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UNDERSTANDING THE IMPACT THE HOSPITAL READMISSION RATE PROGRAM AND VALUE BASED PURCHASING HAS HAD ON THE FINANCIAL VIABILITY OF ACADEMIC HEALTH CENTERS, 2011 TO 2015.

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Understanding the Impact the Hospital Readmission Rate Program and Value Based Purchasing has had on the Financial Viability of Academic Health Centers, 2011 to 2015.

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

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Abstract

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Academic Health Centers (AHCs) hold a unique place in today's health care environment. They service their communities through a tripartite mission of education, research, and provision of complex care to disadvantaged populations. To achieve this mission, AHCs face challenges in funding and cost containment compared to non-AHCs. Additionally, the implementation of government programs like the Hospital Readmission Rate Program (HRRP) and Value Based Purchasing (VBP) have the potential to affect AHCs differently from non-AHCs. While AHC's unique features are known and there has been research to date on HRRP and VBP, literature has yet to statistically explore the financial differences between AHCs and non-AHCs and how HRRP and VBP may have differentially affected AHCs compared to non-AHCs.

The objectives of this study are to explore financial differences between AHCs and non-AHCs and the impact that HRRP and VBP has had on these two types of organizations through the use of a contingency theory framework. Contingency theory is

an organizational theory that seeks to explain variations in organizational performance over time by studying internal and external environmental influences.

Guided by Contingency Theory, the study used a non-randomized, quasi-experimental, retrospective study design to evaluate two hypotheses. The study sample consisted of a total of 10,157 (991 AHCs) US non-rural hospital years from 2011 through 2015. The study used operating margin and total margin as the key measures of hospital financial performance for the dependent variables. HRRP and VBP were combined into a single independent variable along with hospital type differentiating AHCs from non-AHCs. Covariates of Herfindahl-Hirschman Index, Medicaid expansion, health system affiliation, and ownership structure were used to control for other environmental influences. A repeated measure analysis of variance was employed to test the difference between the two hospital groups in isolation of HRRP, VBP, and covariates and a repeated measure analysis of variance with covariance was used to test the full model, which incorporated HRRP, VBP, and covariates. The results of the analysis support the significance of HRRP and VBP on hospital operating margin, but the results did not support a differential effect of these programs on AHCs as compared to non-AHCs.

While the results did not support the two main hypotheses, it did provide valuable insight into the financial differences between AHCs and non-AHCs and the importance of VBP and HRRP on hospital financial performance. The results also provide important policy implications and thoughts on potential managerial actions given the HRRP and VBP programs.

Chapter 1: Introduction

The Study Problem

Academic Health Centers (AHCs), a critical part of the healthcare infrastructure, are the only healthcare organizations explicitly tasked with the tripartite mission to advance science, educate providers, and provide complex care to disadvantaged populations. To support their mission, they rely on a combination of government funding and health insurance recovery (Statista, 2018). Recently, financial penalties threaten their financial margin, and to borrow a phrase commonly repeated in hospitals and the nonprofit health sector, with no margin there is no mission. Two recent Medicare payment adjustment programs, the Hospital Readmission Reduction Program (HRRP) and Value Based Purchasing (VBP), could substantially affect the viability of these healthcare providers. Although both HRRP and VBP affect hospitals and their margins in similar ways, HRRP is a penalty focused on excess hospital readmission, whereas VBP applies an across-the-board payment reduction with the possibility of a payback based on achieving certain metrics. With the implementation of the HRRP, all hospitals face up to a 3% penalty on all Medicare reimbursement for high readmission rates, whereas VBP reduces all Medicare payments by 2%, with a potential payback of 3% (Morse, 2016). Although much of the research on HRRP and VBP has focused on their financial impact on all U.S. based hospitals, the unique impact these programs have had on AHCs has not been examined.

This study uses previous methods and approaches to review and analyze hospital profitability around government programs to determine the impact of these programs on AHCs. On average, AHCs depend on government funding, such as Medicare, for more than 50% of their total net patient revenues, compared to the

national average for hospitals, which was 40.2% in 2014 (Statista, 2018). A lack of research to understand the unique impact HRRP and VBP could have on AHCs compared to non-AHCs may leave AHCs facing financial hardship from these programs more than conventional community hospitals.

This study will provide valuable insight into the financial impact and performance of AHCs under HRRP and VBP. This will be accomplished through regression analyses to explore if AHCs have been differently affected compared to non-AHCs through financial margin. The expected outcome is the statistically larger negative impact on AHCs' total and operating margins compared to non-AHCs. It is expected that the decline in operating and total margins is due to the increasing nature of the HRRP penalties from 1% to 3% from 2013 through 2015 and the VBP payment reduction of 2% offset by hospitals' opportunities to increase their incentive payments up to 3%. The outcome of this research will assist policymakers and AHCs in understanding how penalties have affected AHCs' historical financial performance.

Background

The AHC mission is critical to the success of the U.S. healthcare system, but it is expensive to fund. AHCs have been found to be 80% costlier than non-teaching community hospitals, with an average cost $676 higher per patient case than non-AHCs (Reuter, 1997). The higher cost is a product of the patient populations they serve and the increased costs related to resident education. Although AHCs only represent 5% of all US hospitals, they provide 37% of all charity care, 26% of all Medicaid hospitalizations, and receive 38% of transfers from other hospitals that cannot care for patients with complex needs (Grover, Slavin, & Willson, 2014). This patient

responsibility is often coupled with a regional safety net designation, with AHCs maintaining nearly 80% of regional standby services, such as level 1-trauma centers. The ability to provide such complex and expensive services to a population that is often disadvantaged creates financial pressures. AHCs rely on patient care revenue to a large degree to support these critical areas; however, the care they provide and the populations they serve do not provide high levels of revenue above the cost of care (Reuter & Gaskin, 1997).

