are shown in the first column of Appendix 1. The coefficients of the variable *closure* and the interaction term between *closure* and year 2002 are significantly different from 0 at the significance level of 0.05, suggesting that the effect of closure is present. Both coefficients are negative, suggesting that hospitals with closure or non-response were more likely than those without such issues to not offer HH care before and to reduce HH care after the BBA (particularly for 2002).

Second, in order to test the significance of the state effect, two models are compared. More specifically, another logit model with the same specification as described in the previous paragraph except for replacing the state HH CON with a set of state dummy variables is estimated. The result of this model is shown in the second column of Appendix 1. Empirical evidence indicating state effects can be found from the result. Many coefficients of the state variables are significantly different from zero at the conventional significance levels. Also, the joint test that all the coefficients of the state variables equal to 0 yields a χ^2 (chi-squared) statistic 287.38 with 50 degree of freedom. The probability that a χ^2 value is greater than 287.38 is lower than 0.0001. Thus, the null hypothesis is rejected. In other words, there are significant state effects. Also, a number of coefficients change dramatically from the first model to the second model. For example, the coefficients of religious and secular ownership variables in model 1 are 0.430 and 0.085, respectively. The coefficients become 0.658 and 0.247 in model 2. There is a 53 percent and a 191 percent increase for the two coefficients, respectively.

This is a sign that these two models differ significantly. Based on the fact that the pseudo R^2 improves prominently from the basic model (0.125) to the model with a comprehensive set of state dummy variables (0.157), this study includes the state dummy variables rather than the state HH CON variable.

Finally, the potential issue related to sample selection resulting from the imputation for missing values or/and outliers in a number of the independent variables is tested. This test is done by including the four dummy variables margin_d, pop_d, and cmi_d, and income_d indicating observations with imputation of the entire sample mean for the variables margin, pop, cmi, and income, respectively. Since year effects are a major interest here, each of the four missing dummy variables is also interacted with the year dummy variables and added to the second model discussed in the previous paragraph. Results of this sample selection test are shown in the last column of Appendix 1. Only the coefficients of cmi_d and margin_d are significant at the 0.05 significance level, implying that only the imputation for the two variables, cmi and margin, could cause sample selection biases. Also, the coefficient of the interaction term between margin and year'03 are statistically significant. Thus, the three terms, cmi_d, margin_d, and margin x year'03, are included in the final analysis model in order to control for the effects resulting from the value imputation. In addition, the result of the third model shows that the coefficients of the variable closure and its interaction term with year 2002 are also significant at the 0.05 level. Hence, these two terms are included in the final analytical model, too.

Results of the Full Model

A logit model with a full set of organizational and market factors (described in Chapter 4) and year dummy variables representing years 1998 through 2003 was applied to test the hypotheses. The complete results are presented in Appendix 2. The results for year and ownership effects, organizational and market factors, and control variables are presented separately**.**

In Table 14, the coefficients of the year dummy variables represent the change in public hospitals' probability of offering HH care between 1997 and the corresponding year, after controlling for other factors. Positive changes in the probability of offering HH services are observed between 1997 and the six years following the implementation of the BBA. This means that holding constant all other factors, public hospitals were in fact more likely to provide HH care in the post-BBA years than in the pre-BBA year, 1997. However, the change in the probability of offering HH care among public hospitals is statistically significant only for the period between 1997 and 1999. Public hospitals' odds of offering HH care in 1999 were 1.88 times the odds in 1997. A joint test of the coefficients to the year terms results in a χ^2 statistic equal to 10.86 with a degree freedom of 6 (p value=0.0927), suggesting that the public hospitals' probability of offering HH care does not change significantly from pre- to post-BBA periods.

In the baseline year before the BBA was implemented, hospitals with different ownership forms differed significantly in the probability of providing HH care. Compared to public hospitals, hospitals in other ownership types were significantly more likely to offer HH care. The ratios of the probability of offering versus not offering HH

Table 14. Estimations of Year and Ownership Effects by Logistic Regression with a Full Set of Year Dummy Variables

Variable	Odds ratio	Coefficient	Standard error
Year effects (Base: 1997)			
Year'98	1.156	0.145	0.241
Year'99	1.880	0.631 *	0.274
Year'00	1.846	0.613	0.324
Year'01	1.878	0.630	0.334
Year'02	1.180	0.165	0.351
Year'03	1.170	0.157	0.358
Ownership effects			
Religious hospital	1.884	0.633 ***	0.132
Religious x year'98	0.891	-0.115	0.078
Religious x year'99	0.843	-0.171	0.098
Religious x year'00	0.793	-0.231 *	0.109
Religious x year'01	0.873	-0.136	0.118
Religious x year'02	0.775	-0.255 *	0.127
Religious x year'03	0.813	-0.207	0.133
Secular hospital	1.291	0.256 **	0.090
Secular x year'98	0.993	-0.007	0.050
Secular x year'99	0.895	-0.111	0.062
Secular x year'00	0.953	-0.048	0.073
Secular x year'01	1.031	0.031	0.079
Secular x year'02	1.041	0.040	0.083
Secular x year'03	1.120	0.113	0.088
For-profit hospital	1.591	0.464 *	0.184
For-profit x year'98	0.768	-0.263	0.135
For-profit x year'99	0.416	-0.876 ***	0.174
For-profit x year'00	0.284	-1.257 ***	0.209
For-profit x year'01	0.309	-1.173 ***	0.217
For-profit x year'02	0.306	-1.185 ***	0.223
For-profit x year'03	0.373	-0.987 ***	0.222

* $p<0.05$; ** $p<0.01$; *** $p<0.001$

Complete results are shown in Appendix 2.

care among religious hospitals, for-profit hospitals, and secular hospitals were 1.88, 1.59, 1.29 times, respectively, the ratios among their public counterparts.

Consistent with expectations, the relative changes in the probability of offering HH care from the pre- to the post-BBA periods between the for-profit and public hospital groups are all significantly different from zero except for year 1998 (in fact it is marginally significant in 1998, p value=0.05). For example, the ratio of the odds of offering HH care among for-profit versus public hospitals in 1999 was 0.768 times the ratio in 1997. In other words, the probability of offering versus not offering HH care was lower for for-profit as compared to public hospitals in response to the enactment of the BBA. Also, the probability of not offering versus offering HH care was much higher (3.5 times (1/0.284)) for for-profit as compared to public hospitals following the implementation of the BBA between 1997 and 2000. This relation is significant throughout the whole study period. Therefore, hypothesis 1a is supported. Nevertheless, for-profit hospitals' reduction in the likelihood of offering versus not offering HH care relative to that of public hospitals rose between 1997 and 2000 but declined between 2000 and 2003. The coefficients to the interaction terms between for-profit hospitals and year 1998 and between for-profit hospitals and year 2000 are statistically significant (χ^2 (1)= 22.66, p value<0.0001), while the coefficients to the interaction terms between the for-profit hospital and year 2000 and between the for-profit hospital and year 2003 are not statistically significant at the 0.05 significance level (χ^2 (1)= 2.62, p value =0.1056). Thus, compared to public hospitals, the change in the probability of offering versus not

offering HH care among for-profit hospitals is significant between 1997 and 2000, but not significant after 2000.

In addition, the relative changes in ratio of the probability of offering versus not offering HH between the for-profit and private nonprofit hospital groups after the implementation of the BBA are significantly different from zero. Table 15 provides the results concerning year and ownership effects on hospital provision and change in provision of HH care by applying a full model with private nonprofit hospitals (including religious and secular nonprofits) serving as the base group. The results suggest that for-profit hospitals were significantly less likely than their private nonprofit counterparts to continue offering HH care post-BBA. For example, the ratio of the odds of offering HH care among for-profit versus private nonprofit hospitals in 2003 was only 0.353 times the ratio in 1997. In other words, the probability of not offering versus offering HH care was significantly higher (nearly 3 times) for for-profit as compared to private nonprofit hospitals in response to the enactment of the BBA. Although the relative change between 1997 and 1998 is not statistically significant at the 0.05 level, a joint test of all the relative changes from 1997 to the post-BBA years are all zero results in a χ^2 (6) equal to 36.12 (p value<0.0001). This provides empirical evidence that for-profit hospitals were more likely than private nonprofit hospitals to reduce HH care post-BBA. Therefore, hypothesis 1b is supported.

On the other hand, the relative changes in the probability of offering versus not offering HH between the public and private nonprofit hospital groups after the implementation of the BBA are only significantly different from zero for the period between 1997 and 1999.

Table 15. Estimations of Year and Ownership Effects by Logistic Regression with a Full Set of Year Dummy Variables (Private NFPs Serve as Base group)

Variable	Odds ratio	Coefficient	Robust Standard Error	z	P>|z|
Year Effect (Base: 1997)					
1998	1.129	0.122	0.245	0.500	0.620
1999	1.642	0.496	0.278	1.780	0.075
2000	1.704	0.533	0.328	1.630	0.104
2001	1.872	0.627	0.339	1.850	0.065
2002	1.186	0.171	0.353	0.480	0.628
2003	1.268	0.237	0.361	0.660	0.511
Ownership Effect (Base: private nonprofits)					
Public	0.733	-0.310***	0.089	-3.490	0.000
Public x year'98	1.026	0.026	0.048	0.540	0.589
Public x year'99	1.131	0.123*	0.060	2.050	0.040
Public x year'00	1.082	0.079	0.070	1.120	0.262
Public x year'01	0.998	-0.002	0.076	-0.020	0.983
Public x year'02	1.011	0.011	0.081	0.140	0.890
Public x year'03	0.944	-0.057	0.085	-0.670	0.502
For-profit	1.141	0.131	0.181	0.730	0.467
For-profit x year'98	0.790	-0.236	0.134	-1.760	0.079
For-profit x year'99	0.471	-0.754***	0.173	-4.360	0.000
For-profit x year'00	0.309	-1.176***	0.206	-5.700	0.000
For-profit x year'01	0.309	-1.173***	0.214	-5.470	0.000
For-profit x year'02	0.310	-1.171***	0.221	-5.300	0.000
For-profit x year'03	0.353	-1.041***	0.220	-4.740	0.000
Other independent and control variables are not shown here					
Model Statistics					
Log pseudolikelihood = -18949.708					
Wald χ^2 (150)= 1582.37					
Prob (> Wald χ^2 (150)) <0.0001					
Pseudo R^2=0.1622					
N=32,642					

* p<0.05; ** p<0.01; *** p<0.001

A joint test of all the relative changes from 1997 to the post-BBA years are all zero results in a χ^2 (6) equal to 10.18 (p value =0.1174). This means that there is no considerable difference in the change in the probability of offering versus not offering HH care between public and private nonprofit hospitals post-BBA. Therefore, hypothesis 1c is not supported.

In addition, it can be noted from Table 14 that there may be differences between religious and secular nonprofit hospitals in the change in the ratio of the probability of providing versus not providing HH services after the BBA. Tests are conducted to examine whether the differences in coefficients between the two nonprofit ownership types are statistically significant following the estimation of the model reported in Appendix 2. The results of the tests shown in Table 16 suggest that the coefficients are not significantly different for years 1998 through 2001 but are significantly different for years 2002 and 2003. Contrary to expectations, secular nonprofit hospitals were more likely than religious nonprofit hospitals to continue providing HH care in 2002 and 2003 as compared to 1997. Also, different patterns of change in the probability of offering versus not offering HH are noted between religious and secular nonprofit hospital groups. Compared to public hospitals, religious hospitals were always more likely to reduce HH provision in the years following the implementation of the BBA. For secular hospitals, this only holds for two years, 1999 and 2000. In other post-BBA years, secular hospitals were less likely than their public counterparts to reduce HH provision. These findings provide initial evidence that hypothesis 1d is not supported. The difference in the change

Table 16. Test Results of the Significance of the Differences between Religious and Secular Nonprofit Hospitals in the Change in HH Provision Post-BBA

Year	Coefficients			χ^2 (1)	p value
	Secular x Year	Religious x Year	Difference		
1998	-0.007	-0.115	0.108	2.00	0.1569
1999	-0.111	-0.171	0.060	0.41	0.5240
2000	-0.048	-0.231*	0.184	2.23	0.0722
2001	0.031	-0.136	0.167	2.30	0.1290
2002	0.040	-0.255*	0.295*	6.34	0.0118
2003	0.113	-0.207	0.321**	6.84	0.0089
Post-BBA	0.009	-0.183*	0.192*	4.98	0.0256

* p<0.05; ** p<0.01; *** p<0.001

in the odds of offering HH care between religious and secular nonprofit hospitals in response to the BBA as a whole will be discussed in the next section.

Based on the results reported in Table 17, most of the organizational and market factors assumed to be relevant to hospitals' decisions to offer HH care are significantly associated with hospitals' likelihood of providing HH care. On average, a one percent increase in the Medicare proportion results in 1.009 times significantly more likely to offer versus not offer HH care. Therefore, hypothesis 2a is supported. Also, the result suggests that a one percent increase in hospital total profit margin results in 1.015 times the ratio of the probability of offering versus not offering HH care. This provides empirical evidence that hypothesis 3a is supported. In addition, one more hospital bed results in 1.002 times the ratio of the probability of offering to not offering HH care. This finding can be used to support hypothesis 6a. Furthermore, one point increase in the hospital case mix index on average results in 2.18 times the odds of offering HH care. This provides empirical evidence that hypothesis 7a is supported. Finally, hospitals

Table 17. Estimations of the Effects of Organizational and Market Factors by Logistic Regression with a Full Set of Year Dummy Variables

Variable	Odds ratio	Coefficient	Standard error
Organizational factors			
Medicare	1.009	0.009 ***	0.002
Medicare x year'98	1.001	0.001	0.002
Medicare x year'99	1.000	0.000	0.002
Medicare x year'00	0.999	-0.001	0.002
Medicare x year'01	1.002	0.002	0.002
Medicare x year'02	1.000	0.000	0.002
Medicare x year'03	1.003	0.003	0.002
Margin	1.015	0.015 ***	0.003
Margin x year'98	1.000	0.000	0.004
Margin x year'99	0.992	-0.008	0.004
Margin x year'00	0.994	-0.006	0.005
Margin x year'01	1.002	0.002	0.006
Margin x year'02	0.995	-0.005	0.008
Margin x year'03	1.000	0.000	0.007
Nursing	1.000	0.000	0.005
Nursing x year'98	0.988	-0.012 *	0.005
Nursing x year'99	0.994	-0.006	0.006
Nursing x year'00	0.984	-0.016 *	0.007
Nursing x year'01	0.984	-0.017 *	0.007
Nursing x year'02	0.997	-0.003	0.007
Nursing x year'03	0.988	-0.013	0.007
Hospital size	1.002	0.002 ***	<0.001
Hospital size x year'98	1.000	0.000	<0.001
Hospital size x year'99	1.000	0.000	<0.001
Hospital size x year'00	1.001	0.001	<0.001
Hospital size x year'01	1.001	0.001 **	<0.001
Hospital size x year'02	1.000	0.000	<0.001
Hospital size x year'03	1.000	0.000	<0.001
Hospital CMI	2.180	0.779 ***	0.216
CMI x year'98	1.026	0.026	0.167
CMI x year'99	0.684	-0.379 *	0.183
CMI x year'00	0.769	-0.263	0.215

Table 17 (continued)

Variable	Odds ratio	Coefficient	Standard error
CMI x year'01	0.613	-0.489 *	0.208
CMI x year'02	0.733	-0.311	0.218
CMI x year'03	0.641	-0.445	0.233
Market factors			
HHA/elderly	4.764	1.561 ***	0.190
HHA/elderly x year'98	1.030	0.029	0.087
HHA/elderly x year'99	0.855	-0.157	0.125
HHA/elderly x year'00	1.121	0.114	0.141
HHA/elderly x year'01	1.275	0.243	0.157
HHA/elderly x year'02	1.055	0.054	0.178
HHA/elderly x year'03	0.987	-0.013	0.198
Elderly proportion	1.023	0.023 *	0.010
Elderly x year'98	1.006	0.006	0.006
Elderly x year'99	1.002	0.002	0.008
Elderly x year'00	0.996	-0.004	0.009
Elderly x year'01	0.984	-0.016	0.010
Elderly x year'02	0.991	-0.009	0.010
Elderly x year'03	0.998	-0.002	0.011
Growth	1.016	0.016	0.015
Growth x year'98	1.015	0.015	0.020
Growth x year' 99	1.030	0.029	0.020
Growth x year' 00	1.007	0.007	0.018
Growth x year' 01	1.008	0.008	0.019
Growth x year '02	0.970	-0.031	0.024
Growth x year' 03	1.037	0.036	0.019
NFP hospital x FP market	1.001	0.001	0.003
NFP x FP market x year'98	1.000	0.000	0.002
NFP x FP market x year'99	0.998	-0.002	0.003
NFP x FP market x year'00	0.998	-0.002	0.003
NFP x FP market x year'01	0.997	-0.003	0.004
NFP x FP market x year'02	0.991	-0.009 *	0.004
NFP x FP market x year'03	0.989	-0.011 **	0.004
FP hospital x NFP market	0.996	-0.004	0.003

Table 17 (continued)

Variable	Odds ratio	Coefficient	Standard error
FP x NFP market x year'98	1.003	0.003	0.002
FP x NFP market x year'99	1.003	0.003	0.003
FP x NFP market x year'00	0.999	-0.001	0.004
FP x NFP market x year'01	0.998	-0.002	0.004
FP x NFP market x year'02	0.996	-0.004	0.004
FP x NFP market x year'03	0.991	-0.009 *	0.004

* p<0.05; ** p<0.01; *** p<0.001
Complete results are shown in Appendix 2.

located in a county with one percent more elderly population causes the ratio of the probability of offering to not offering HH services to rise by a factor of 1.023. Therefore, hypothesis 8a is supported.