The American Hospital Association found that in 2015, Medicaid and Medicare reimbursements to hospitals were $57.8 billion under the cost of providing that care (Belliveau, 2016). The combination of high reliance on low paying populations and the need to provide expensive care in addition to their educational mission makes AHC reliance on government payers and programs all the more concerning. This concern stems from AHCs' financial susceptibility to changes in government policies and the introduction of new payment programs.

HRRP and VBP are two such programs that significantly affect the payments to all hospitals for Medicare services. HRRP is a set of penalties that are assessed on hospitals for excess hospital readmissions within 30 days of a Medicare patient's discharge. Once the penalty rates are calculated, they are applied to all Medicare payments for each hospital. The penalties started at 1% of all Medicare payments for a hospital in fiscal year 2013, then increased to 2% in year two, and 3% in year three (Boccuti & Casillas, 2017). The penalties have had a sizeable impact, costing hospitals $290 million in 2013 and $528 million in 2017 (Boccuti & Casillas, 2017). Research has shown that HRRP has impacted the majority of hospitals in the United States. In 2016,

only 799 hospitals of the 3,400 hospitals, less than a quarter, were not assessed penalties under the program (Rice, 2015).

VBP is foundationally different from HRRP. VBP is not a penalty but a reduction in total payments by 2% that could then be earned back based on a hospital's performance on several key metrics. Hospitals can earn back a percentage of total payments, up to approximately 3%. The law states that the 2% collected is to be redistributed back to the highest performing hospitals in the program. The 2% reduction generated around $1.9 billion for payments in 2018 (CMS C, 2017). Overall, approximately 2,955 hospitals were part of the program in 2017, declining to 2,808 in 2018 (Castellucci, 2017). Around half of these hospitals saw little change in reimbursement, receiving payments and penalties between -.5 to .5% of Medicare payments (Castellucci, 2017). The highest performing hospitals saw a 3% increase, whereas the lowest performing facilities saw a net loss of 1.65% (Castellucci, 2017). Of the 3,500 hospitals, roughly a third received an overall decline from the program (Castellucci, 2017).

These two programs have the potential to affect hospital financial performance. Hospital financial performance relates to a hospital's ability to generate enough income from services and other sources to cover its costs. Any revenue that is not used to cover its costs is profit. This level of financial performance is measured through financial ratios, such as financial margin. It is not measured by performance-related metrics such as patient satisfaction or the number of hospital-acquired infections. Financial performance can be low or high, with high-performance resulting in a strong net income after operating expenses.

HRRP and VBP have the potential to impact hospital margins since their penalties directly affect the amount of revenue a hospital needs to cover its costs. Recent research shows that the operating margins of some hospitals were affected as much as 4.24% under these programs (Chen et al., 2017). Other studies have shown that large teaching hospitals**,** which served as a major safety net in their communities by treating larger shares of Medicare or socioeconomically disadvantaged patients, faced the highest HRRP and VBP penalty rates (Bazzoli, Thompson, & Waters, 2018; Thompson, Waters, Kaplan, Cao, & Bazzoli, 2017). Higher penalties can have a significant impact on these hospitals and their margins (Bazzoli et al., 2018). These penalty rates can disproportionately affect AHCs due to their high reliance on Medicare payments, a large Medicare population, and high costs.

A theoretical model will be employed to investigate the effects of these regulations on AHCs. Theories are important in research since they can provide a complex and comprehensive explanation of areas that can be difficult to understand, such as how organizations operate (Bacharach, 1989; Reeves, Albert, Kuper, & Hodges, 2008; Van De Ven, 1989). With a theoretical model, we can better understand the specific areas that are influencing changes in hospital margins in response to HRRP and VBP. Organizational theories explain the behavior of organizations and organizational phenomena by reviewing areas such as bureaucratic infrastructures, integration, and the process of decision making. By understanding these behaviors, theories, can be used to explain why some organizations act in certain ways or perform differently than other organizations. Contingency theory is a popular perspective within

the canon of macro-level organization theory that directly addresses organizational performance.

Contingency theory provides a framework where an organization's performance is determined by its adoption of an organizational structure that best fits with the environment that influences its operations. It was developed and advanced in the 1960s through works that include Burns and Stalker (1961), Woodward (1965), Thompson (1967), and Lawrence and Lorsch (1967). Contingencies can be the communities and patients that hospitals serve, revenue sources, and pressures to service the organizations' missions, among other items. Based on these contingencies, an organization needs to adapt as contingencies change.

Contingency theory can be applied to explain the difference in AHC versus non-AHC financial performance under the environmental changes created by HRRP and VBP. The collective implementation of HRRP and VBP represents a change in the contingency of revenue sources, specifically Medicare payments. This altered contingency would affect hospitals' financial performance, leading to the need for organizational change. However, contingency theory would also suggest that, as a new contingency factor, the impact of the collective implementation of HRRP and VBP would vary from hospital to hospital based on their environment and existing organizational structure. Changes in contingencies would explain why AHCs would have their financial performance affected to a different degree compared to non-AHCs. Additionally, AHCs would have a more difficult time adapting to changes in HRRP or VBP than non-AHCs due to their high reliance on government payers and large, cumbersome structures~~,~~ that make organizational changes more difficult.

In this study, AHC status along with HRPR and VBP penalties will be the independent variables with total and operating margin the dependent variables. The study's research questions seek to identify the effect of these programs on AHCs to inform policymakers and AHC leadership.

Research Questions

Research Question 1

Are historical total and operating margins of AHCs statistically different from non-AHCs?

Research to date has not compared the operating and/or total margins of AHCs to non-AHCs, even though it is to be expected that their financial margins would be different, as noted above. This study will investigate the difference between AHCs' and non-AHCs' operating and total margins through two periods of interest, pre-HRRP and VBP (period 1 from 2011 to 2012) and post-HRRP and VBP (period 2 from 2013 to 2015). A descriptive analysis will be performed as a first step to understand if there is a difference between these two hospital groups on the basis of total and operating margin without introducing any other independent or control variables.

The descriptive analysis will be performed with period 1 and period 2 and AHC/non-AHC group membership as the independent variables. AHC status will be determined based on the Counsel of Teaching Hospital designation from the American Association of Medical Colleges**,** and margins will be calculated from the CMS Medicare Cost Reports. If there is a significant interaction between both, it will mean that both the period and hospital group are associated with hospital financial margins and will be informative in leading to the second research question.

Research Question 2

Is the operating and total margins of AHCs more significantly negatively affected from 2011 to 2015, with the implementation of HRRP and VBP, compared to non-AHCs?

The study's second research question investigates the impact of the HRRP and VBP program on AHCs' and non-AHCs' operating and total margins over time while controlling for several variables. The process will create a linear model that will analyze the operating and total margins from 2011 through 2015. An independent variable of the year will help guide the changes taking place in the contingencies for AHC and HRRP/VBP. In addition to these variables and in line with other research, several variables will be controlled for that have been historically shown as being linked with hospital profitability (Bai & Anderson, 2016). The research question will control for state Medicaid expansion, Herfindahl-Hirschman Index on competitiveness, ownership status, and health system affiliation. By controlling for these variables, the study will be able to better assess the potential impact that HRRP and VBP have had on hospital profitability (Bai & Anderson, 2016; Chen et al., 2017)**.**

The expected outcome from the study is that AHCs will have experienced a higher financial impact on operating and total margins from 2011 to 2015 than non-AHCs. As HRRP and VBP are implemented, it is expected that the operating and total margins of both types of hospitals will fall. The fall in margins are due to the increasing nature of the HRRP penalties from 1% to 3% and the implementation of VBP.

Scope and Analytic Approach of the Study

All the data in this study will be from publically available data sets including the CMS Medicare Cost Reports, American Hospital Association Annual Survey, state

websites on Medicare expansion, and data from the Association of American Medical Colleges. Once the data is organized, SPSS will be used to review for outliers and issues of multicollinearity. The first step in data analysis is to review the data for a statistical difference in margins between AHCs and non-AHCs both pre and post-HRRP and VBP. This will be informative as it will show if there is a significant difference when including all factors that can after the different hospital types. The statistical analysis for the first step is a repeated measures two-way ANOVA. A repeated measures analysis of variance (RMANOVA) model will be used with the dependent variable being hospital operating and total margin. The RMANOVA model will be a two-way model including the interaction between the two factors. The between units factor is Hospital Type (AHC or non-AHC), and the within unit factor is Period (Period 1 is years 2011-2012 (Pre- HRRP and VBP), Period 2 is years 2013-2015 (HRRP and VBP implemented)). After this informative analysis, there will be a clear calculation of the differences between AHCs' and non-AHCs' financial performance in the two periods.

After the data analysis, a RMANCOVA model will be used to analyze the research question with the dependent variable being hospital operating and total margin and independent variables of hospital type and HRRP/VBP penalty rates. The RMANCOVA models combine both ANOVA and regression in the predictive model. The RMANCOVA model will include a between units factor (Hospital type: AHC or non-AHC) and a within units factor (Year: 2011, 2012, 2013, 2014, and 2015 along with combination of HRRP penalties and VBP incentives), as well as the interaction between hospital type, HRRP and VBP penalty, and year. A strength of this analysis is that it will be performed for both AHCs and non-AHCs**,** allowing for a complete model. It is

expected that this analysis will show differential change in both operating and total margin over time due to the inability of AHCs to respond and manage HRRP and VBP as easily as non-AHCs.

Significance and Limitations of the Study

The purpose of the research is to demonstrate the difference in AHCs compared to non-AHCs in the area of operating and total margin and to show the impact of HRRP and VBP over the six years before and after its implementation. The research is novel in its approach by providing valuable insight not only in the difference in the financial performance between these two groups of organizations but also on the outlook of AHCs' financial health due to the implementation of the HRRP and VBP programs. However, as with all research, this field of study faces several limitations.

The first limitation is the need to control for as many variables that impact hospital profitability as possible. For instance, other policies and rules occurred other than HRRP and VBP, such as the expansion of Medicaid. Multiple co-variates will be used to control for as many variables associated with profitability as possible.

Second, there have been some concerns with the data reporting and the accuracy that is provided by the hospitals in the Medicare cost reports. The main concern is in the way hospitals report the data. There is not a stringent verification process, which can lead to data outliers (Guadagnino, 2012). Data will need to be reviewed for outliers to ensure its consistency. Future studies can build on the research by including other government programs that affect profitability such as Hospital Acquired Conditions penalties.

The innovation of the study is its focus on AHCs. The study will be the first to review the difference in financial margins between AHCs and non-AHCs. Although the nature of AHCs indicates higher costs**,** and their dependence on low paying government programs would indicate lower revenue, little research has investigated if there is an actual difference. In the second step, the study will be breaking new ground through its investigation in the change in the financial margins of AHCs pre and post-HRRP and VBP compared to non-AHCs. Previous research has not used five years of financial information to create a model of the trends in financial health of AHCs. These two unique focus areas need to be investigated now to understand how HRRP and VBP have affected these hospitals' financial health. The novel investigation into the financial performance of AHCs will shed light on how they fared under these government programs. By maintaining their financial positions, these hospitals will continue not only to serve their populations but also continue to advance science and educate the next generation of healthcare providers.

Organization of Subsequent Chapters

The remaining chapters will provide more detail on the history of academic health centers and government policies, a detailed review of the literature to date that is pertinent to this study, the theoretical framework, the methods used in this study, the study's results, and its conclusion. Chapter 2 reviews the background of AHCs, the Hospital Readmission Reduction Program, and Value Based Purchasing. It also reviews the relevant literature on the financial performance of hospitals related to government programs and how information is pertinent to the study of AHC profitability. Chapter 3 outlines the theoretical framework for the study, contingency theory. It reviews the

history and constructs of the theory and how they shape the study's vision and hypotheses. Chapter 4 forms the study's design including the methods used, data sources and transformations, statistical procedures, and variables. The results of the methods and procedures are represented in Chapter 5. Chapter 6 discusses how the results of the analysis are related and support or refute study hypotheses. It also reviews how the theoretical framework was supported or refuted by the results. Finally, the potential implications of the study will be reviewed.