Several factors are founded to be either not associated with hospital provision of HH care or in a way contrary to the expectation of this study. First, Table 17 suggests that one more HHA per 1,000 elderly people in the county results in 4.76 times the ratio of the probability of offering to not offering HH care in 1997, other relevant factors being equal. This finding contradicts hypothesis 5a which states that HHA resource availability is associated negatively with hospital provision of its own HH care. Therefore, hypothesis 5a is not supported.

In addition, an increase in the nursing FTE proportion has no discernable effect on the ratio of the probability of offering to not offering HH care (odds ratio=1.000). This suggests that nursing FTE proportion is not associated with hospital provision of HH care. Thus, hypothesis 4a is also not supported. Finally, elderly population growth rate in the county is associated positively with hospitals' probabilities of offering HH care. A one

percent increase in elderly population growth rate results in about 1.016 times the ratio of the probability of providing to not providing HH care. However, this coefficient is not statistically significantly different from zero at a 0.05 significance level. Therefore, hypothesis 9a is not empirically supported.

With respect to the interaction terms of the organizational/market factors and year dummy variables, most of the coefficients are non-significant at the 0.05 significance level. This implies that these factors in general are not associated with the change in hospitals' ratio of the probability of providing versus not providing HH care between 1997 and the corresponding years post-BBA. Yet there are a few exceptions. Hospital nursing FTE proportion is found to be associated negatively with hospitals' change in the ratio of the probability of offering versus not offering HH care in 1998, 2000, and 2001, compared to 1997. This implies that, contrary to expectations, hospitals with higher proportions of total FTEs contributed by nursing staff were more likely to reduce HH care in these years following the implementation of the BBA.

In addition, hospital size is noted to be associated negatively with the reduction in hospitals' ratio of the probability of providing versus not providing HH care between 1997 and 2001. This means that larger hospitals were significantly less likely than smaller hospitals to reduce HH care between 1997 and 2001. Moreover, hospital CMI is associated positively with the reduction in hospitals' probability of offering versus not offering HH services between 1997 and 1999 as well as 2001. For example, the result shows that an one point increase in CMI results in 0.684 times the ratio of the probability of offering versus not offering HH care in response to the enactment of the BBA between

1997 and 1999. Furthermore, there is a negative impact of for-profit hospital market penetration on public and private nonprofit hospitals' change in the probability of offering versus not offering HH care in the 1997-2002 and 1997-2003 periods. This implies that public and private nonprofit hospitals located in a county with higher FP hospital penetration are significantly more likely than those located in lower FP hospital penetration counties to reduce HH care between 1997 and 2002 or 2003.

Because there is in general a dearth of significant and consistent relationships between each of the organizational and market factors and hospitals' changes in the ratio of the probability of offering versus not offering HH care in the post-BBA years, hypotheses 2b, 3b, 4b, 5b, 6b, 7b, 8b, 9b, 10a, and 10b are not supported. These hypotheses will be reexamined later by using a reduced model investigating the joint effect of the post-BBA years.

Finally, the relationships between the control variables and hospitals' likelihood of offering HH care are presented in Table 18. All the coefficients are significant at conventional levels. First, the result suggests the odds of providing HH care among system-affiliated hospitals were 0.694 times the odds among their freestanding counterparts in the study period. In other words, system-affiliated hospitals were less likely than their freestanding counterparts to provide HH care in the study period.

During the same period, non-teaching hospitals' ratio of the probability of offering to not offering HH care was nearly 2 (1/0.526) times that of teaching hospitals. Also, the ratio of the probability of offering to not offering HH services among rural hospitals were 1.59 times the ratio among urban hospitals. Furthermore, a $1,000

Table 18. Results Showing the Relationship between Hospital Provision of HH Care and Control Variables in the Logit Model with a Full Set of Year Dummy Variables

Variable	Odds ratio	Coefficient	Standard error
Control variables			
System	0.694	-0.365 ***	0.060
Teaching	0.526	-0.642 ***	0.150
Rural	1.598	0.469 ***	0.085
Income	0.987	-0.013 *	0.006
Unemployment	0.966	-0.035 **	0.013
Closure	0.577	-0.550 ***	0.108
Closure x year'02	0.504	-0.686 *	0.327
CMI_d	0.195	-1.634 ***	0.364
Margin_d	0.490	-0.713 **	0.227
Margin_d x year'03	1.517	0.417 *	0.179

* p<0.05; ** p<0.01; *** p<0.001
Complete results are shown in Appendix 2.

increase in county per-capita income on average resulted in 1.01 (1/0.987) times the ratio of not offering to offering HH care. Finally, a 1 percent increase in county unemployment rate caused the ratio of the probability of not offering to offering HH care to rise by a factor of 1.04 in the period of 1997 through 2003. These suggest that all the control variables are negatively associated with hospitals' likelihood of offering HH care, except that rural hospitals are more likely than urban hospitals to offer HH care.

Results of the Reduced Model

Since the majority of the coefficients of the interaction terms between the organizational and market factors and year dummy variables are non-significant at the conventional level of 0.05, a reduced model is applied to examine the joint effect of the post-BBA years on the change in the likelihood of providing HH care as compared to the

pre-BBA year. In this model, a dummy variable (post_BBA) indicating the post-BBA period years 1998 through 2003 is used to replace all the year dummies in the full model. A shortened version of the results without showing the state effects is reported in Table 19 while the completed results are presented in Appendix 3.

The results of the reduced model are very similar to those of the full model. This model further confirms that the post-BBA effect on hospitals' changes in the probability of offering HH care is present for the for-profit hospital group compared to public hospitals. Thus, hypothesis 1a is supported. A test of significance of the difference in the coefficient for the interaction terms of ownership and post_BBA between for-profit and private nonprofit (including religious and secular nonprofits) results in a χ^2 (2) equal to 39.92 (p value<0.0001), suggesting that hypothesis 1b is also supported. However, a test of significance of the joint effect of secular and religious ownership on the change in probability of offering HH care post-BBA results in a χ^2 (2) equal to 5.19 (p value=0.0745). This means that there is no significant overall difference in the change in probability of offering HH care between public and private nonprofit hospitals after the implementation of the BBA. Thus, hypothesis 1c is not supported. Also, a test of the significance of the difference in the coefficient between religious and secular nonprofit hospitals after the BBA results in a χ^2 (1) equal to 4.98 (p value= 0.0256). Although the difference is statistically significant, the direction of the relationship is opposite to the expectation. It suggests that religious hospitals were more likely than secular nonprofit hospitals to reduce HH provision after the BBA. Therefore, hypothesis 1d is rejected.

Table 19. Results of the Reduced Logit Model with a Post-BBA Dummy Variable

Variable	Odds ratio	Coefficient	Standard error
Post-BBA (vs. Pre-BBA)	1.357	0.305	0.253
Ownership effects (vs. Public)			
Religious	1.865	0.623 ***	0.132
Religious x Post-BBA	0.833	-0.183 *	0.090
Secular	1.278	0.245 **	0.090
Secular x Post-BBA	1.009	0.009	0.059
For-profit	1.625	0.485 **	0.183
For-profit x Post-BBA	0.385	-0.956 ***	0.159
Organizational factors			
Medicare	1.009	0.009 **	0.002
Medicare x Post-BBA	1.000	0.000	0.002
Margin	1.015	0.015 ***	0.003
Margin x Post-BBA	0.996	-0.004	0.004
Nursing	1.000	0.000	0.005
Nursing x Post-BBA	0.990	-0.010	0.005
Hospital size	1.002	0.002 ***	0.000
Hospital size x Post-BBA	1.000	0.000	0.000
CMI	2.114	0.749 ***	0.214
CMI x Post-BBA	0.799	-0.224	0.165
Market factors			
HHA/elderly	4.956	1.601 ***	0.191
HHA/elderly x Post-BBA	1.073	0.070	0.113
Elderly	1.024	0.024 *	0.010
Elderly x Post-BBA	0.996	-0.004	0.007
Growth	1.015	0.015	0.015
Growth x Post-BBA	1.010	0.010	0.015
NFP x FP market	1.001	0.001	0.003
NFP x FP market x Post-BBA	0.996	-0.004	0.003
FP x NFP market	0.995	-0.005	0.003
FP x NFP market x Post-BBA	1.000	0.000	0.003
Control variables			
System	0.694	-0.366 ***	0.059
Teaching	0.533	-0.629 ***	0.148
Rural	1.576	0.455 ***	0.083

Table 19 (continued)

Variable	Odds ratio	Coefficient	Standard error
Income	0.983	-0.017 **	0.006
Unemployment	0.944	-0.057 ***	0.012
Closure	0.678	-0.388 ***	0.113
Closure x Post-BBA	0.937	-0.066	0.110
CMI_d	0.252	-1.380 ***	0.409
CMI _d x Post-BBA	0.701	-0.355	0.356
Margin_d	0.422	-0.863 ***	0.262
Margin_d x Post-BBA	1.271	0.240	0.214
Constant		-1.140 **	0.419
State variables are not shown here			
Model Statistics			
Log pseudolikelihood	-19201.629		
Wald χ^2 (88)	1365.6		
P(>Wald χ^2 (88))	<0.0001		
Pseudo R^2	0.151		
N	32642		

* p<0.05; ** p<0.01; *** p<0.001
Complete results are shown in Appendix 3.

The results of the reduced model concerning the effects of the organizational and market factors on HH provision before the BBA are close to those of the full model as the coefficients and significance of the related terms are very similar. Thus, the findings also support hypotheses 2a, 3a, 6a, 7a, and 8a, but fail to support hypotheses 4a, 5a, and 9a.

Of particular interest are the effects of these factors on the change in the probability of offering HH care after the BBA. It is clearly noted that all the coefficients to the interaction terms of these factors and post_BBA are not significant at the 0.05 significance level. These findings provide further evidence that hypotheses 2b, 3b, 4b, 5b, 6b, 7b, 8b, 9b, 10a, and 10b are not supported.

Sensitivity Analysis

As mentioned in Chapter 4, the data regarding the dependent variable, hospital provision of HH care in a particular year, came from two data sources including the HCRIS and AHA. The results discussed above are based on the data combining information from the two files using the HCRIS as the master source and AHA as the supplementary source. Although this arrangement of the data should result in the best data quality given the information available, it is necessary to conduct a sensitivity analysis to check potential inconsistencies in results due to this particular type of data arrangement. Because the two data files have their own strengths and weaknesses, this sensitivity analysis employs a different arrangement of the data sources to create a new dependent variable. That is, the AHA data are used as the master source and the HCRIS as the supplementary source. More specifically, this new dependent variable (hhprov_new) is coded as "1" if a hospital reported to the AHA survey that HH services are owned or provided by the hospital or its subsidiary and as "0" if HH services are provided through other arrangements. However, if a hospital did not report related information to the AHA survey but had non-zero HH revenues included in the HCRIS file in a particular year, the new HH provision variable is also coded as "1" and as "0" otherwise. Then a reduced logit model similar to that described in the previous section except using the new dependent variable is estimated.

A comparison of the result of this new model (AHA model) with that of the model (HCRIS model) presented in the previous section is reported in Appendix 4. The comparison suggests that the two models yield similar results. All significant coefficients

between the two models have the same signs. The differences in the significant coefficients across the models range from -24 percent to 37 percent. The differences in the coefficients of major interest between the two models are between -21 percent and 37 percent. In general, the two models do not differ in the major findings of this study except for the effect of nursing FTE proportion after the BBA. While this effect is insignificant for the HCRIS model, it becomes statistically significant for the AHA model. In fact, the effect of nursing FTE proportion on hospital provision of HH care after the BBA is marginally significant for the HCRIS model (p value=0.51). Both models demonstrate a negative effect, suggesting that the proportion of hospital total FTEs contributed by nursing staff is associated positively with the likelihood of reducing HH provision after the BBA. However, the results of the hypotheses tests are the same no matter which data arrangement for the dependent variable discussed above is applied.

Summary of Findings

The major findings of the analyses organized by the structure of the study hypotheses are summarized in Table 20. Seven out of twenty-two proposed hypotheses are empirically supported. Hospital Medicare inpatient day proportion, hospital total profit margin, hospital case mix index, number of hospital beds, and elderly population proportion in the county are positive and significant determinants of hospital provision of HH care. Hospital's nursing FTE proportion and annual elderly population growth rate in the county are insignificant determinants of hospital provision of HH services. Finally, contrary to the expectation, the number of HHAs per 1,000 elderly people in the county is a positive and significant contributor to hospital provision of HH services.

Table 20. Effects of Factors on Hospitals' Provision of HH Care Before and Reduction in Provision of HH Care After the Implementation of the BBA

Hypotheses	Variables	Expected Sign		Effect Founded	
		P (offer)	P(continue) post-BBA	P (offer)	P(continue) post-BBA
Economics- Ownership					
H1a	FP vs. Public		(-)		**(-)*** **
H1b	FP vs. NFP		(-)		**(-)*** **
H1c	NFP vs. Public		(-)		$(-)^{NS}$
H1d	Secular vs. Religious		(-)		**(+)***
Resource Dependence					
H2a~H2b	Medicare	(+)	(+)	**(+)****	$(+)^{NS}$
H3a~H3b	Margin	(+)	(+)	**(+)*****	$(-)^{NS}$
H4a~H4b	Nursing	(+)	(+)	$(+)^{NS}$	**(-)**^{MS}
Transaction Cost					
H5a~H5b	HHA/elderly	(-)	(-)	**(+)*****	$(+)^{NS}$
H6~H6b	Hospital size	(+)	(+)	**(+)*****	$(+)^{NS}$
H7a~H7b	CMI	(+)	(+)	**(+)*****	$(-)^{NS}$
Institutional Theory					
H8a~H8b	Elderly	(+)	(+)	**(+)****	$(-)^{NS}$
H9a~H9b	Growth	(+)	(+)	$(+)^{NS}$	$(+)^{NS}$
H10a	NFPs x FP market		(-)		$(-)^{NS}$
H10b	FPs x NFP market		(+)		$(+)^{NS}$

* p<0.05; ** p<0.01; *** p<0.001
NS: not statistically significant at the 5% significance level
MS: marginally significant at the 5% significant level

After the implementation of the BBA, as hypothesized, for-profit hospitals were significantly more likely than public and private nonprofit hospitals to reduce HH care. However, other relationships proposed in this study are not supported. There is no discernable difference in the change in the probability of offering HH care between public and private nonprofit hospitals after the BBA. Surprisingly, religious hospitals were indeed more likely than secular hospitals to discontinue HH services post-BBA.