Chapter 2: Literature Review

This chapter reviews the literature on Academic Health Centers (AHCs), HRRP and VBP. The chapter begins with an in-depth discussion of AHCs and their unique role in the US health care system. It reviews why they are important to the health care system and how their financial performance may be especially susceptible to changes in payer processes. It then discusses HRRP and VBP programs, their inception, and how the programs have impacted hospitals nationwide, along with a review of the current literature on the impact of HRRP and VBP on hospitals. This chapter will close by synthesizing the current literature and identifying gaps in the research.

Academic Health Centers

Overview. AHCs are unique health care providers with a mission of advancing science, educating health care providers, and providing complex care to disadvantaged populations (Tallia & Howard, 2012). Even though AHCs do not have a specific definition, they are typically comprised of a medical school plus additional health professions' schools, such as nursing or dental; have extensive biomedical research programs; and have one or more affiliated hospitals or health systems (Robertson, 2013). These hospitals are often in urban environments and act as safety net hospitals, hospitals that serve a substantial level of low income or vulnerable populations. Due to their size, various services, and typical central locations, they are often on the front line for public health and natural disasters (AAHC, 2018). These mission driven activities require additional funding to remain operational. Much of the funding for these activities comes from reimbursement for care: insurance payments.

Generally, teaching hospitals engage in primary or secondary medical education and employ residents for training purposes. The American Hospital Association

recognizes over 1,000 teaching hospitals in the United States. A subset of these hospitals are AHCs (AHA, 2018). AHCs hospitals are defined and recognized as being part of the Council of Teaching Hospitals, or COTH, a member organization under the Association of American Medical Colleges. COTH is an organization that represents the nation's leading teaching hospitals and health systems (AAMC, 2018a).

There are various membership levels under the COTH designation. To be a COTH member, a hospital needs to have an affiliation agreement with a medical school accredited by the liaison Committee on Medical Education. Each hospital also must participate in at least four residency programs with at least two being in medicine, surgery, obstetrics/gynecology, pediatrics, family practice, or psychiatry (AAMC, 2018b). The COTH designation includes health systems, individual hospitals, and Veterans Affairs hospitals. For this study, only COTH members that are eligible for HRRP and VBP are considered. The COTH members that are excluded are children, cancer, and Veterans Affairs hospitals. As of February 2018 there were 221 COTH members that will be included.

Tri-part mission. The AHC tri-part mission is critical to the success of the U.S. health care system but is expensive to fund. This is due, in part, to the intensive work it takes to educate the next generation of physicians through Graduate Medical Education (GME). GME trains physicians after graduation from medical school in their chosen area of medial specialization. This training can last three to seven years after medical school graduation and occurs at teaching hospitals and in their ambulatory care settings (MEDPAC, 2007). Reuter (1997) found AHCs are 80% costlier than non-teaching community hospitals largely due to educational costs. For example, AHCs average

$2,681 of cost per case in 1993 while all other large non-teaching hospitals had an average cost of $676 per case in 1993 (Reuter, 1997). A 2002 study estimated the average AHC cost per case was 80% higher than the national average. This cost difference between an AHC and non-AHC may contribute to a difference in profit margins across these two hospital types. Additionally, the base operating DRG payments from Medicare are similar between AHCs and non-AHCs operating in the same geographic area, although AHCs qualify for some additional Medicare revenue supplements not provided to non-AHCs.

Some of the additional treatment costs for Medicare patients experienced at AHCs are covered through Direct Graduate Medical Education (DGME) and Indirect Medical Education (IME) payments from Medicare. These supplemental payments are in recognition that teaching hospitals will have higher costs of care when compared to non-teaching hospitals due to their educational activities. These programs were started in 1965 as part of the Hospital Insurance Program Act. The Act recognized that government insurance should compensate hospitals for the costs of trainees including stipends as well as compensation for educators. A 2018 report by AAMC found that COTH teaching hospitals spent an average of $165,556 in 2015 to train a resident (AAMC, 2018c). Medicare's share of the costs is was only $43,370 in 2015 for DGME (AAMC, 2018c). The remaining balance must be covered by a hospital's revenue recoveries.

One study found that out of an estimated $27 billion in total AHC mission-related costs in 2002, $16.2 billion was related to GME (Koenig et al., 2003). A 2013 study found the costs of stipends, faculty supervision, simulation and other equipment, and

salaries for administrative staff were estimated to account for $16 billion annually (Grover et al., 2014). Out of the total cost of GME, only $3.4 billion was covered for DGME and $8.3 billion for IME in 2016 by Medicare (RGC, 2017). In addition to the increase in direct costs, recent unfunded mandates, such as decreased duty hours and stricter supervision requirements, have increased the cost for residency training programs (Grover et al., 2014).

In addition to issues related to their patient populations, AHCs are often responsible for providing complex care. The ability to provide complex and expensive services requires equipment and medical teams that are not fully utilized. The expenses for this underutilized capacity cover equipment such as positron emission tomography (PET) scanners, specialty care beds, and other expensive services such as transplant units (Koenig et al., 2003). In 2002, a study by Koenig et al. (2003) estimated these services cost AHCs $9.6 billion in 2002. Additionally, they found nearly 80% of regional standby services, such as level 1 trauma centers, are AHCs.