Nine out of the ten organizational and market factors that were supposed to play certain roles in hospitals' decisions to continue or discontinue HH care after the BBA have no significant effects, based on the empirical result of the analyses performed. Yet the hospital nursing FTE proportion has a negative and marginally significant effect on hospitals' continuation of HH care provision after the BBA. These findings will be further discussed in the next chapter.

CHAPTER 6: DISCUSSION AND CONCLUSIONS

Following the implementation of the BBA, there was a decline in the number of hospital-based HHAs and in the probability hospitals would provide HH services. As stated in Chapter 1, the purpose of this study is to shed light on the objective function of hospitals by examining how they change their provision of HH services in response to a change in financial incentives, and to explore the factors that influence hospital provision of HH services. Using a multi-theoretical framework and a difference-in-difference estimation approach, the current study reveals the objective functions of hospitals with different ownership forms and explores the key factors affecting hospitals provision and change in provision of HH services in the face of the BBA. This chapter summarizes the results presented in the previous chapter, interprets the findings, describes implications, discusses study limitations, and suggests areas for future research.

Summary and Interpretation of the Descriptive and Bivariate Analyses

This study examines hospitals' probabilities of reducing or discontinuing HH provision from one pre-BBA period to six post-BBA periods. Significant decreases in the percentage as well as the number of hospitals offering HH care over the study period were noted. Between 1997 and 2003, the percentage of acute-care general community hospitals offering HH care dropped from 60 percent to 42 percent; the number of hospital-based HHAs kept declining from 2,847 to 1,912 (a 33% decline.

Various degrees of reduction in HH provision among different hospital ownership types were also clearly observed. Among the hospitals of different ownership types, for-profit hospitals were the most likely to reduce provision of HH services (39%), followed by religious nonprofit hospitals (21%), public hospitals (14%), and secular nonprofit hospitals (13%). Between 1997 and 2000, the percentage offering HH services fell 32 percent among for-profit hospitals, 9 percent among religious hospitals, 6 percent among secular hospitals, and 4 percent among public hospitals (see Table 13). These findings are similar to those from Horwitz (2005a) who reported a 37.5 percent, 7.7 percent, and 1.5 percent decline among for-profit, nonprofit, and public hospitals, respectively.

As shown in the last two columns of Table 21, the number of hospitals offering HH care declined by 303 for secular nonprofit hospitals, 281 for for-profit hospitals, 234 for public hospitals, and 117 for religious hospitals. However, the number of hospitals offering HH care declined by around 70 percent among for-profits, 32 percent among religious nonprofits, 31 percent among public hospitals, and 23 percent among secular nonprofits.

Table 21. The Number of Hospitals Offering HH Care, By Ownership Type and Year

Ownership \ Year	1997	1998	1999	2000	2001	2002	2003	Change in #	Change in %
Public	745	723	718	648	589	556	511	-234	-31.4%
Religious	362	345	339	314	293	256	245	-117	-32.3%
Secular	1,338	1,343	1,276	1,217	1,137	1,102	1,035	-303	-22.6%
For-profit	402	359	264	161	143	131	121	-281	-69.9%
Total	2,847	2,770	2,597	2,340	2,162	2,045	1,912	-935	-32.8%

From these results, at least four conclusions can be drawn. First, compared to public and private nonprofit hospitals, for-profit hospitals behaved differently, dramatically decreasing provision of HH care after the implementation of the BBA. Second, the share of nonprofit hospital-based HHAs in total hospital-based HHAs increased from 86 percent in 1997 to 94 percent in 2003. This may have implications for the quality of hospital-based HH care if HHA ownership is associated with care quality (Rosenau and Linder, 2003). Third, although for-profit hospitals dropped HHAs more dramatically than did other ownership types, the impact of the reduction on HH access may not be proportionally strong because for-profit hospitals only account for 10 percent to 15 percent of total hospitals. In fact, the reduction in for-profit hospital-based HHAs accounts for only 30 percent of overall decrease in total hospital-based HHAs during the study period. Finally, as mentioned in the previous chapter, for-profit hospitals' probability of offering HH care dropped dramatically between 1997 and 2000, compared to other ownership types. However, between 2000 and 2003, the change in the overall probability with which for-profit hospitals offered HH care became more comparable to those of other ownership types (see Figure 12). This may be an indication that the HH IPS and/or BBRA of 1999 to a certain extent lessened the financial concern of for-profit hospital managers about HH provision. However, the HH IPS or/and BBRA do not seem to have had a clear influence on public and private nonprofit hospitals' concerns in continuing to provide HH care or not. F tests to assess whether hospitals' probabilities of offering HH care changed across years from 1997 through 1999 result in F values equal to 0.06 (p value=0.94), 0.86 (p value=0.42), 2.03 (p value=0.10) for public, religious, and

secular nonprofit hospitals, respectively. This indicates that there were no significant changes in the probability of offering HH care right after the implementation of the BBA among each type of nonprofit hospitals.

Certain trends with regard to the organizational and market factors of interest are revealed by the descriptive and bivariate analyses. First, the overall hospital total profit margin fell significantly across the post-BBA period, particularly in the first year following the implementation of the BBA. The average hospital total profit margin decreased from 2.46 percent in 1997 to 1.52 percent in 1998. This provides evidence that the BBA may have a direct impact on hospitals' financial performance. Yet the decreases in total profit margin became less dramatic after 2001. From 2001 to 2003, the overall hospital profit margin declined slightly from 0.67 percent to 0.65 percent. The implementation of the HH IPS and/or BBRA of 1999 should play an effective role in slowing down the deterioration of hospital financial conditions.

Second, the number of HHAs per 1,000 elderly people in the county declined over the study period. This may be a result of the implementation of the BBA which made HH services unprofitable. Third, during the study period, both hospital nursing density (as measured by the proportion of total FTEs accounted by nursing FTEs) and hospital average CMI in general decreased. This is reasonable because as the overall complexity of patient conditions decreased, fewer nursing capacities are needed to take care of the patients in the hospital. Finally, across the study period, the proportion of system-affiliated hospitals kept rising, probably due to market pressures on hospitals to

share resources, reduce costs, building up bargaining power, and increase legitimacy (D'Aunno and Zuckerman, 1987; Luke and Walston, 2003).

For the market factors, the counties where acute-care general community hospitals were located on average did not become more aged or less aged across time during the study period, while the growth rate of the elderly population in counties differed considerably from one year to another. Finally, two contrasting social trends are observed in the analysis. Between 1997 and 2003, the counties where the sampled hospitals were located, on average, became wealthier, as reflected by the increase in per-capita income. However, the same counties experienced an overall decrease in unemployment rate in the first half period followed by a dramatic increase in the second half period. This is a sign that these counties were faced with increasing socioeconomic inequity, particularly in the period of 2000 to 2003.

Summary and Interpretation of the Hypotheses Tests

The primary goal of this study is to shed light on how the objective functions of hospitals with different ownership forms differ by comparing their responses to changes in payment policies following enactment of the BBA. Thus, the first research question asked: Did the relative changes in hospital provision of HH care differ among public, religious nonprofit, secular nonprofit, and for-profit hospitals after the implementation of the BBA? Four hypotheses (hypotheses 1a-1d) were proposed to examine the effects of the ownership types on the change in hospitals' probability of offering HH care after the reduction in financial incentive brought about by the implementation of the BBA.
The second major interest of this study is to examine the effects of certain organizational

and market factors on hospital provision and change in provision of HH services after the BBA. These factors including hospitals' reliance on PAC, hospital financial and workforce capabilities, transaction uncertainty, frequency, and complexity, normative and mimetic pressures, and the interaction of ownership and market penetration. To explore these issues eighteen hypotheses were developed. Multivariate analyses were conducted to test these hypotheses. The results of the hypothesis testing are shown in Table 22. The following section will provide further discussion and interpretation of these results. The effects of ownership will be discussed first, followed by the roles of the organizational and market factors.

Hypotheses 1a-1d: Ownership Effects

In alignment with hypotheses 1a and 1b, for-profit hospitals were significantly more likely than public and private nonprofit hospitals, respectively, to reduce HH services after the implementation of the BBA, holding other things equal. Since the BBA prominently reduced the Medicare reimbursement payments for HH services and Medicare payment accounts for the largest portion of total HHA revenues, the implementation of the BBA created a strong financial incentive to reduce HH provision among hospitals. However, if hospitals of different ownership types have different objectives, they should respond differently to the BBA, as reflected by differences in the change in the likelihood of providing HH. This empirical finding suggests that for-profit hospitals were the most responsive ownership type in the face of a major reduction in financial incentive. In other words, compared with both public and private nonprofit

Table 22. Summary of Hypotheses Tests

Hypotheses	Ownership/Factors	Supported	
		Offer HH pre-BBA	Change HH provision post-BBA
Economics- Ownership			
H1a	FP vs. Public		**Yes**
H1b	FP vs. NFP		**Yes**
H1c	NFP vs. Public		No
H1d	Secular vs. Religious		Opposite
Resource Dependence			
H2a~H2b	Level of hospital dependence on post-acute care- % Medicare inpatient days	**Yes**	No
H3a~H3b	Hospital financial capability- Hospital profit margin	**Yes**	No
H4a~H4b	Professional capability- Nursing density	No	No (Opposite)
Transaction Cost			
H5a~H5b	Uncertainty- Limited HHAs	Opposite	No
H6~H6b	Frequency-Hospital size	**Yes**	No
H7a~H7b	Complexity-Hospital CMI	**Yes**	No
Institutional Theory			
H8a~H8b	Normative pressure- Elderly population %	**Yes**	No
H9~H9b	Normative pressure- Elderly population growth rate	No	No
H10a	Mimetic pressure- NFPs x FP market penetration		No
H10b	Mimetic pressure- FPs x NFP market penetration		No

hospitals, for-profit hospitals are indeed more profit-oriented. They behave like other profit-maximizing firms, as expected by economic theory.

This finding is consistent with the findings from Wheeler et al. (1999) on subacute care (SAC), Horwitz (2005a) on HH, and Lucente (2006) on NH. Similar to the current study, the studies by Horwitz (2005a) and Lucente (2006) compared hospital

provision of HH and NH services, respectively, before and after the implementation of the BBA, and found that for-profit hospitals were the most likely to reduce HH provision post-BBA. Wheeler et al. (1999) reported that for-profit hospitals are more responsive to financial conditions in their decisions to invest SAC than are nonprofit hospitals. As expected by finance theory, profit-maximizing hospitals with lower financial returns would be more likely than those with higher returns to search for diversified cash flow. Wheeler and colleagues found that for-profit hospitals that experienced relatively low financial returns began to offer more SAC services than more profitable for-profits. This study observes similar results by including interaction terms of ownership types and total profit margin using private nonprofit hospitals as the base group. The coefficient to the interaction term between for-profit type and total profit margin is -0.0092 with a standard error of 0.0049 and a p value of 0.06, which is marginally significant at the 0.05 level. This means that compared to nonprofit hospitals, less profitable for-profit hospitals are more likely than more profitable for-profits to provide HH care, holding other things constant.

However, based on the aforementioned discussion, it is still unclear whether nonprofit hospitals are also profit-oriented in nature and whether there are differences in operational objectives among public, religious, and secular nonprofit hospitals. This study found no significant difference in the reduction in the ratio of the probabilities of offering versus not offering HH care between public and private nonprofit hospitals post-BBA. Yet there are significant differences between religious and secular nonprofit hospitals in the likelihood of dropping HH services after the BBA. As shown in Table 16

in the previous chapter, religious nonprofits were significantly more likely than secular nonprofits to reduce HH care since 2002. The difference in the likelihood of reduction of HH provision between religious and secular nonprofit hospitals gradually increased over the study period. The overall post-BBA difference is also statistically significant between the two nonprofit ownership types.

In order to further examine these relationships, the probability of offering HH care is simulated for hospitals with different ownership types across the study period and plotted in Figure 13. These simulated probabilities were calculated based on the fitted full model reported in Appendix 2, holding constant the factors except years (used here to represent the presence of the BBA) and ownership types. The purpose of this figure is to illustrate the relationship between ownership types and the probability of providing HH care while holding constant all other factors for each year. More specifically, the following steps were applied to compute the simulated probabilities:

The fitted model is simplified as:

$probhh=1/(1+e-(\beta_0+B_1Years+B_2Ownerships+B_3Ownerships \times Years+ B_4Others))$—(1);

Where probhh is the predicted probability of offering HH care based on the fitted model. From (1), the following expression is obtained:

$e^{(\beta 0 + B1Years + B2Ownerships + B3Ownerships \times Years + B4Others)} = probhh/ (1- probhh)$ —(2);

From (2), the following expression is obtained:

$\beta_0 + B_1Years + B_2Ownerships + B_3Ownerships \times Years + B_4Others =$

$\ln(probhh/(1-probhh))$—(3)

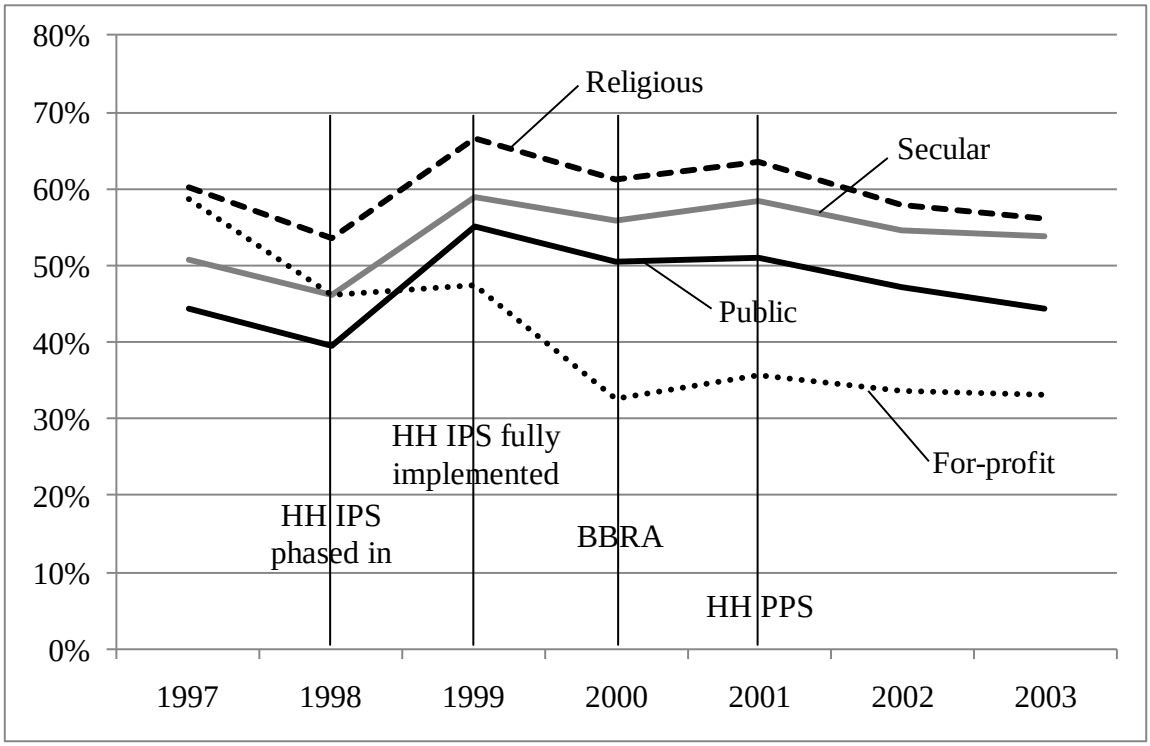

Figure 13. A Simulation of the Probability of Offering HH Care, By Ownership Type and Year, Holding Other Factors Constant

From (3), the following expression is obtained:

$B_4Others=ln[probhh/(1-probhh)-(\beta_0+B_1Years+B_2Ownerships+B_3Ownerships \times Years)]$

Then the mean of $B_4Others$, mean_$B_4Others$, is calculated. Finally, the simulated probability equals to $1/(1+e^{-(\beta 0+B1Years+B2Ownerships+B3Ownerships \times Years+ mean\_B4Others)})$.