AAMC reported that in fiscal year 2016 61% of all pediatric intensive care beds were in COTH hospitals and 69% of all burn unit beds were in COTH hospitals (AAMC, 2018c). COTH hospitals also represent 96% of all comprehensive cancer centers, and 25% of all Medicaid hospitalizations in 2016 (AAMC, 2018c). COTH hospitals support 25% of all charitable care costing a median of $15.3 million per year compared to $0.6 million for nonteaching hospitals in 2016 (AAMC, 2018c). AHCs often serve large numbers of indigent, Medicare, and Medicaid patients (Thier, 2001). These services have been historically expensive to operate and maintain, further straining AHCs available funding.

Research is another key part of AHC's mission. The research performed not only advances human health, but also fuels the economy and spurs research innovation. Much of the funding for research comes from the National Institutes of Health. In 2013, the NIH funded almost to $13 billion for research in medical schools and teaching hospitals toward the direct cost of providing research. Although the NIH does provide funds for facilities and administration cost, these funds do not cover the full cost of supporting research. In a survey by the AAMC in 2013, it was estimated that the average medical school investment was an additional $.53 for every dollar of sponsored research it received. This investment generated $13.7 to $398 million per year in additional costs not funded by the granting agencies, with the average per hospital being around $111 million (Datahound, 2015). This estimate was based on reporting by forty-six institutions whose research ranged from $26 to $751 million per year. Much of the unfunded costs are supported by clinical revenues and other revenue sources, which puts additional financial strain on AHCs. (Datahound, 2015)

As noted above, it was estimated that all mission related costs combined in 2002 totaled $27 billion (Koenig et al., 2003). The combination of high reliance on low paying populations, the need to provide expensive care, and the educational and research missions of AHCs, makes their reliance on government sources of revenue and pay-for-performance programs all the more important.

Hospital Readmission Reduction Program

In the 2000s, a high level of hospital readmission rates began to gain national attention. Thomas, Rahman, Mor, and Intrator (2014) reported that in 2007 approximately 20% of Medicare patients age 65 years and older had been readmitted to

a hospital within 30 days of discharge. Toles et al (2014), reviewed readmission rates in North and South Carolina in 2007 and found that within 90 days of release from a hospital, 37.5% of Medicare beneficiaries treated at skilled nursing facilities were readmitted to a hospital within 30 days. These readmissions are costly for Medicare and the health care system. A 2007 Medicare Payment Advisory Commission report estimated that Medicare was spending $12 billion on potentially preventable readmissions in 2005 (MEDPAC, 2007).

Some of these high rates are related to the reimbursement policy of Medicare. Until 2012, the payment policy of Medicare covered services based on care provided, and not on the quality of that care. If the care given resulted in infections or other issues requiring readmission of patients, or additional procedures, the hospitals did not experience any negative financial repercussions. With the growing trend and cost of readmissions, Medicare started focusing on reducing readmission rates and improving the quality of care and follow-up that patients receive (Wachino, Artiga, & Rudowitz, 2014).

In October 2012, the Centers for Medicare and Medicaid Services (CMS) attempted to address this growing trend by implementing the Hospital Readmissions Reduction Program (CMS D, 2018). This program intended to penalize hospitals with risk-standardized readmission rates higher than the national averages for certain types of patient diagnoses and procedures. These penalties are calculated based on risk adjusted measures of unplanned readmissions, a patient returning to a hospital within 30 days of discharge for any reason to an acute care hospital. A 30 day window is used because readmissions and deaths after a longer period of time may have less to do with

the care provided in the hospital and more to do with the other complicating illnesses, patient's own behavior, or care provided to patients after hospital discharge. These rates are calculated for Medicare beneficiaries aged 65 and older who were enrolled in Medicare for 12 months before their hospital admission. Additionally, the rates do not include patients who died during the initial admission, who left the hospital against medical advice, or have documented co-morbidities that would cause a readmission to be expected (Medicare.gov, 2018).

At its inception, the program focused on three main diagnoses: acute myocardial infarction (AMI), congestive heart failure, and pneumonia (McIlvennan, Eapen, & Allen, 2015). Each year, CMS calculates risk-standardized readmission rates for each hospital, compares them with national averages for the same condition, and then determines the penalty. This program was gradually implemented over three years. Penalties are assessed on all Medicare payments for each hospital, regardless of the type of diagnosis or procedure for which the Medicare patient receives treatment. The penalties started at 1% of all Medicare payments for that hospital in 2013, then increased to 2% in year two, and 3% in year three (Boccuti & Casillas, 2017). This scaffold process of implementing the program was intended to give hospitals the opportunity to improve their readmission rates prior to the full penalty being imposed.

The penalties have had a sizeable impact, costing hospitals $290 million in 2012 and $528 million in 2017 (Boccuti & Casillas, 2017). Since the program's implementation, Medicare has imposed $1.89 billion in penalties (Boccuti & Casillas, 2017). The HRRP program appears to have had some desirable effects, with patients experiencing decreased readmissions since HRRP implementation. In 2012, CMS

reported that its All-Cause Hospital Readmission measure, which is a risk-standardized readmission rate for all beneficiaries age 65 or older, fell from 19% to 17.8% over a 5-year period (Ness & Kramer, 2013). Although this is only a 1% change, this was a shift from the trend of increasing readmission rates years prior to 2012.

One study found the reduction in readmissions was achieved not only by hospitals who had readmission rates close to the national average, but also by hospitals with readmission rates well above the national average (Wasfy et al., 2017). With these results, CMS expanded its initial focus to include COPD, hip/knee replacement, and, in 2016, coronary artery bypass graft surgery (CMS D, 2018). Overall, penalties have increased over the last five years, both in terms of the number of facilities penalized and the size of the penalty (Rice, 2015). In 2016, only 799 hospitals of the 3,400 hospitals included nationally were not assessed penalties under the program (Rice, 2015). This large percentage of hospitals that were penalized, 76.5%, leads many hospitals to argue against the sweeping nature of these penalties and their actual benefit.

The question of the effectiveness and appropriateness of these penalties has driven much of the research done to date. In a study by Gu et al. (2014), researchers reviewed the impact of HRRP on hospitals serving vulnerable populations. The research compared profit margin between hospital types to understand the HRRPs financial impact. The study used regression analysis to estimate the risk-adjusted readmission rates and financial penalties under HRRP. The researchers found that hospitals with higher proportions of patients that were dual-eligible had higher hospital readmission rates and lower operating margins. Gu and the research team concluded HRRP

penalties assessed on hospitals that have low profit margins could affect their ability to continue care for their vulnerable populations.

In a similar study, Joynt and Jha (2013) used data from 2008 through 2011 applying HRRP criteria to historical data to review what the impact of HRRP would have been had HRRP was implemented in previous years. They found major teaching hospitals were more likely to be penalized than non-teaching hospitals; 44% vs 33%. The researchers recognized that although the penalties may be small, they could have a large effect on hospitals that had low profit margins.

Another question researchers have attempted to address is if safety net hospitals are penalized at a higher rate than other hospitals and if they were able to reduce their penalty rates. In an article by Carey and Lin (2016), the authors studied changes in HRRP penalties from 2013 to 2015 for safety net hospitals compared to other hospitals. They found safety net hospitals had higher readmission rates to begin with and had more room for improvement. The researchers compared two groups of hospitals that both started with the same percentage of 30 day readmissions in 2013 to see if those groups rates were significantly different 3 years after the implementation of HRRP in 2015. One group was comprised of safety nets and another of hospitals categorized as 'other' non safety net hospitals. The researchers focused on the actual number of readmissions within that 30 day period and not the actual HRRP penalty rate. The researchers found that while both groups the number of readmissions, safety net hospitals did not show as large an improvement. Using myocardial infarctions as a marker, safety-net hospitals improved only 2.86% whereas other hospitals improved 3.20%. This difference demonstrates the difficulty safety net hospitals may have in

reducing their rates compared to other hospitals. The researchers also recognized the cost to reduce readmission rates. They noted these costs involve items such as staff time and new technologies to track and manage readmission rates and that these investments may create burden for hospitals with limited budgets and tight financial margins. These investments also could result in further declines on their financial margins and could be made at the expense of other mission-related activities.

Research by DuGoff, Bishop and Rawal (2014) supported this finding, noting that HRRP penalties can exacerbate the financial challenges that safety net hospitals already encounter and could lead to hospital closures in underserved areas. Even with the HRRP program's risk adjustment formula, patient factors related to their socioeconomic status are not included. Since such factors are not considered, there is concern that these penalties will adversely affect the ability of hospitals serve vulnerable hospital populations. In fiscal year 2019, CMS intends to incorporate socioeconomic status adjustments into the calculation of HRRP penalties, but it is still unclear how these adjustments will be implemented.

In March 2017, the Kaiser Foundation performed a review of the first five years of HRRP implementation (Boccuti & Casillas, 2017). They found that, across all five years of the program, major teaching hospitals, hospitals with higher shares of low-income beneficiaries, and safety net hospitals were among the highest penalized. These three groups of hospitals were penalized 86% of the time compared to other hospitals at 66%. This combination of penalized group's compound with AHCs as AHCs typically fall in each of these three groupings. These findings were corroborated in a study by Thompson et al. (Thompson et al., 2017).

Thompson et al. (2017) found that hospitals, penalized in the early years of HRRP, were more likely to be penalized in subsequent years. Moreover, they determined that four specific categories of hospitals (urban, major teaching, large, and/or safety-net hospitals) were more likely to be penalized in all years. These four demographics often encompass AHCs based on AAMC data (AAMC, 2018c). They also found that hospitals treating higher proportions of socioeconomically disadvantaged patients maintained a substantial penalty burden over their study period. These higher proportional shares of penalties may financially stress these specific hospitals more than other types of hospitals.

Thompson et al. (2017) also made the connection between the financial penalties and the burden on hospitals with high dependence on Medicare revenue. In their analysis, higher proportions of Medicare patients were associated with greater risk for larger penalties, due to a higher proportion of hospital overall reimbursements being tied to Medicare.

The HRRP program was designed and has been implemented with a standard formula that is applied to all hospitals equally. A standard approach to all hospitals can have unintended consequences as not all hospitals characteristics are incorporated in the formula to ensure an equitable outcome. Research has found that large teaching, safety net hospitals with large Medicare patient populations are among the most likely to be penalized, an outcome of the HRRP formula. Although the penalty rates may not be large percentagewise, these rates can have a substantial impact on these hospitals. Research to date has focused on the penalty rates with little research being done on the impact of penalties on financial margins over time and the specific difference between

AHCs and non-AHCs. To better understand the impact of these rates on AHCs, this study will build on the existing research by assessing differences in financial measures across AHCs and non-AHCs.

Value Based Purchasing

Value Based Purchasing (VBP) is another program implemented through the Affordable Care Act and a response by CMS to change the focus from a quantity payment system to one more focused on quality. VBP was established to encourage hospitals to provide higher quality of care in a more efficient way. It was instituted on July 1, 2011 for discharges of Medicare patients occurring on or after October 1, 2011, federal fiscal year 2012, for Medicare subsection (d) hospitals. A Medicare subsection (d) hospital is a general, acute care, short-term hospital. Unlike HRRP, this program was designed to incentivize and reward hospitals that met or exceeded the performance standards established. This was an advancement by CMS as they state that this program is intended to "…transform Medicare from a passive payer of claims to an active purchaser of quality health care for its beneficiaries" (CMS E, 2013). To fund this program, all applicable hospitals have their MS-DRG payments reduced by 2%. These funds create a pool that are redistributed to those hospitals meeting performance objectives on the program dimensions described below.

An important component of this program was establishing a set of agreed upon quality measures through partnerships with stakeholders. CMS identified three areas that would guide the scoring methodology including; a) providers should be scored on their overall achievement relative to national benchmarks; b) scoring methodologies should be weighted more heavily towards outcome, patient experience, and functional

status measures; and c) methodologies should be reliable and as straightforward as possible.