It can be seen from Figure 13 that, after holding equal other factors, the probability of offering HH care in the first year after the implementation of the BBA rose slightly for hospitals of all ownership types except for for-profit hospitals. Overall, the for-profit group had a downward trend in the probability of offering HH services after the implementation of the BBA. Surprisingly, in the second period (1998- 1999), the

likelihood of providing HH care increased dramatically for public and private nonprofit ownership types. The probabilities of offering HH services among hospitals of these three nonprofit ownership types remained stable between 1999 and 2001. Between 2001 and 2002, all the ownership types had a considerable drop in the probability of offering HH care. However, the probability among for-profit hospitals flattened out after 2002.

After holding all other considered conditions equal, for-profit hospitals and religious hospitals had an overall (1997 through 2003) reduction in the probability of offering HH services, while the probability of offering HH care increased for public and secular nonprofit hospitals between 1997 and 2003. The probability decreased most significantly for for-profit hospitals (a 20% reduction), followed by religious nonprofit (1%). The probabilities of offering HH care among public and secular nonprofit hospitals increased slightly by 4 percent and 7 percent, respectively. It is also clear that the trends regarding the probability of offering HH care are similar among the three types of nonprofit hospitals. For-profit hospitals have a pattern of HH provision very different from the nonprofit sectors in the post-BBA periods. These findings are basically consistent with the results of the bivariate analyses described earlier. In addition, the simulated graph further demonstrates that the three nonprofit ownership types did not change significantly in the probability of offering HH care in the face of the reduced reimbursement payments that followed the implementation of the BBA, if other conditions were all the same. This provides empirical evidence that U.S. acute-care general nonprofit community hospitals in general may not be very sensitive to the change

in the reimbursement environment. It can thus be concluded that public and private hospitals do have objectives other than profit-maximization.

These results suggest that nonprofit hospitals could be two-good producers whose objective is to maximize total market outputs (Weisbrod, 1988). As long as the total profit margin can be maintained or is not lower than zero, they will continue to offer unprofitable services to meet the health care needs of the community. While Weisbrod's original model focuses on private nonprofits, scholars have extended this perspective to view all nonprofit (including public and private nonprofits) hospitals as the producers providing the under-supplied but necessary services such as charity care in the market (Frank and Salkever, 1991).

Based on the two-good model, the increase in the probability of offering HH care among nonprofit hospitals between 1997 and 2001 can be explained as efforts nonprofit hospitals made to make up for the loss of for-profit hospital-based HHAs and expected loss of the total hospital-based HHA capacities. By doing this, the overall HH care need could be met.

However, between 2001 and 2002, the probability of offering HH care among nonprofit hospitals dropped significantly. This may be a result of the combination of the implementation of the HH PPS on October 1, 2000 as well as that nonprofit hospitals' profit margins had reduced considerably due largely to the implementation of the BBA since 1997. Yet it can also be argued that public and private nonprofit hospitals are inefficient profit maximizers, although public hospitals have seldom been modeled in this way.

It should be noted that the discussion here focuses largely on the relative change or simulated change, not the real change in the probability of offering HH care among different hospital ownership forms. In fact, hospitals of all ownership types declined in HH provision during the study period. Therefore, the finding should still be consistent with that of Bazzoli and colleagues (2006) who reported a reduction in uncompensated care provision in safety-net hospitals that were largely comprised of public and religious hospitals after a decline in Medicaid payments resulting from the BBA.

With respect to the significant difference in the change in probabilities of offering HH care between religious and secular nonprofit hospitals after the BBA, a number of explanations are provided. First, more than 80 percent of religious nonprofit hospitals were members of health systems, while only 40-50 percent of secular nonprofit hospitals were system-affiliated hospitals in the study period. Religious health systems should be able to take an advantage of their systemized structures in the arrangement of acute and PAC continuum. If religious health systems are more likely to adopt certain types of regional planning strategies or are more effective in arranging PAC services for their member hospitals as compared to their secular counterparts, individual religious hospitals may be more flexible in discontinuing HH services. This is likely because in the face of the payment reduction resulting from the BBA, religious health systems may take a more active role in arranging or centralizing PAC services in the region. The benefits of doing this include economies of scale or scope, resource sharing, and meeting the community need as well as the bottom line at the same time.

The second explanation may be that religious hospitals carried a larger responsibility for providing uncompensated care, compared to their secular counterparts. As mentioned in Chapter 1, the BBA also reduced the adjustment received by hospitals that treat a disproportionate share of low-income patients. Thus, religious hospitals might have perceived a stronger impact from the BBA than secular nonprofits. As a result, religious hospitals were more likely than secular hospitals to reduce HH care after the implementation of the BBA.

The third possible explanation for the difference in the change in HH provision between the religious and secular ownership types would be that secular nonprofit hospitals are governed directly by their communities, while religious hospitals are directed in large part by church authorities or large healthcare systems in the case of Catholic hospitals. While the community representatives are more concerned with the heath care need of their communities, church representatives may have the objective of serving the needs of their church such as for evangelical purposes, increasing church reputation or/and competitive power (Bercea, Ekelund, and Tollison, 2005), and delivering a social ministry in addition to meeting community needs. If the provision of HH care is not closely related to the objectives valued highly by church authorities, religious hospitals may be more likely to discontinue it in an environment unfavorable to HH operation. On the other hand, secular nonprofit hospitals are not as responsive as their religious hospitals to policy changes as long as there is a demand for PAC in the community.

Hypotheses 2a-9a: Effects of Organizational and Market Factors on Hospital Provision of HH Care

In addition to revealing the ownership effects on hospital provision of HH services after the implementation of the BBA, this study is intended to explore related organizational and market factors that influence HH provision. Hypotheses 2a~9a are employed for this particular purpose. This section presents the discussion of the major findings to these hypotheses.

First, in accordance with hypothesis 2a, the proportion of hospital inpatient days contributed by Medicare patients was found to be positively associated with the probability of offering HH care. Here, the proportion of Medicare patients in a hospital is used to measure the hospital's reliance on PAC. Hospitals with higher Medicare proportions should be faced with greater pressure of seeking suitable PAC facilities for their discharged elderly patients. This result suggests that hospitals with a higher level of dependence on PAC facilities are more likely to offer HH care. This finding is consistent with the findings from Xu (2000) on HH care, and Chiu (1995) and Lucente (2006) on NH services, although they used the Medicare proportion to measure transaction frequency. Based on these findings, it can be concluded that hospitals' reliance on PAC is associated with a greater likelihood for hospitals to offer HH care.

In alignment with hypothesis 3a, this study finds that hospital financial capability, as measured by total profit margin, is positively associated with hospital provision of HH care. This finding is partially consistent with the findings reported by Wheeler et al. (1999). In their study, the size of hospital SAC was found to be negatively associated

with hospital financial risk as measured by the variance of cash flow. That is, hospitals with greater fluctuations in financial returns are less likely than financially stable hospitals to provide SAC. However, the relationship between the level of financial returns (measured by cash flow) and hospital probability of offering SAC is reported by Wheeler et al. to be insignificant, although positive. By applying total profit margin as a measure of financial performance, the current study demonstrates that financial resources are important for hospitals in offering HH services.

Inconsistent with hypothesis 4a, workforce capability (as measured by the ratio of nursing FTEs to total FTEs in a hospital and its subsidiary) is not significantly associated with hospital provision of HH care. This suggests that hospital nursing capability does not matter regarding HH care provision. Using a somewhat different nursing density ratio, the number of RN and LPN per bed, Wheeler et al. (1999) and Lucente (2006) found a significant effect of nursing density on hospital provision of both SAC and NH services. However, nursing density was found to be positively associated with SAC provision in the Wheeler et al. study, while it was negatively associated with NH care provision in Lucent's study. There are at least two reasons that may explain why this study found no significant relationship between nursing density and hospital provision of HH care. On the one hand, hospitals with higher nursing density are more capable of providing HH services. On the other hand, these hospitals are more able to provide better inpatient acute care to their patients, reducing the need to transfer their patients to HH settings.

Contrary to hypothesis 5a, this study finds that HHA service availability (measured by the number of HHAs per 1,000 elderly people in the county) is positively

associated with hospitals' probability of providing HH care. HHA availability in the local market should reduce the level of transaction uncertainty between acute care and HH services. Hospitals faced with lower levels of transaction uncertainty (with more HHAs in the county) concerning discharging patients to necessary HH settings should feel less need to provide their own HH services. However, the finding suggests that hospitals with lower levels of transaction uncertainty in discharging patients to HHAs are more likely than those with higher levels of transaction uncertainty to provide their own HH services. This confusing result may be a result of the use of an imprecise measure. That is, the number of HHAs in the county may not be able to correctly measure the actual HH capacity in the market. It is very likely that each HHA differs materially in size or service volume. Therefore, it is suggested that a more appropriate measure should be employed, if available. For example, Chiu (1995) used area hospital occupancy rate as a measure of transaction uncertainty and found positive association between the measure and hospital provision of NH care. Also in studying the linkage between hospitals and NHs, Lucente (2006) applied the ratio of NH beds to the elderly population in the county to measure transaction uncertainty and found a positive association.

However, the effect of transaction uncertainty on hospital provision of PAC may depend on the type of care studied. For example, Wheeler et al. (1999) found a negative association between hospital size of SAC and two-year lagged hospital occupancy, a measure used by Xu (2000) and Lucente (2006) to represent transaction uncertainty. In studying hospital integration with HH services, Xu (2000) employed a number of variables to measure transaction uncertainty. These variables include the ratio of the

number of RNs and LPNs employed by HHAs to the elderly population, hospital occupancy rate, the ratio of the number of NHs to the elderly population, and imbalanced demand over supply of HH services (using a dichotomous variable to indicate the level of the number of Medicare-certified HHAs relative to the elderly population). None of the coefficients to these variables were shown to be statistically significant. These findings may suggest that transaction uncertainty is not a major concern in hospitals' decisions to offer HH care, at least not in the expected way.

Consistent with hypothesis 6a, hospital size, which is used to measure transaction frequency, is empirically found to be associated positively with hospital provision of HH care. Hospital size has been consistently demonstrated by a number of studies to be associated positively with hospital offering of PAC services such as HH (Xu, 2000), SAC (Wheeler et al., 1999), NH (Lucente, 2006), and end-of-life care (White et al., 2002). Several theoretical perspectives would predict that larger hospitals are more likely to offer HH services. First, this relationship may be predicted by economies of scale or scope from the viewpoint of economics. Second, resource dependence theory argues that larger hospitals have more resources to provide more necessary services. Also, larger hospitals usually have more patients and diverse health care needs, driving hospitals to integrate various services in order to secure their patient sources, the most critical resource for hospitals. Finally, from the perspective of transaction cost economics, larger hospitals may need to be involved with more activities discharging patients to necessary PAC services, thus increasing transaction frequency and transaction costs. In order to

reduce related transaction costs, these hospitals may set up their own PAC facilities and provide PAC services for their discharged patients.

Furthermore, this study observes a positive and significant effect of hospital CMI on hospital provision of HH care. Most of the people who need HH care are partially dependent patients whose conditions may be more complex than those who do not need HH care. The CMIs of these chronic conditions should be higher. This result suggests that transaction complexity is a key concern in transferring patients to HHAs. That is, hospitals with more medically complex patients are more likely to offer HH services, driven by the difficulty and relating costs in transferring these medically complex patients to external HHAs. Thus hypothesis 7a is supported.

Consistent with hypothesis 8a, normative pressure (as measured by the proportion of elderly population in the county) is a driving force for hospital adoption of HH care. Previous studies such as Wheeler et al. (1999) and Xu (2000) were unable to find a discernable effect of elderly population proportion on hospital offering of SAC and HH, respectively. This study empirically reveals that higher social pressures resulting from higher elderly density in the local area is associated with hospitals to provide their own HH care. It is also possible that hospitals in counties with a higher elderly density view it as a market opportunity for PAC diversification.

However, the second measure of the level of social/normative pressure, elderly population growth rate in the county, is noted to be not significantly associated with hospital offering of HH services. Possible explanations include (1) the change in elderly population may not be directly perceived by the residents in a community; (2) elderly

population change varies year by year. Hence, people in the community will evaluate the need of LTC/PAC in the community based on the elderly proportion instead of the change in the elderly population.

Hypotheses 2b-10b: Effects of Organizational and Market Factors on Hospital Provision of HH Care after the Implementation of the BBA

One of the major interests of this study is to examine the factors that affect hospitals' decisions to drop HH care after enactment of the BBA. From the results presented in Chapter 5, it is clear that only one of the factors examined has significant effect on changing hospitals' probabilities of offering HH services. More specifically, only ownership type (i.e., for-profit versus public and private nonprofit hospitals, and religious nonprofit versus secular nonprofit hospitals) can statistically explain the relative decrease in the probability of offering HH care post-BBA. All other organizational and market factors considered overall did not influence hospitals' changes in provision of HH services, except for nursing FTE proportion whose effect is marginally significant.

The non-significant effects of the organizational and market factors on the changes in hospital provision of HH care suggest that the change in financial incentive is the most critical and consistent consideration in hospitals' responses to the implementation of the BBA. Compared to the ownership effects resulting from hospitals' objectives, other factors are minimized when it comes to planning for the strategic change in HH care in the face of the BBA. However, this does not mean that these organizational and market factors are no longer important in hospital managers' considerations concerning HH provision. These factors are still in the hospital's equation

of HH provision but simply do not affect the change in hospitals' likelihood of providing HH services in the post-BBA period.

Also, the findings related to the role of the organizational and market factors in the change in HH provision could also be a result of the analytical approach used here. It is likely that hospital managers made service provision decisions in one particular year based on the performance and situation of the previous year. However, this study assumes no time lag between performance evaluations and decisions. Nevertheless, most of the factors considered such as ownership, CMI, nursing staff proportion, proportion of Medicare patients, hospital size, and market characteristics are basically quite stable for individual hospitals. The application of a time-lagged approach may not make a big difference to the result.

In addition, although this study observes expected spillover effects of nonprofit hospitals on for-profit hospitals, and vice versa (hypotheses 10a and 10b), the effects are not statistically significant. This suggests that the mimetic pressure resulting from cross ownership influence may be present, but it is relatively weak. Horwitz and Nichols (2007) reported that nonprofit hospitals were more likely to offer HH services in the high than the low for-profit penetration markets when the services were profitable (in the pre-BBA period). Yet when the services became less profitable, nonprofit hospitals reduced their likelihood of offering HH services more dramatically in high than low for-profit penetration markets. The results for for-profit hospitals are similar. The directions of the relationships found in the current study are consistent with those from Horwitz and Nichols, but the relationships are not significant. The difference in these findings may be

due to the different definitions employed by the current study and that conducted by Horwitz and Nichole.

The Relationships between the Control Variables and Hospital Provision of HH Care

As expected, all the control variables are significantly associated with hospitals' likelihood of providing HH care. Teaching hospitals and system-affiliated hospitals were less likely to offer HH care than non-teaching and freestanding hospitals, respectively. As mentioned earlier, health systems may have particular regional resource sharing mechanisms (Luke, Walston, and Plummer, 2004), thus reducing system member hospitals' likelihood of establishing their own HHAs. In addition, teaching hospitals may focus largely on providing acute care tertiary services, conducting educational programs and research projects rather than offering PAC services. This study also found that rural hospitals were more likely than their urban counterparts to provide HH care, due probably to the relative lack of family members to take care of the dependent elderly at home in rural areas.

Finally, two variables measuring local ability to pay for health care were controlled for in the analysis. Results show that hospitals located in counties with higher unemployment rates were less likely than those located in counties with lower unemployment rates to offer HH services. This result makes sense since counties with higher unemployment rates should be less able to pay for HH care, given some of HH services are privately paid. There might be more uninsured people in these counties, thus reducing the motivation of hospitals to set up HHAs. It is also observed that hospitals were more likely to discontinue HH services in higher than in lower per-capita income

counties. If county per-capita income also measures local ability to pay for health care, the result should be opposite. Obviously these findings contradict with each other. However, it is very likely that counties with higher per-capita incomes have more working residents, and they are less likely to need HH services.