With these guiding principles, CMS established 45 measures under the Hospital IQR program that focus on quality of care provided to Medicare patients, how closely best clinical practices are followed, and how well hospitals enhance patients experiences (CMS F, 2017). These measures are broken down into four weighted domains: safety, clinical care, efficiency and cost reduction, and patent and caregiver-centered experience of care/care coordination. Each domain is weighted at 25%. To ensure the measures remained relevant CMS made provisions to change or replace quality measures or indicators when they were no longer relevant, were shown to not represent the best clinical practice, and/or were no longer appropriate. (CMS F, 2017).

The VBP program works by providing incentive payments to hospitals based on one of two criteria: 1) how well hospitals perform on each measure compared to the performance of other hospitals during a baseline period (achievement); and 2) how much hospitals improve their performance on each measure compared to their performance in a baseline period (improvement) (CMS F, 2017). CMS calculates both sets of criteria to determine bonuses and uses whichever criteria results in a higher bonus.

Casterllucci (2017) found about 57% of hospitals will receive Medicare bonuses in 2018. This represents roughly 1,600 hospitals in the US, which is an increase from 2017 when about 55% of hospitals received a bonus. On the other hand, the number of hospitals for which bonuses did not exceed payment reductions to create the VBP pool fell from 1,343 in 2017 to 1,211 in 2018. The total number of hospitals that are

participating in the program also fell from 2,955 in 2017 to 2,808 in 2018. This study also found more than half of the hospitals in the program will see only a small change (-0.5 to 0.5) to their DRG payments due to this program in 2018 from their 2017 figures. The highest performing hospitals saw an increase in their DRG payments of 3% whereas the lowest performing hospitals saw a cut of 1.65%.

Gilman, et al., (2015) reviewed the effect of VBP on safety net hospitals. They found that the VBP program more heavily penalized these hospitals compared to non-safety net hospitals. In 2014, 63% of safety net hospitals received payment reductions whereas only 51% of non-safety net other hospitals received reductions. A primary reason noted by the researchers for this poor performance related to process-of-care and patient experience scores. Safety net hospitals tend to fare worse on these scores compared to other hospitals. Curtis and Bernheim (2013) commented that teaching hospitals serving underserved populations may experience a potential loss of revenue that would “unduly strain” their financial health.

HRRP and VBP Research

Existing research has investigated the combined effect of HRRP and VBP on hospitals. These two areas are important to review together as the benefit of VBP could counteract the penalties from HRRP or the 2% reduction could layer on an additional penalty to hospitals that are performing poorly under both programs.

Figueroa, Wang, and Jha (2016) reviewed the characteristics of hospitals receiving the largest pay for performance penalties, including HRRP, VBP, and Hospital Acquired Infections Reduction Program (HACRP), a similar program to HRRP and VBP that was implemented in fiscal year 2015. The study found hospitals classified as large

were 12.1% more likely to be penalized and major teaching hospitals were 10.6% more likely to be penalized. The study also found safety net hospitals were 15.9% more likely to be penalized. The researchers summarized their findings by stating that hospitals that fall in the three categories of large, major teaching, safety nets hospitals were significantly more likely to be penalized under all three programs. These categories are in line with AHCs, which are often large major teaching hospitals that serve as safety nets.

Chen et al. (2017) specifically looked into disadvantaged hospitals (as they are more susceptible to financial penalties based on previous research into safety-net hospitals) and the effect of HRRP and VBP, on hospital total and operating margins. The study focused on comparing Mississippi Delta region hospitals to other national hospitals outside of this region. The Mississippi Delta region was selected as it has been identified by the Census Bureau as socioeconomically disadvantaged with a mostly rural population consisting of minority and underserved individuals with high rates of diseases. The researchers found that although the total margin, measured as net total revenue minus costs divided by total revenue, between Mississippi Delta Region hospitals and hospitals outside of this region were different pre-HRRP and VBP, and that the gap between their financial margins widened between 2008 and 2014. Also, between 2008 and 2011, the unadjusted total margin gap ranged between 1.55% and 2.55% between Mississippi Delta region hospitals and other hospitals, varying slightly in each year. In 2012, the gap between financial margin remained at 1.71% but saw a steep separation in 2013 of 4.18% and an even larger gap of 5.04% in 2014 between the two groups of hospitals.

A similar, but more dramatic, difference was found with unadjusted operating margin, measured as patient revenue minus cost divided by patient revenue. The average difference between the two hospital groups was 2.59% from 2008 to 2011 but increased to 6.11% in 2012, 7.94% in 2013, and 8.92% in 2014. The researchers concluded that these differences between the hospital groups was likely due to the amount of penalties incurred from HRRP and VBP, along with the increased expenditures for infrastructure investments to reduce readmission and improve quality.

Similarly, Gilman et al., (2015) researchers assessed the combined impact that VBP and HRRP had on safety net hospitals. The authors examined uncompensated care costs per bed as their safety net indicator. The financial effect on hospitals was assessed by examining the probability of incurring a penalty and the magnitude of that penalty. The study found safety net hospitals were less likely to receive VBP bonuses (37% compared to 49%) of non-safety net hospitals, and were more likely to be penalized (63% compared to 51%). This is in line with another study by Gilman, et al., (2015). When HRRP was examined, it was found that safety net hospitals were more likely to have higher readmission rations for acute myocardial infarction, heart failure, and pneumonia compared to other hospitals. As a result of this, safety net hospitals saw greater penalties compared to other hospitals. When assessing the combined effect of these penalties, safety net hospitals had penalties almost twice that of other hospitals. Gilman et al. (2015) also found that 1 of every 10 safety net hospitals received a payment reduction of 1.0% or greater in 2014. The researchers noted that although this is a small percentage, these hospitals have tight margins and high rates of Medicare patients, which could more substantially affect them financially. Moreover, high penalty

rates year after year could have a lasting effect on these hospitals and the communities they serve.