Implications of the Findings

The findings of this study have several important implications. The discussions of the implications in this section are divided into four parts, including policy implications, implications for hospital managers, theoretical implications, and implications for methodology.

Policy Implications

A number of policy implications can be drawn from the empirical findings of this study. First, the findings reported here provide evidence in support of tax exempt status for private nonprofit hospitals. This study reveals that private nonprofit hospitals' objectives are similar to those of their public counterparts but are very different from those of for-profit hospitals. Public and private nonprofit hospitals together play a critical role in meeting the total health care need of the market. In this light, they exist because of market failure or the expectation of market deficiency such as the expected reduction in HH provision after the BBA. Therefore, the tax benefits enjoyed by nonprofit hospitals should be justifiable given their provision of the necessary but under-supplied services (because these services are less profitable or unprofitable) in the health care market.

Second, these findings do not support the argument that "We (the U.S.) are the only advanced country in the world that has chosen to leave health care to the tender

mercies of a panoply of for-profit businesses, whose purpose is to maximize income and not to provide health" quoted earlier in this dissertation. Thus, in thinking of health care reform or policy changes, it may be more appropriate to view hospitals as groups with different objectives instead of one industry with an overarching for-profit purpose. As Horwitz (2005a: 796) states, "ownership could be considered in designing reimbursement policies".

Third, this study provides evidence that the BBRA of 1999 were particularly effective in stopping or slowing down the declining pace of HH care provision among for-profit hospitals. The decline in the probability of offering HH care among for-profit hospitals flattened out right after the implementation of the BBRA at the end of 1999 in both the actual or simulated probability figures (see Figures 12 and 13, respectively). However, the BBRA does not seem to have an influence on provision of HH services among public and private nonprofit hospitals. Surprisingly, the HH PPS which is considered to be less stringent in HH service reimbursement than the HH IPS did not significantly change the reduction pace in the probability of offering HH care among hospitals of all ownership types in the actual probability figure, but did significantly reduced the probability among all ownership types in the simulated probability figure. This may be a result of hospitals' view of the HH PPS as another major policy scheme for controlling Medicare HH expenditures and reducing HH reimbursement.

Finally, between 1997 and 2003, the share of nonprofit hospital-based HHAs increased, due to the dramatic decline in the number of for-profit hospital-based HHAs after the implementation of the BBA. If nonprofit HHAs are more likely than their

for-profit counterparts to provide services with better quality (Rosenau and Linder, 2003), the BBA might have brought some benefits to the quality of overall HH services. The quality benefits could offset some of the negative impacts resulting from the reduction in access to hospital-based HH services. This may explain in part why researchers were not able to find discernable reductions in quality of PAC services received by Medicare patients after the BBA (e.g., McCall, Korb, Petersons, and Moore, 2003; Kilgore et al., 2009).

Management Implications

This study provides at least three insights for hospital managers. First, private nonprofit hospital managers can use the empirical evidence found in this study to support their tax exempt status. In addition, most of the organizational and market factors examined here are significantly associated with hospital provision of HH services. In considering providing HH services or diversifying into PAC services, hospitals can conduct a comprehensive assessment of their situations based on these factors.

Furthermore, a key contribution of this study is to reveal that, in response to a major payment policy change, hospitals' adaptive strategies concerning service provision may be based largely on their operative objectives rather than other organizational or market performance or conditions following the implementation of the policy. Whether this phenomenon is specific to hospital provision of HH care in response to the BBA or is also applicable to hospital provision of other service types after the implementation of other policies warrants further research.

Theoretical Implications

A number of theoretical implications can be drawn here. First, the findings of this study mostly support the economic model viewing nonprofit hospitals as two-good producers whose objective function is to maximize market output for meeting the health care needs of the community. Yet the possibility that nonprofit hospitals are inefficient profit-maximizers still cannot be totally ruled out based on the analytical results.

Second, this study empirically demonstrates the different behavior between religious and secular nonprofit hospital groups. Nevertheless, the proposed conceptual model in Chapter 3 is not able to explain the difference observed. Given the fact that very limited existing theoretical or conceptual models can be applied to differentiate these two nonprofit hospital sectors, this study calls for further development of conceptual frameworks in exploring the distinct behaviors between religious and secular nonprofit hospitals.

Third, the findings of this study strengthen the argument of and the proposal for using multi-theoretical frameworks in empirical research. It can be seen from the results of the hypothesis tests that only part of the constructs proposed by each organization theory are empirically supported. This finding suggests that there is no perfect or ideal theory that alone can explain or predict all the relations regarding hospitals' responses to environmental changes. Each theoretical perspective has its own strengths and weaknesses. In this regard, different theories are in fact complementary in providing a wider and more comprehensive view of organization behaviors. However, the difference in theoretical predicting ability may be due to the extent to which the measures are

appropriately selected. Thus, alternative measures may be needed for further tests of the theories.

Methodology Implications

Policy evaluation is an important task for researchers and analysts. This study demonstrates a straightforward analytical approach for conducting longitudinal research to examine several aspects of hospital behavior across time following the implementation of a particular policy. In addition, compared to previous related studies, the current study should be able to obtain a more valid estimation of the relationships of interest by taking into account more organizational and market factors drawn from relevant theories. Possible validity issues or biases related to data and analysis are also considered and addressed with reasonable efforts. Therefore, this study provides a useful example for future related research.

Limitations of the Study

There are several noteworthy limitations to this study that should be addressed. First, there might be history threats present in this study. Although this study controls for potential state policy effects, the approach employed here only control for the differences present throughout the study period. That is, possible changes in reimbursement payments in individual states within the study period may fail to be controlled for (Spector, Cohen, and Pesis-Katz, 2004). In addition, no effort was taken to isolate the effects of concurrent events that might influence hospital provision of HH services at the national level. However, the implementation of the BBA has been widely recognized as the national landmark policy affecting the operation of acute-care, PAC, and LTC

organizations in the late 90s. In addition, the findings here are aligned with the expected path of hospitals' responses following the implementations of the HH IPS, BBRA, and/or HH PPS. No other underlying effects resulting from national policies or events could be observed in the analysis.

Second, there might be issues resulting from omitted variables. For example, the financial performance of hospital-based HHAs should be a critical factor in the equation of hospital closure of HHAs. Yet this factor is not included in the analytical model due to technical difficulty. Nevertheless, pre- versus post-BBA indicators (i.e., the year dummies) were employed to represent the overall profitability of HH agencies in this study. This is based on the assumption that HH services were profitable before and unprofitable after the BBA (Horwitz, 2005b). In this case, if the financial performance of individual hospital-based HHAs is controlled for, it may not be able to see the post-BBA effect which is the primary interest of this study. This is because the actual financial impact of the BBA reflected by the financial performance of HHAs is set to be equal. That is, this may cause an issue of an overspecified model in this analysis (Wooldridge, 2006: 94-95). Therefore, this study examines a perceived impact (post-BBA effect) rather than a direct impact (i.e., the effect of the actual reduction or change in hospital-based HHA financial performance post-BBA) of the BBA. Also, a hospital total profit margin measure is included in the analysis to reflect the overall financial performance of individual sampled hospitals. Future research may be conducted to evaluate the direct impact of the BBA on hospital operations.

Another set of omitted variables include other PAC/LTC services individual hospitals provide as well as other types of arrangement for provision of these services. These factors should also be in the equations of hospitals' provision of HH services. However, there are issues of reverse causality between these factors and hospital HH provision. Those hospitals that already owned a HHA should have lower likelihood of having other PAC services and other service arrangements. For the issue of service arrangement, system membership has been included in the analysis, which is supposed to partially control for the effect of service arrangement. For the issue of other type of PAC services, the effect of NH provision may need to be considered since HH and NH care are the two major types of PAC services hospitals provide. Future studies can apply a bivariate probit model to simultaneously study hospital provision of HH and NH services, while considering the correlation of these two service types.

In addition, the effectiveness or ability of health systems in arranging services continuum among their member hospitals in a local market should also be considered. As mentioned earlier, this factor may explain why religious hospitals were more likely to reduce HH provision after the enactment of the BBA, compared to their secular counterparts. However, there is still a lack of a widely-recognized measure for this factor.

Third, as mentioned in Chapter 4, there might be anticipatory effects of hospitals in response to the BBA. However, these effects have been observed to be minor. As demonstrated in Figures 12, the change in the percentage of offering HH services is not significant for each ownership type in the beginning of the study period, i.e., 1997 to 1998. A dramatic drop in the percentage among for-profit hospitals was not observed

until 1998, one year after the implementation of the BBA. According to Horwitz (2005a), hospitals' probability of offering HH services were generally stable among all types of hospitals between 1995 and 1997. The decline in the probability among for-profit hospitals accelerated after 1997. These findings provide evidence that the anticipatory effects of hospitals in response to the BBA before 1997 can be ignored.

Fourth, one potential limitation may result from that the pre-BBA data are based on only one year of data while the post-BBA data are based on six-year data. Biases could be present if the pre-BBA data are systematically under- or over-estimated. However, there is no clear evidence that the pre-BBA data are problematic, based on the examination of the variable statistics reported in Table 10.

Finally, this study is only applicable to the U.S. non-federal, short-term, acute-care general community hospitals located in the 50 states and the District of Columbia. Since the hospitals without a Medicare provider ID were excluded from the analysis, the findings of this study should be only generalizable to those Medicare-certified general community hospitals.

Suggestions for Future Studies

This study raises several questions for future research. While this study in fact examines a post-BBA effect, future research might study the direct impact of the BBA on hospital provision of HH services. This can be done by employing the reduction in HH Medicare revenues after the BBA as the key explanatory variable.

Future studies might also study the impact of the BBA on hospital provision of other types of PAC services such as NH care. Results of studying hospital provision of

NH services after the implementation of the BBA are seldom reported. Given that NH and HH services differ in service population, service scope, and revenue source, hospitals should have different strategic considerations in changing NH provision post-BBA. New knowledge about the linkage between hospitals and PAC services can be gained by comparing the results from studies on hospital provision of NH services with the findings regarding hospital offering HH care reported by previous and the current studies.

While this study applies whether a hospital provides its own HH care to indicate HH provision, future research might use HH service volume to measure HH provision. In response to the BBA, some hospitals may still provide HH services, but the level of provision may be decreased. A whether-or-not measure is not able to detect the change in the size of HH service over time. Thus, HH service volume should be a more sensitive measure for studying the relationship of interest.

Finally, more studies are needed for revealing the different behaviors between religious and secular hospitals. So far economic and organizational theories usually consider these two nonprofit types to be the same health care organizations in terms of operational objectives and resulting behaviors. However, this study and previous studies (e.g., Ballou and Weisbrod, 2003; Hansmann, Kessler, and McClellan, 2003; White, Cochran, and Patel, 2002) have empirically demonstrated that religious and secular nonprofit hospitals differ significantly in operational behaviors or responses to the change in operating environment. More sophisticated theoretical or conceptual models on nonprofit hospitals are needed for guiding related research. On the other hand, more

empirical studies comparing the behavior of these two hospital ownership types are helpful in verifying the theoretical or conceptual models.

Conclusions

By using a natural experiment approach and longitudinal national hospital data, this study sheds light on the objective functions of hospitals with different ownership forms by comparing their relative reductions in HH provision after the implementation of the BBA. The empirical findings reveal that for-profit hospitals behave differently as compared to public and private nonprofit hospitals, due to their different operational objectives. While the response of for-profit hospitals is consistent with the profit-maximizer model, both public and private nonprofit ownership types behave consistently in accordance with the model of two-good producers whose objective is to maximize market outputs for meeting the health care needs of the community, given the break-even requirement. This finding provides support for the tax exemption the United States government has granted private nonprofit hospitals.

Although the response patterns of the nonprofit ownership types are in general similar, this study found that, contrary to expectation, religious hospitals were more likely than secular nonprofit hospitals to have reduced HH provision after the BBA. Further studies are needed to explore the difference in operational behaviors between these two ownership types.

Built on previous related studies and applying a more comprehensive set of independent and control variables and improved data sources, this study is able to examine the effects of certain organizational and market factors on hospital offering of

HH care pre-BBA and the change in the provision of HH care in the six years following the implementation of the BBA. Hospital proportion of Medicare patients, hospital size, total profit margin, case mix index, elderly density in the market are found to be positive determinants of a hospital's likelihood of offering HH care. However, these organizational and market factors, in general, play a non-significant role in influencing hospitals' changes in HH care provision after the implementation of the BBA. These findings raise a number of relevant questions for future research.

LIST OF REFERENCES

Aldrich, H. F., & Pfeffer, J. (1976). Environments of organizations. *Annual Review of Sociology, 2*(1), 79.

Alexander, J. A., & Morrisey, M. A. (1989). A resource-dependence model of hospital contract management. *Health Services Research, 24*(2), 259-284.

American Hospital Association. (2006). Hospital survey finds increase in ED visits, uncompensated care in 2005. Retrieved 09/05/09, from http://www.ahanews.com/ahanews_app/jsp/display.jsp?dcrpath=AHANEWS/AHANewsArticle/data/AHA_News_061030_Hospital_survey&domain=AHANEWS.

American Hospital Association. (2009a). 2008 AHA annual survey health forum, L.L.C. Retrieved 09/14/09, from http://www.ahadata.com/ahadata/files/2009/AHAAnnualSurvey.pdf.

American Hospital Association. (2009b). AHA data: Survey history & methodology. Retrieved 09/05/09, from http://www.ahadata.com/ahadata/html/historymethodology.html.

Angelelli, J., Fennell, M. L., Hyatt, R. R., & McKenney, J. (2003). Linkages in the rural continuum: The Balanced Budget Act and beyond. *The Gerontologist, 43*(2), 151-157.

Angelelli, J., Gifford, D., Intrator, O., Gozalo, P., Laliberte, L., & Mor, V. (2002). Access to postacute nursing home care before and after the BBA. *Health Affairs, 21*(5), 254-264.

Ballou, J. P., & Weisbrod, B. A. (2003). Managerial rewards and the behavior of for-profit, governmental, and nonprofit organizations: Evidence from the hospital industry. *Journal of Public Economics, 87*(9), 1895-1920.

Baum, C. F. (2006). *An Introduction to Modern Econometrics Using Stata*. College Station, TX: Stata Press.

Bazzoli, G. J., Lindrooth, R. C., Kang, R., & Hasnain-Wynia, R. (2006). The influence of health policy and market factors on the hospital safety net. *Health Services Research, 41*(4), 1159-1180.

Bercea, B., Ekelund, R., & Tollison, R. (2005). Cathedral building as an entry-deterring device. *Kyklos*, 58(4), 453-465.

Bodenheimer, T., & Grumbach, K. (2009). *Understanding Health Policy: A Clinical Approach*. New York: McGraw-Hill Medical.

Bureau of Labor Statistics. (2008). Overview of BLS statistics on inflation and prices. Retrieved 10/23/09, from http://www.bls.gov/bls/inflation.htm.

Centers for Medicare and Medicaid Services. (2005). Acute inpatient PPS: Details for case mix index. Retrieved 09/05/09, from http://www.cms.hhs.gov/AcuteInpatientPPS/FFD/itemdetail.asp?filterType=none&filterByDID=-99&sortByDID=2&sortOrder=ascending&itemID=CMS022523&intNumPerPage=10.

Centers for Medicare and Medicaid Services. (2009a). Cost report overview. Retrieved 09/05/09, from http://www.cms.hhs.gov/CostReports/.

Centers for Medicare and Medicaid Services. (2009b). Home health PPS: Overview. Retrieved 04/02/09, from http://www.cms.hhs.gov/HomeHealthPPS/.

Centers for Medicare and Medicaid Services. (2009c). Hospital outpatient PPS: Overview. Retrieved 04/02/09, from http://www.cms.hhs.gov/HospitalOutpatientPPS/.

Chiu, H. (1995). *The linkage between hospitals and nursing homes: Alternative approaches to minimizing transaction costs.* (Doctor of Philosophy, Virginia Commonwealth University).

Chou, S. Y. (2002). Asymmetric information, ownership and quality of care: An empirical analysis of nursing homes. *Journal of Health Economics, 21*(2), 293-311.

Clement, J. P., White, K. R., & Valdmanis, V. (2002). Charity care: Do not-for-profits influence for-profits? *Medical Care Research and Review, 59*(1), 59-78.

Daft, R. L. (2001). *Organization Theory and Design*. Cincinnati, OH: South-Western College Pub.

Dansky, K. H., Milliron, M., & Gamm, L. (1996). Understanding hospital referrals to home health agencies. *Hospital & Health Services Administration*, 41(3), 331-342.

D'Aunno, T. A., & Zuckerman, H. S. (1987). The emergence of hospital federations: An integration of perspectives from organizational theory. *Medical Care Review, 44*(2), 323-343.

Davidoff, A. J., LoSasso, A. T., Bazzoli, G. J., & Zuckerman, S. (2000). The effect of changing state health policy on hospital uncompensated care. *Inquiry, 37*(3), 253-267.

DiMaggio, P. J., & Powell, W. W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. *American Sociological Review, 48*(2), 147-160.

Erus, B., & Weisbrod, B. (2003). Objective functions and compensation structures in nonprofit and for-profit organizations: Evidence from the "Mixed" hospital industry. In E. L. Glaeser (Ed.), *The Governance of Not-for-Profit Organizations* (pp. 117-142). Chicago: University of Chicago Press.

Evashwick, C. J. (2005). Definition of the continuum of care. *The Continuum of Long-Term Care* (3rd ed., pp. 3-13). N.Y.: Thomson/Delmar Publishers.

Feldman, P. H., Nadash, P., & Gursen, M. D. (2002). Long-term care. In S. Jonas, & A. R. Kovner (Eds.), *Jonas & Kovner's Health Care Delivery in the United States* (7th ed., pp. 199-237). New York: Springer Publishing Company.

Feldman, P. H., Nadash, P., & Gursen, M. D. (2005). Long-term care. In A. R. Kovner, J. Knickman & S. Jonas (Eds.), *Jonas & Kovner's Health Care Delivery in the United States* (8th ed., pp. 274-325). New York: Springer Publishing Company.

Fennell, M. L., & Campbell, S. E. (2007). The regulatory environment and rural hospital long-term care strategies from 1997 to 2003. *The Journal of Rural Health, 23*(1), 1-9.

Folland, S., Stano, M., & Goodman, A. C. (2004). *The Economics of Health and Health care* (4th ed.). Upper Saddle River, NJ: Pearson/Prentice Hall.

Frank, R.G., & Salkever, D.S. (1991). The supply of charity services by nonprofit hospitals: Motives and market structure. *The Rand Journal of Economics, 22*(3), 430-45.

Giardina, C. W., Fottler, M. D., Shewchuk, R. M., & Hill, D. B. (1990). The case for hospital diversification into long-term care. *Health Care Management Review, 15*(1), 71-82.

Grabowski, D. C. (2001). Medicaid reimbursement and the quality of nursing home care. *Journal of Health Economics, 20*(4), 549-569.

Grabowski, D. C., & Hirth, R. A. (2003). Competitive spillovers across non-profit and for-profit nursing homes. *Journal of Health Economics, 22*(1), 1-22.

Griffith, J. R., & White, K. R. (2007). *The Well-Managed Healthcare Organization* (6th ed.). Chicago: Health Administration Press.

Hannan, M. T., & Freeman, J. (1984). Structural inertia and organizational change. *American Sociological Review, 49*, 149-164.

Hannan, M. T., & Carroll, G. R. (1995). An introduction to organizational ecology. In G. R. Carroll, & M. T. Hannan (Eds.), *Organizations in Industry: Strategy, Structure, and Selection* (pp. 17-31). New York: Oxford University Press.

Hansmann, H. (1980). The role of nonprofit enterprise. *Yale Law Journal, 89*, 835-901.

Hansmann, H., Kessler, D., & McClellan, M. (2002). *Ownership form and trapped capital in the hospital industry*. Stanford, CA: National Bureau of Economic Research.

Harrington, C., Woolhandler, S., Mullan, J., Carrillo, H., & Himmelstein, D. U. (2002). Does investor-ownership of nursing homes compromise the quality of care? *International Journal of Health Services: Planning, Administration, Evaluation, 32*(2), 315-325.

Harrington, C., Zimmerman, D., Karon, S. L., Robinson, J., & Beutel, P. (2000). Nursing home staffing and its relationship to deficiencies. *The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences, 55*(5), S278-87.

Health Resources and Services Administration. (2009). ARF overview. Retrieved 09/05/09, from http://arf.hrsa.gov/overview.htm.

Hirth, R. A. (1999). Consumer information and competition between nonprofit and for-profit nursing homes. *Journal of Health Economics, 18*(2), 219-240.

Horwitz, J. R. (2005a). Making profits and providing care: Comparing nonprofit, for-profit, and government hospitals. *Health Affairs, 24*(3), 790-801.

Horwitz, J. R. (2005b). Research note: Relative profitability of acute care hospital services-on line exhibit. Retrieved from http://content.healthaffairs.org.proxy.library.vcu.edu/cgi/data/24/3/790/DC1/1.

Horwitz, J. R., & Nichols, A. (2007). *What do nonprofits maximize? Nonprofit hospital service provision and market ownership mix*. Stanford, CA: National Bureau of Economic Research.

Hosmer, D. W., & Lemeshow, S. (2000). *Applied Logistic Regression*. New York: Wiley.

Hughes, S. L., & Renehan, M. (2005). Home health. In C. J. Evashwick (Ed.), *The Continuum of Long-Term Care* (3rd ed., pp. 87-111). New York: Thomson/Delmar Learning.

Institute of Medicine (U.S.). Committee on Quality of Health Care in America. (2001). *Crossing the Quality Chasm: A New Health System for the 21st Century*. Washington, DC: National Academy Press.

Kane, R. A., Kane, R. L., & Ladd, R. C. (1998). *The Heart of Long Term Care*. New York: Oxford University Press.

Kilgore, M. L., Grabowski, D. C., Morrisey, M. A., Ritchie, C. S., Yun, H., & Locher, J. L. (2009). The effects of the Balanced Budget Act of 1997 on home health and hospice in older adult cancer patients. *Medical Care, 47*(3), 279-285.

LeBlanc, A. J., & Hurley, R. E. (1995). Adoption of HIV-related services among urban US hospitals: 1988 and 1991. *Medical Care, 33*(9), 881-891.

Levit, K., Smith, C., Cowan, C., Lazenby, H., & Martin, A. (2002). Inflation spurs health spending in 2000. *Health Affairs, 21*(1), 172-181.

Lindrooth, R. C., & Weisbrod, B. A. (2007). Do religious nonprofit and for-profit organizations respond differently to financial incentives? The hospice industry. *Journal of Health Economics, 26*(2), 342-357.

Lucente, B. C. (2006). *Hospitals' decision to vertically integrate skilled nursing before and after the Balanced Budget Act.* (Doctor of Philosophy, Virginia Commonwealth University).

Luke, R. D., & Walston, S. L. (2003). Strategy in an institutional environment: Lessons learned from the 1990s "revolution" in health care. In S. S. Mick, & M. E. Wyttenbach (Eds.), *Advances in Health Care Organization Theory* (pp. 289-323). San Francisco: Jossey-Bass.

Luke, R. D., Walston, S. L., & Plummer, P. M. (2004). *Healthcare Strategy: In Pursuit of Competitive Advantage*. Chicago: Health Administration Press.

McCall, N., Komisar, H. L., Petersons, A., & Moore, S. (2001). Medicare home health before and after the BBA. *Health Affairs, 20*(3), 189-198.

McCall, N., Korb, J., Petersons, A., & Moore, S. (2003). Reforming Medicare payment: Early effects of the 1997 Balanced Budget Act on postacute care. *The Milbank Quarterly, 81*(2), 277-303, 172-3.

McCall, N., Petersons, A., Moore, S., & Korb, J. (2003). Utilization of home health services before and after the Balanced Budget Act of 1997: What were the initial effects? *Health Services Research, 38*(1 Pt 1), 85-106.

Medicare Payment Advisory Commission. (2000). *The* Balanced Budget Act *of 1997: A current look at its impact on patients and providers.*

Medicare Payment Advisory Commission. (2002). *Medicare payment policy: Report to the congress.* Washington, DC: Medicare Payment Advisory Commission.

Meyer, B. D., Viscusi, W. K., & Durbin, D. L. (1995). Workers' compensation and injury duration: Evidence from a natural experiment. *The American Economic Review, 85*(3), 322-340.

Meyer, B. D. (1995). Natural and quasi-experiments in economics. *Journal of Business and Economic Statistics, 13*(2), 151-160.

Meyer, J. W., & Scott, W. R. (1983). *Organizational Environments: Ritual and Rationality*. Beverly Hills: Sage.

Morrisey, M. A., Sloan, F. A., & Valvona, J. (1988). Shifting Medicare patients out of the hospital. *Health Affairs, 7*(5), 52-64.

National Association of Home Care and Hospice. (2008). Basic statistics about home care. Retrieved 1/22/09, from http://www.nahc.org/facts/08HC_Stats.pdf.

National Conference of State Legislatures. (2009). Certificate of need: State health laws and programs. Retrieved 09/05/09, from http://www.ncsl.org/programs/health/cert-need.htm.

Newhouse, J. P. (1970). Toward a theory of nonprofit institutions: An economic model of a hospital. *The American Economic Review, 60*(1), 64-74.

Oliver, C. (1991). Strategic responses to institutional processes. *The Academy of Management Review, 16*(1), 145-179.

Paone, D. L., & Mullen, D. M. (2005). Hospitals. In C. J. Evashwick (Ed.), *The Continuum of Long-Term Care* (3rd ed., pp. 51-68). New York: Thomson/Delmar Learning.

Pauly, M. V., & Redisch, M. (1973). The not-for-profit hospital as a physicians' cooperative. *American Economic Review, 63*(March), 87-99.

Pfeffer, J., & Salancik, G. R. (1978). *The External Control of Organizations: A Resource Dependence Perspective*. New York: Harper & Row.

Poisal, J. A., Truffer, C., Smith, S., Sisko, A., Cowan, C., Keehan, S., et al. (2007). Health spending projections through 2016: Modest changes obscure part D's impact. *Health Affairs, 26*(5), w242-w253.

Polit, D. F., & Beck, C. T. (2004). *Nursing Research: Principles and Methods.* (7th ed.). Philadelphia: Lippincott Williams & Wilkins.

Porter, M. E., & Teisberg, E. O. (2006). *Redefining Health Care: Creating Value-Based Competition on Results*. Boston: Harvard Business School Press.

Public Broadcasting Service. (2009). Bill Moyers Journal: Health care reform. Retrieved 08/20/09, from http://www.pbs.org/moyers/journal/07242009/watch.html.

Robinson, J. C. (1994). The changing boundaries of the American hospital. *The Milbank Quarterly*, 72(2), 259-275.

Robinson, J. C. (1996). Decline in hospital utilization and cost inflation under managed care in California. *JAMA: The Journal of the American Medical Association, 276*(13), 1060-1064.

Roggenkamp, S. D., White, K. R., & Bazzoli, G. J. (2005). Adoption of hospital case management: Economic and institutional influences. *Social Science & Medicine, 60*(11), 2489-2500.

Roomkin, M. J., & Weisbrod, B. A. (1999). Managerial compensation and incentives in for-profit and nonprofit hospitals. *Journal of Law, Economics & Organization., 15*(3), 750-781.

Rosenau, P. V., & Linder, S. H. (2003). Two decades of research comparing for-profit and nonprofit health provider performance in the United States. *Social Science Quarterly, 84*(2), 219-241.

Scott, W. R., & Davis, G. F. (2007). *Organizations and Organizing: Rational, Natural, and Open System Perspectives*. Upper Saddle River, N.J.: Pearson Prentice Hall.

Selznick, P. (1948). Foundations of the theory of organization. *American Sociological Review, 13*(1), 25-35.

Shortell, S. M., Zukoski, A. P., Alexander, J. A., Bazzoli, G. J., Conrad, D. A., Hasnain-Wynia, R., et al. (2002). Evaluating partnerships for community health improvement: Tracking the footprints. *Journal of Health Politics, Policy and Law, 27*(1), 49-91.

Shortell, S. M., Gillies, R. R., & Devers, K. J. (1995). Reinventing the American hospital. *The Milbank Quarterly, 73*(2), 131-160.

Shortell, S. M. (1997). Commentary on "physician-hospital integration and the economic theory of the firm". *Medical Care Research and Review, 54*(1), 25-31.

Singleton, R., Straits, B., Straits, M. M., & McAllister, R. J. (1988). *Approaches to Social Research*. New York: Oxford University Press.

Sloan, F. A. (2000). Not-for-profit ownership and hospital behavior. In A. J. Culyer, & J. P. Newhouse (Eds.), *Handbook of Health Economics, vol. 1B* (pp. 1142-1170). Amsterdam: Elsevier Science.

Spector, W. D., Cohen, J. W., & Pesis-Katz, I. (2004). Home care before and after the Balanced Budget Act of 1997: Shifts in financing and services. *The Gerontologist, 44*(1), 39-47.

Spector, W. D., Selden, T. M., & Cohen, J. W. (1998). The impact of ownership type on nursing home outcomes. *Health Economics, 7*(7), 639-653.

Stevens, R. (1999). *In Sickness and in Wealth: American Hospitals in the Twentieth Century*. Baltimore: Johns Hopkins University Press.

Stiles, R. A., Mick, S. S., & Wise, C. G. (2001). The logic of transaction cost economics in health care organization theory. *Health Care Management Review, 26*(2), 85-92.

Stiles, R. A., & Mick, S. S. (1997). Components of the costs of controlling quality: A transaction cost economics approach. *Hospital & Health Services Administration, 42*(2), 205-219.

Thompson, J. D. (1967). *Organizations in Action: Social Science Bases of Administrative Theory*, NY: McGraw-Hill.

U.S. Department of Health & Human Services. (1999). Balanced Budget Refinement Act of 1999: Highlights. Retrieved 04/07/09, from http://www.hhs.gov/news/press/1999pres/19991118b.html.

Walston, S. L., Kimberly, J. R., & Burns, L. R. (2001). Institutional and economic influences on the adoption and extensiveness of managerial innovation in hospitals: The case of reengineering. *Medical Care Research and Review, 58*(2), 194-228.

Weick, K. (1969). *The Social Psychology of Organizing*. Reading, MA: Addison-Wesley Publishing Company.

Weisbrod, B. A. (1988). *The Nonprofit Economy*. Cambridge, MA: Harvard University Press.

Westphal, J. D., Gulati, R., & Shortell, S. M. (1997). Customization or conformity? An institutional and network perspective on the content and consequences of TQM adoption. *Administrative Science Quarterly, 42*(2), 366-394.

Wheeler, J. R., & Clement, J. P. (1990). Capital expenditure decisions and the role of the not-for-profit hospital: An application of a social goods model. *Medical Care Review, 47*(4), 467-486.

Wheeler, J. R., Burkhardt, J., Alexander, J. A., & Magnus, S. A. (1999). Financial and organizational determinants of hospital diversification into subacute care. *Health Services Research, 34*(1 Pt 1), 61-81.

White, K. R., & Begun, J. W. (1998/1999). How does Catholic hospital sponsorship affect services provided? *Inquiry, 35*(4), 398-407.

White, K. R., Begun, J. W., & Tian, W. (2006). Hospital service offerings: Does Catholic ownership matter? *Health Care Management Review, 31*(2), 99-108.

White, K. R., Cochran, C. E., & Patel, U. B. (2002). Hospital provision of end-of-life services: Who, what, and where? *Medical Care, 40*(1), 17-25.

Williamson, O. E. (1975). *Markets and Hierarchies, Analysis and Antitrust Implications: A study in the Economics of Internal Organization*. New York: Free Press.

Williamson, O. E. (1985). *The Economic Institutions of Capitalism: Firms, Markets, Relational Contracting*. New York: Free Press; Collier Macmillan.

Wooldridge, J. M. (2006). *Introductory Econometrics: A Modern Approach* (3rd ed.). Australia; Cincinnati, Ohio: South-Western College Pub.

Xu, Y. (2000). *Factors associated with hospital arrangements in providing home health services.* (Doctor of Philosophy, Virginia Commonwealth University).

Zelman, W. N., McCue, M. J., & Glick, N. D. (2003). *Financial Management of Health Care Organizations: An Introduction to Fundamental Tools, Concepts, and Applications* (2nd ed.). San Francisco: Jossey-Bass.

Zinn, J. S., Weech, R. J., & Brannon, D. (1998). Resource dependence and institutional elements in nursing home TQM adoption. *Health Services Research, 33*(2), 261-273.

APPENDIX

Appendix 1. Comparison of the Three Models with Different Sets of Control Variables

Variable \ Model	Simple logit model (1)	(1) plus State Dummy variables	(2) plus Missing Dummy Variables
Year effects (Base: 1997)			
Year'98	0.293	0.165	0.161
Year'99	0.751 **	0.704 *	0.646 *
Year'00	0.833 **	0.673 *	0.639 *
Year'01	0.929 **	0.737 *	0.650
Year'02	0.444	0.263	0.174
Year'03	0.473	0.270	0.174
Ownership effects			
Religious hospital	0.430 ***	0.658 ***	0.634 ***
Religious x year'98	-0.078	-0.105	-0.116
Religious x year'99	-0.133	-0.162	-0.171
Religious x year'00	-0.182	-0.225 *	-0.228 *
Religious x year'01	-0.083	-0.136	-0.131
Religious x year'02	-0.204	-0.255 *	-0.254 *
Religious x year'03	-0.157	-0.209	-0.208
Secular hospital	0.085	0.247 **	0.255 **
Secular x year'98	0.008	0.002	-0.004
Secular x year'99	-0.096	-0.100	-0.109
Secular x year'00	-0.022	-0.037	-0.045
Secular x year'01	0.058	0.040	0.035
Secular x year'02	0.061	0.052	0.039
Secular x year'03	0.135	0.130	0.114
For-profit hospital	0.359 *	0.449 *	0.459 *
For-profit x year'98	-0.231	-0.273 *	-0.265 *
For-profit x year'99	-0.798 ***	-0.855 ***	-0.880 ***
For-profit x year'00	-1.161 ***	-1.257 ***	-1.264 ***

Appendix 1 (continued)

Variable \ Model	Simple logit model (1)	(3) plus State Dummy variables	(4) plus Missing Dummy Variables
For-profit x year'01	-1.071 ***	-1.160 ***	-1.176 ***
For-profit x year'02	-1.083 ***	-1.168 ***	-1.185 ***
For-profit x year'03	-0.898 ***	-0.974 ***	-1.012 ***
Organizational factors			
Medicare	0.010 ***	0.009 ***	0.009 ***
Medicare x year'98	0.001	0.002	0.001
Medicare x year'99	0.000	0.001	0.000
Medicare x year'00	0.000	-0.001	-0.001
Medicare x year'01	0.003	0.003	0.002
Medicare x year'02	0.001	0.000	0.000
Medicare x year'03	0.003	0.003	0.003
Margin	0.013 ***	0.015 ***	0.015 ***
Margin x year'98	0.000	-0.001	0.000
Margin x year'99	-0.006	-0.008	-0.009
Margin x year'00	-0.005	-0.006	-0.006
Margin x year'01	0.003	0.001	0.001
Margin x year'02	-0.004	-0.006	-0.006
Margin x year'03	0.001	0.000	0.000
Nursing	0.008	0.002	0.000
Nursing x year'98	-0.011 *	-0.012 *	-0.013 *
Nursing x year'99	-0.004	-0.007	-0.007
Nursing x year'00	-0.012	-0.016 *	-0.016 *
Nursing x year'01	-0.014 *	-0.017 *	-0.017 *
Nursing x year'02	-0.002	-0.004	-0.003
Nursing x year'03	-0.010	-0.014	-0.013
Hospital size	0.002 ***	0.002 ***	0.002 ***
Hospital size x year'98	0.000	0.000	0.000
Hospital size x year'99	0.000	0.000	0.000
Hospital size x year'00	0.001	0.001	0.001
Hospital size x year'01	0.001 **	0.001 **	0.001 **
Hospital size x year'02	0.001	0.001	0.000
Hospital size x year'03	0.001	0.001	0.000
Hospital CMI	1.001 ***	0.800 ***	0.778 ***

Appendix 1 (continued)

Variable \ Model	Simple logit model (1)	(5) plus State Dummy variables	(6) plus Missing Dummy Variables
CMI x year'98	-0.110	-0.010	0.029
CMI x year'99	-0.469 **	-0.415 *	-0.380 *
CMI x year'00	-0.423 *	-0.309	-0.265
CMI x year'01	-0.663 **	-0.536 **	-0.483 *
CMI x year'02	-0.506 *	-0.367	-0.308
CMI x year'03	-0.699 **	-0.506 *	-0.436
Market factors			
HHA/elderly	1.720 ***	1.540 ***	1.558 ***
HHA/elderly x year'98	-0.003	0.027	0.037
HHA/elderly x year'99	-0.215	-0.166	-0.153
HHA/elderly x year'00	0.080	0.116	0.115
HHA/elderly x year'01	0.226	0.259	0.248
HHA/elderly x year'02	0.074	0.074	0.048
HHA/elderly x year'03	0.002	0.016	-0.014
Elderly proportion	0.033 ***	0.023 *	0.022 *
Elderly x year'98	0.005	0.006	0.005
Elderly x year'99	-0.001	0.000	0.001
Elderly x year'00	-0.012	-0.007	-0.005
Elderly x year'01	-0.024 *	-0.019	-0.017
Elderly x year'02	-0.015	-0.012	-0.010
Elderly x year'03	-0.005	-0.003	-0.003
Growth	0.022	0.017	0.017
Growth x year'98	0.018	0.018	0.014
Growth x year' 99	0.028	0.030	0.030
Growth x year' 00	-0.009	0.006	0.007
Growth x year' 01	-0.008	0.009	0.009
Growth x year '02	-0.029	-0.032	-0.031
Growth x year' 03	0.039 *	0.037	0.036
NFP hospital x FP market	0.004	0.000	0.001
NFP x FP market x year'98	0.000	0.000	0.000
NFP x FP market x year'99	-0.002	-0.002	-0.002
NFP x FP market x year'00	-0.002	-0.001	-0.001
NFP x FP market x year'01	-0.003	-0.003	-0.003

Appendix 1 (continued)

Variable \ Model	Simple logit model (1)	(7) plus State Dummy variables	(8) plus Missing Dummy Variables
NFP x FP market x year'02	-0.008 *	-0.008 *	-0.009 *
NFP x FP market x year'03	-0.010 **	-0.010 **	-0.011 **
FP hospital x NFP market	-0.004	-0.005	-0.004
FP x NFP market x year'98	0.003	0.003	0.003
FP x NFP market x year'99	0.002	0.004	0.004
FP x NFP market x year'00	-0.002	-0.001	-0.001
FP x NFP market x year'01	-0.003	-0.002	-0.002
FP x NFP market x year'02	-0.005	-0.003	-0.004
FP x NFP market x year'03	-0.010 **	-0.009 *	-0.009 *
Control variables			
System	-0.269 ***	-0.382 ***	-0.365 ***
Teaching	-0.760 ***	-0.637 ***	-0.642 ***
HH CON	-0.337 ***		
Rural	0.393 ***	0.488 ***	0.477 ***
Income	-0.022 ***	-0.013 *	-0.013 *
Unemployment rate	-0.025 *	-0.035 **	-0.035 **
Closure	-0.505 ***	-0.542 ***	-0.449 ***
Closure x year'98	-0.089	-0.076	-0.072
Closure x year'99	-0.141	-0.096	-0.086
Closure x year'00	-0.304	-0.234	-0.253
Closure x year'01	-0.392	-0.331	-0.326
Closure x year'02	-0.876 **	-0.799 *	-0.804 *
State dummies			
Maine		-1.543 ***	-1.374 ***
New Hampshire		-1.742 ***	-1.585 ***
Vermont[#]		-4.889 ***	-4.721 ***
Massachusetts		-0.922 **	-0.747 *
Rhode Island		-1.067	-0.778
Connecticut		-1.535 ***	-1.371 **
New York		-1.493 ***	-1.314 ***
New Jersey		-1.024 **	-0.839 **
Pennsylvania		-0.562 *	-0.393

Appendix 1 (continued)

Variable \ Model	Simple logit model (1)	(9) plus State Dummy variables	(10) plus Missing Dummy Variables
Delaware		0.072	0.253
Maryland		-0.979 **	-0.816 *
D.C.		-1.368	-1.196
West Virginia		-0.141	0.157
North Carolina		-0.684 **	-0.496
South Carolina		-0.995 **	-0.815 *
Georgia		-1.497 ***	-1.324 ***
Florida		-0.275	-0.098
Ohio		-0.524 *	-0.335
Indiana		0.245	0.421
Illinois		-0.466	-0.288
Michigan		-0.696 **	-0.525
Wisconsin		-1.641 ***	-1.478 ***
Kentucky		-0.686 *	-0.513
Tennessee		-0.610 *	-0.410
Alabama		-0.002	0.161
Mississippi		-1.392 ***	-1.221 ***
Minnesota		-0.579 *	-0.417
Iowa		-0.365	-0.201
Missouri		0.033	0.234
North Dakota		-0.940 **	-0.773 *
South Dakota		-0.422	-0.095
Nebraska		-0.515	-0.347
Kansas		-0.817 **	-0.527
Arkansas		0.812 *	1.001 **
Louisiana		-0.681 **	-0.432
Oklahoma		-0.016	0.168
Texas		-0.622 **	-0.432
Montana		-0.570	-0.394
Idaho		-0.131	0.043
Wyoming		-0.033	0.143
Colorado		-0.674 *	-0.469
New Mexico		-0.756	-0.593

Appendix 1 (continued)

Variable \ Model	Simple logit model (1)	(11) plus State Dummy variables	(12) plus Missing Dummy Variables
Arizona		-0.620	-0.427
Utah		-0.079	0.064
Nevada		-0.758 *	-0.595
Washington		-0.911 **	-0.734 *
Oregon		0.824 *	1.005 **
California		-0.341	-0.124
Alaska		-0.527	-0.321
Hawaii		-1.110 *	-0.913
CMI_d			-1.377 ***
CMI_d x year'98			-0.242
CMI_d x year'99			-0.223
CMI_d x year'00			-0.098
CMI_d x year'01			-0.402
CMI_d x year'02			-0.346
CMI_d x year'03			-0.638
Pop_d			-1.638
Pop_d x year'98			0.136
Pop_d x year'99			0.403
Pop_d x year'00			-0.072
Pop_d x year'01			0.553
Pop_d x year'02			0.365
Pop_d x year'03			0.132
Margin_d			-0.844 **
Margin_d x year'98			-0.037
Margin_d x year'99			0.111
Margin_d x year'00			0.180
Margin_d x year'01			0.100
Margin_d x year'02			0.480
Margin_d x year'03			0.605 *
Income_d			1.499
Income_d x year'98			0.073
Income_d x year'99			-0.400
Income_d x year'00			-0.052

Appendix 1 (continued)

Variable \ Model	Simple logit model (1)	(13) plus State Dummy variables	(14) plus Missing Dummy Variables
Income_d x year'01			-0.465
Income_d x year'02			-0.537
Income_d x year'03			-0.206
Constant	-2.330 ***	-1.429 ***	-1.504 ***
Model Statistics			
Log pseudolikelihood	-19787.842	-19056.515	-18920.998
Wald χ^2	1399.52 (df=109)	1603.70 (df=158)	1775.75 (df=186)
P(>Wald χ^2)	<0.001	<0.001	<0.001
Pseudo R^2	0.125	0.157	0.163
N	32642	32642	32642

* p<0.05; ** p<0.01; *** p<0.001

Appendix 2. Completed Results of the Full Model

Variable	Odds ratio	Coefficient	Standard error
Year effects (Base: 1997)			
Year'98	1.156	0.145	0.241
Year'99	1.880	0.631 *	0.274
Year'00	1.846	0.613	0.324
Year'01	1.878	0.630	0.334
Year'02	1.180	0.165	0.351
Year'03	1.170	0.157	0.358
Ownership effects			
Religious hospital	1.884	0.633 ***	0.132
Religious x year'98	0.891	-0.115	0.078
Religious x year'99	0.843	-0.171	0.098
Religious x year'00	0.793	-0.231 *	0.109
Religious x year'01	0.873	-0.136	0.118
Religious x year'02	0.775	-0.255 *	0.127
Religious x year'03	0.813	-0.207	0.133
Secular hospital	1.291	0.256 **	0.090
Secular x year'98	0.993	-0.007	0.050
Secular x year'99	0.895	-0.111	0.062
Secular x year'00	0.953	-0.048	0.073
Secular x year'01	1.031	0.031	0.079
Secular x year'02	1.041	0.040	0.083
Secular x year'03	1.120	0.113	0.088
For-profit hospital	1.591	0.464 *	0.184
For-profit x year'98	0.768	-0.263	0.135
For-profit x year'99	0.416	-0.876 ***	0.174
For-profit x year'00	0.284	-1.257 ***	0.209
For-profit x year'01	0.309	-1.173 ***	0.217
For-profit x year'02	0.306	-1.185 ***	0.223
For-profit x year'03	0.373	-0.987 ***	0.222
Organizational factors			
Medicare	1.009	0.009 ***	0.002
Medicare x year'98	1.001	0.001	0.002
Medicare x year'99	1.000	0.000	0.002

Appendix 2 (continued)

Variable	Odds ratio	Coefficient	Standard error
Medicare x year'00	0.999	-0.001	0.002
Medicare x year'01	1.002	0.002	0.002
Medicare x year'02	1.000	0.000	0.002
Medicare x year'03	1.003	0.003	0.002
Margin	1.015	0.015 ***	0.003
Margin x year'98	1.000	0.000	0.004
Margin x year'99	0.992	-0.008	0.004
Margin x year'00	0.994	-0.006	0.005
Margin x year'01	1.002	0.002	0.006
Margin x year'02	0.995	-0.005	0.008
Margin x year'03	1.000	0.000	0.007
Nursing	1.000	0.000	0.005
Nursing x year'98	0.988	-0.012 *	0.005
Nursing x year'99	0.994	-0.006	0.006
Nursing x year'00	0.984	-0.016 *	0.007
Nursing x year'01	0.984	-0.017 *	0.007
Nursing x year'02	0.997	-0.003	0.007
Nursing x year'03	0.988	-0.013	0.007
Hospital size	1.002	0.002 ***	0.000
Hospital size x year'98	1.000	0.000	0.000
Hospital size x year'99	1.000	0.000	0.000
Hospital size x year'00	1.001	0.001	0.000
Hospital size x year'01	1.001	0.001 **	0.000
Hospital size x year'02	1.000	0.000	0.000
Hospital size x year'03	1.000	0.000	0.000
Hospital CMI	2.180	0.779 ***	0.216
CMI x year'98	1.026	0.026	0.167
CMI x year'99	0.684	-0.379 *	0.183
CMI x year'00	0.769	-0.263	0.215
CMI x year'01	0.613	-0.489 *	0.208
CMI x year'02	0.733	-0.311	0.218
CMI x year'03	0.641	-0.445	0.233
Market factors			
HHA/elderly	4.764	1.561 ***	0.190

Appendix 2 (continued)

Variable	Odds ratio	Coefficient	Standard error
HHA/elderly x year'98	1.030	0.029	0.087
HHA/elderly x year'99	0.855	-0.157	0.125
HHA/elderly x year'00	1.121	0.114	0.141
HHA/elderly x year'01	1.275	0.243	0.157
HHA/elderly x year'02	1.055	0.054	0.178
HHA/elderly x year'03	0.987	-0.013	0.198
Elderly proportion	1.023	0.023 *	0.010
Elderly x year'98	1.006	0.006	0.006
Elderly x year'99	1.002	0.002	0.008
Elderly x year'00	0.996	-0.004	0.009
Elderly x year'01	0.984	-0.016	0.010
Elderly x year'02	0.991	-0.009	0.010
Elderly x year'03	0.998	-0.002	0.011
Growth	1.016	0.016	0.015
Growth x year'98	1.015	0.015	0.020
Growth x year' 99	1.030	0.029	0.020
Growth x year' 00	1.007	0.007	0.018
Growth x year' 01	1.008	0.008	0.019
Growth x year '02	0.970	-0.031	0.024
Growth x year' 03	1.037	0.036	0.019
NFP hospital x FP market	1.001	0.001	0.003
NFP x FP market x year'98	1.000	0.000	0.002
NFP x FP market x year'99	0.998	-0.002	0.003
NFP x FP market x year'00	0.998	-0.002	0.003
NFP x FP market x year'01	0.997	-0.003	0.004
NFP x FP market x year'02	0.991	-0.009 *	0.004
NFP x FP market x year'03	0.989	-0.011 **	0.004
FP hospital x NFP market	0.996	-0.004	0.003
FP x NFP market x year'98	1.003	0.003	0.002
FP x NFP market x year'99	1.003	0.003	0.003
FP x NFP market x year'00	0.999	-0.001	0.004
FP x NFP market x year'01	0.998	-0.002	0.004
FP x NFP market x year'02	0.996	-0.004	0.004
FP x NFP market x year'03	0.991	-0.009 *	0.004

Appendix 2 (continued)

Variable	Odds ratio	Coefficient	Standard error
Control variables			
System	0.694	-0.365 ***	0.060
Teaching	0.526	-0.642 ***	0.150
Rural	1.598	0.469 ***	0.085
Income	0.987	-0.013 *	0.006
Unemployment	0.966	-0.035 **	0.013
Closure	0.577	-0.550 ***	0.108
Closure x year'02	0.504	-0.686 *	0.327
CMI_d	0.195	-1.634 ***	0.364
Margin_d	0.490	-0.713 **	0.227
Margin_d x year'03	1.517	0.417 *	0.179
State dummies			
Maine	0.215	-1.537 ***	0.378
New Hampshire	0.174	-1.747 ***	0.442
Vermont[#]	0.008	-4.883 ***	1.040
Massachusetts	0.401	-0.914 **	0.313
Rhode Island	0.387	-0.950	0.625
Connecticut	0.215	-1.538 ***	0.444
New York	0.227	-1.483 ***	0.251
New Jersey	0.365	-1.007 **	0.311
Pennsylvania	0.569	-0.564 *	0.249
Delaware	1.091	0.087	0.879
Maryland	0.375	-0.982 **	0.338
D.C.	0.256	-1.363	0.702
West Virginia	0.991	-0.009	0.339
North Carolina	0.516	-0.661 *	0.264
South Carolina	0.375	-0.981 **	0.325
Georgia	0.226	-1.486 ***	0.270
Florida	0.749	-0.289	0.245
Ohio	0.606	-0.502 *	0.248
Indiana	1.292	0.256	0.267
Illinois	0.635	-0.454	0.243
Michigan	0.501	-0.691 **	0.256
Wisconsin	0.193	-1.645 ***	0.277

Appendix 2 (continued)

Variable	Odds ratio	Coefficient	Standard error
Kentucky	0.508	-0.678 *	0.269
Tennessee	0.563	-0.575 *	0.266
Alabama	0.994	-0.006	0.273
Mississippi	0.250	-1.385 ***	0.302
Minnesota	0.556	-0.587 *	0.263
Iowa	0.690	-0.371	0.277
Missouri	1.070	0.068	0.261
North Dakota	0.389	-0.943 **	0.329
South Dakota	0.767	-0.265	0.343
Nebraska	0.596	-0.517	0.284
Kansas	0.498	-0.697 *	0.277
Arkansas	2.295	0.831 *	0.347
Louisiana	0.551	-0.596 *	0.259
Oklahoma	1.004	0.004	0.281
Texas	0.551	-0.596 **	0.225
Montana	0.571	-0.561	0.325
Idaho	0.885	-0.122	0.363
Wyoming	0.977	-0.024	0.484
Colorado	0.531	-0.633 *	0.317
New Mexico	0.470	-0.755	0.415
Arizona	0.555	-0.589	0.318
Utah	0.909	-0.095	0.314
Nevada	0.469	-0.758 *	0.383
Washington	0.407	-0.899 **	0.295
Oregon	2.314	0.839 *	0.368
California	0.751	-0.287	0.228
Alaska	0.626	-0.468	0.589
Hawaii	0.341	-1.076	0.557
Constant		-1.332 **	0.423
Model Statistics:			
Log pseudolikelihood=	-18933.834	N=	32642
Wald χ^2 (df=157)=	1602.52	Pseudo R^2 =	0.163
Prob (>Wald χ^2 (157))=	<0.0001		

* p<0.05; ** p<0.01; *** p<0.001

Appendix 3. Completed Results of the Reduce Model with the Post-BBA Dummy Variable

Variable	Odds ratio	Coefficient	Standard error
Post-BBA (vs. Pre-BBA)	1.357	0.305	0.253
Ownership effects (vs. Public)			
Religious	1.865	0.623 ***	0.132
Religious x Post-BBA	0.833	-0.183 *	0.090
Secular	1.278	0.245 **	0.090
Secular x Post-BBA	1.009	0.009	0.059
For-profit	1.625	0.485 **	0.183
For-profit x Post-BBA	0.385	-0.956 ***	0.159
Organizational factors			
Medicare	1.009	0.009 **	0.002
Medicare x Post-BBA	1.000	0.000	0.002
Margin	1.015	0.015 ***	0.003
Margin x Post-BBA	0.996	-0.004	0.004
Nursing	1.000	0.000	0.005
Nursing x Post-BBA	0.990	-0.010	0.005
Hospital size	1.002	0.002 ***	0.000
Hospital size x Post-BBA	1.000	0.000	0.000
CMI	2.114	0.749 ***	0.214
CMI x Post-BBA	0.799	-0.224	0.165
Market factors			
HHA/elderly	4.956	1.601 ***	0.191
HHA/elderly x Post-BBA	1.073	0.070	0.113
Elderly	1.024	0.024 *	0.010
Elderly x Post-BBA	0.996	-0.004	0.007
Growth	1.015	0.015	0.015
Growth x Post-BBA	1.010	0.010	0.015
NFP x FP market	1.001	0.001	0.003
NFP x FP market x Post-BBA	0.996	-0.004	0.003
FP x NFP market	0.995	-0.005	0.003
FP x NFP market x Post-BBA	1.000	0.000	0.003
Control variables			
System	0.694	-0.366 ***	0.059
Teaching	0.533	-0.629 ***	0.148

Appendix 3 (continued)

Variable	Odds ratio	Coefficient	Standard error
Rural	1.576	0.455 ***	0.083
Income	0.983	-0.017 **	0.006
Unemployment	0.944	-0.057 ***	0.012
Closure	0.678	-0.388 ***	0.113
Closure x Post-BBA	0.937	-0.066	0.110
CMI_d	0.252	-1.380 ***	0.409
CMI _d x Post-BBA	0.701	-0.355	0.356
Margin_d	0.422	-0.863 ***	0.262
Margin_d x Post-BBA	1.271	0.240	0.214
State dummies			
Maine	0.223	-1.501 ***	0.376
New Hampshire	0.177	-1.732 ***	0.439
Vermont[#]	0.008	-4.854 ***	1.039
Massachusetts	0.423	-0.861 **	0.309
Rhode Island	0.406	-0.901	0.622
Connecticut	0.228	-1.480 ***	0.439
New York	0.246	-1.402 ***	0.248
New Jersey	0.397	-0.924 **	0.307
Pennsylvania	0.587	-0.532 *	0.246
Delaware	1.127	0.120	0.883
Maryland	0.403	-0.908 **	0.333
D.C.	0.295	-1.222	0.687
West Virginia	1.033	0.032	0.333
North Carolina	0.538	-0.620 *	0.260
South Carolina	0.398	-0.921 **	0.320
Georgia	0.236	-1.442 ***	0.267
Florida	0.755	-0.281	0.240
Ohio	0.625	-0.470	0.245
Indiana	1.281	0.248	0.263
Illinois	0.669	-0.401	0.239
Michigan	0.522	-0.651 *	0.253
Wisconsin	0.198	-1.617 ***	0.273
Kentucky	0.523	-0.649 *	0.266
Tennessee	0.580	-0.545 *	0.261

Appendix 3 (continued)

Variable	Odds ratio	Coefficient	Standard error
Alabama	0.999	-0.001	0.266
Mississippi	0.267	-1.321 ***	0.298
Minnesota	0.551	-0.595 *	0.260
Iowa	0.667	-0.405	0.274
Missouri	1.073	0.070	0.257
North Dakota	0.384	-0.958 **	0.326
South Dakota	0.723	-0.324	0.339
Nebraska	0.568	-0.565 *	0.281
Kansas	0.478	-0.738 **	0.275
Arkansas	2.146	0.764 *	0.337
Louisiana	0.555	-0.590 *	0.254
Oklahoma	0.976	-0.024	0.277
Texas	0.548	-0.602 **	0.222
Montana	0.566	-0.570	0.325
Idaho	0.917	-0.087	0.360
Wyoming	0.919	-0.084	0.473
Colorado	0.536	-0.624 *	0.314
New Mexico	0.469	-0.756	0.410
Arizona	0.579	-0.547	0.313
Utah	0.902	-0.103	0.306
Nevada	0.494	-0.705	0.373
Washington	0.443	-0.814 **	0.291
Oregon	2.464	0.902 *	0.363
California	0.810	-0.210	0.225
Alaska	0.677	-0.391	0.586
Hawaii	0.362	-1.017	0.550
Constant		-1.140 **	0.419
Model Statistics			
Log pseudolikelihood	-19201.629		
Wald χ^2 (88)	1365.6		
P(>Wald χ^2 (88))	<0.0001		
Pseudo R^2	0.151		
N	32642		

* p<0.05; ** p<0.01; *** p<0.001

Appendix 4. Results of Sensitivity Analysis: Comparison of the Coefficients between the Two Models with Dependent Variables Derived from the HCRIS and AHA Files, Respectively

Variable \ Model	Coefficients		
	HCRIS Model	AHA Model	Δ%
Post-BBA (vs. Pre-BBA)	0.305	0.361	
Ownership effects (vs. Public)			
Religious	0.623 ***	0.615 ***	-1%
Religious x Post-BBA	-0.183 *	-0.154	-16%
Secular	0.245 **	0.201 *	-18%
Secular x Post-BBA	0.009	0.081	
For-profit	0.485 **	0.491 **	1%
For-profit x Post-BBA	-0.956 ***	-1.093 ***	14%
Organizational factors			
Medicare	0.009 **	0.009 ***	-3%
Medicare x Post-BBA	0.000	0.000	
Margin	0.015 ***	0.014 ***	-6%
Margin x Post-BBA	-0.004	-0.001	
Nursing	0.000	0.004	
Nursing x Post-BBA	-0.010	-0.014 **	37%
Hospital size	0.002 ***	0.002 ***	-14%
Hospital size x Post-BBA	0.000	0.000	
CMI	0.749 ***	0.721 ***	-4%
CMI x Post-BBA	-0.224	-0.247	
Market factors			
HHA/elderly	1.601 ***	1.520 ***	-5%
HHA/elderly x Post-BBA	0.070	0.039	
Elderly	0.024 *	0.023 *	-7%
Elderly x Post-BBA	-0.004	-0.001	
Growth	0.015	0.015	
Growth x Post-BBA	0.010	0.006	
NFP x FP market	0.001	0.002	
NFP x FP market x Post-BBA	-0.004	-0.004	
FP x NFP market	-0.005	-0.005	
FP x NFP market x Post-BBA	0.000	0.000	
Control variables			

Appendix 4 (continued)

Variable \ Model	Coefficients		
	HCRIS Model	AHA Model	Δ%
System	-0.366 ***	-0.385 ***	5%
Teaching	-0.629 ***	-0.497 ***	-21%
Rural	0.455 ***	0.438 ***	-4%
Income	-0.017 **	-0.015 **	-10%
Unemployment	-0.057 ***	-0.049 ***	-15%
Closure	-0.388 ***	-0.405 ***	5%
Closure x Post-BBA	-0.066	-0.144	
CMI_d	-1.380 ***	-1.283 **	-7%
CMI_d x Post-BBA	-0.355	-0.374	
Margin_d	-0.863 ***	-0.737 **	-15%
Margin_d x Post-BBA	0.240	0.292	
State dummies			
Maine	-1.501 ***	-1.437 ***	-4%
New Hampshire	-1.732 ***	-1.765 ***	2%
Vermont[#]	-4.854 ***	-4.729 ***	-3%
Massachusetts	-0.861 **	-0.925 **	7%
Rhode Island	-0.901	-0.859	
Connecticut	-1.480 ***	-1.364 **	-8%
New York	-1.402 ***	-1.320 ***	-6%
New Jersey	-0.924 **	-0.881 **	-5%
Pennsylvania	-0.532 *	-0.479	-10%
Delaware	0.120	-0.151	
Maryland	-0.908 **	-0.874 **	-4%
D.C.	-1.222	-1.174	
West Virginia	0.032	0.030	
North Carolina	-0.620 *	-0.566 *	-9%
South Carolina	-0.921 **	-0.923 **	0%
Georgia	-1.442 ***	-1.456 ***	1%
Florida	-0.281	-0.367	
Ohio	-0.470	-0.458	
Indiana	0.248	0.243	
Illinois	-0.401	-0.424	
Michigan	-0.651 *	-0.592 *	-9%

Appendix 4 (continued)

Variable \ Model	Coefficients		
	HCRIS Model	AHA Model	Δ%
Wisconsin	-1.617 ***	-1.622 ***	0%
Kentucky	-0.649 *	-0.607 *	-7%
Tennessee	-0.545 *	-0.547 *	0%
Alabama	-0.001	-0.067	
Mississippi	-1.321 ***	-1.202 ***	-9%
Minnesota	-0.595 *	-0.476	-20%
Iowa	-0.405	-0.355	
Missouri	0.070	-0.333	
North Dakota	-0.958 **	-1.052 **	10%
South Dakota	-0.324	-0.216	
Nebraska	-0.565 *	-0.453	-20%
Kansas	-0.738 **	-0.750 **	2%
Arkansas	0.764 *	0.783 *	3%
Louisiana	-0.590 *	-0.598 *	1%
Oklahoma	-0.024	-0.088	
Texas	-0.602 **	-0.704 **	17%
Montana	-0.570	-0.686 *	20%
Idaho	-0.087	-0.107	
Wyoming	-0.084	-0.321	
Colorado	-0.624 *	-0.670 *	7%
New Mexico	-0.756	-0.818 *	8%
Arizona	-0.547	-0.550	
Utah	-0.103	-0.200	
Nevada	-0.705	-0.647	
Washington	-0.814 **	-0.814 **	0%
Oregon	0.902 *	0.685 *	-24%
California	-0.210	-0.239	
Alaska	-0.391	-0.307	
Hawaii	-1.017	-0.892	
Constant	-1.140 **	-1.259 **	11%
Model Statistics			
Log pseudolikelihood	-19201.629	-19309.34	
Wald χ^2 (df=88)	1365.6	1338	

P(>Wald χ^2 (88))	<0.0001	<0.0001
Pseudo R^2	0.151	0.1451
N	32642	32642

* p<0.05; ** p<0.01; *** p<0.001

VITA

Tiang-Hong Chou was born in Tainan, Taiwan on November 15, 1964. He graduated from the Tamkang University with a B.E. in Electronic Engineering in 1987 and received a Master of Science in Resource Development at Michigan State University in 1993. Between 1994 and 2004, he worked as a director of the Development Office and the Planning Department, respectively, in the Mennonite Christian Hospital (MCH) in Hualien, Taiwan. In 2004, he was admitted to the Department of Health Management and Policy at the University of Michigan and received a Master in Health Services and Administration in 2006. After working in MCH for another year, he enrolled in the VCU Department of Health Administration's doctoral program in August, 2007, and completed the requirements for the Ph.D. degree in December, 2009.