Bazzoli, Thompson, and Waters (2018) also examined the combined effect of HRRP and VBP on hospitals, with special emphasis on its effect on safety net hospitals. The study focused on the financial condition, both operating and total margins, of hospitals under these programs in fiscal years 2013 and 2014. They found safety net hospitals did have higher average penalty rates relative to the other hospital types. Additionally, researchers found that predicted operating margins did decline significantly for all hospital types with higher penalty rates. However, total margins for safety net hospitals were not significantly affected by penalty rate increases, although such increases resulted in significant total margin declines for non-safety net hospitals. One reason that total margin declines did not occur for safety net hospitals as their penalties increased is that total margin includes other revenue sources, such as charitable contributions and public appropriations, which are likely greater for safety net hospitals relative to non-safety net hospitals. Thus, safety net hospitals may be filling financial gaps they may be experiencing in operating margins as penalty rates increase. As the researchers recognized, safety net hospitals may be using other sources or diverting budgets from other programs to fill in the financial gap that HRRP and VBP has created. The rebalancing of funds may have created a short-term solution but may not be a long-term solution to funding gaps these programs are creating. This study will expand on this research using fiscal periods prior to HRRP and VBP and expand the fiscal years reviewed to 2015.

Kahn et al. (2015) assessed the combined average payment adjustments of HRRP, VBP, and HACRP. Although the study found that, the three programs resulted in only a -0.5% reduction of total operating payments for the 3,400 hospitals studied, the reduction was -0.9% for major teaching hospitals. With major teaching hospitals penalized at a rate nearly double that of non-teaching hospitals, these hospitals could be worse off financially. Additionally, when taking into consideration the possibility that these larger hospitals are more dependent on Medicare as a payer, the financial impact could be substantial. The researchers also found in 2015, major teaching hospitals were 1.60, 2.58, and 4.04 times more likely to be penalized for VBP, HRRP and Hospital Acquired Infections Reduction Program, respectively, when compared to non-teaching hospitals. The researchers concluded the disproportionate effect on major teaching hospitals is cause for further research into the impact of these programs on hospitals.

Most of the early research on HRRP assessed the impact that HRRP has had on overall readmission rates, with some research focusing on the association of certain hospital characteristics to levels of readmission rates. More recently, researchers have examined the early relationship between HRRP and VBP penalties on hospital financial performance, but these studies have been limited to only a few fiscal years of data and did not compare hospital performance and margins before and after program implementation. Finally, research has not yet included recent financial data and assessed differential impacts on AHCs compared to non-AHCs.

Prior Research on Hospital Profitability

In addition to exploring the impact of HRRP and VBP on hospitals, several studies have explored hospital financial performance and thus provide useful guidance to this study regarding key control variables for a multivariate analysis. Bai and

Anderson (Bai & Anderson, 2016) performed a detailed analysis of the various factors that are associated with hospital profitability. Through the measurement of net income from patient care services per adjusted discharge of acute care hospitals for fiscal year 2013, the researchers examined the following three main set of factors and characteristics that were associated with profitability: a) ownership; b) market power; and c) other characteristics.

Through a regression analysis, they found that geographical location was linked to profitability. Hospitals in the Northeast had the highest median losses while the hospitals in the West earned a profit. Mark-ups were also linked to profitability with hospitals with mark-ups above the median being more likely to be profitable compared to hospitals with low mark-ups. Hospitals that were part of large systems and with regional power tended to earn high profits when compared to independent, low market share hospitals. Small rural hospitals (less than 50 beds) were also found to be less profitable.

In line with the research in this chapter, major teaching hospitals had larger losses compared to urban, larger, non-teaching hospitals. Hospitals that had lower proportion of Medicare patients also were more profitable. Hospitals that shorter lengths of stay and lower costs per adjusted discharge showed higher profits as well.

Following prior research, for-profit hospitals were again found to be more profitable while public hospitals were the least profitable. Some of the most prestigious hospitals, such as Stanford Hospital and the University of Pennsylvania, were among the most profitable, leading the researchers to conclude they were able to leverage bargaining power with insurers. Bai and Anderson (2016) were able to build on an

existing body of knowledge to further the comprehensive review on hospital characteristics and their impact of profitability. This knowledge has been used by researchers to control for potential confounders and thus isolate relationships between key characteristics and hospital profitability.

This is seen in research such as Bazzoli et al. (2018) which used variables such as teaching status, ownership status, system membership, among other variables as control variables. Similarly Chen et al. (2017) used hospital characteristics such as ownership teaching, percentage of Medicaid and Medicare patients, and case mix index as covariates in their analysis of hospitals profitability is the Mississippi Delta region. Finally, Horwitz (2005) used similar covariates of hospital and market characteristics, size (measured by admissions), and geographic location when assessing profits in for-profit and not-for-profit hospitals. This study will continue this method through the use of several covariates to isolate the impact of HRRP and VBP.

Literature Synthesis and Gap Addressed by this Study

AHC's have been recognized as having substantial costs connected to their unique mission and patient population. Research to date has shown that these costs can be considerably higher for AHCs compared to non-AHCs. Research has also shown that AHC patient populations are more heavily weighted toward low paying government insurers. This limits revenues available to cover higher costs which could lead to worse financial outcomes. AHCs also have access to government subsidies due to their patient population and costs through DSH payments and GME education, which to some degree may offset operating losses. Research suggests that the combination of these factors may affect their financial outcomes and profitability but research has not

directly focused on investigating AHCs financial performance using financial margin. This study seeks to address this gap by focusing on AHCs and their financial performance compared to non-AHCs.

AHCs dependencies can also lead AHCs to be more susceptible to changes in government programs and policies. Such government programs are HRRP and VBP. Much research has been done about HRRP and VBP, and studies have found that teaching hospitals, not for profits, and those hospitals that are dependent on government payers are more susceptible to penalties and reduced margins. However, prior research has focused on national trends or on hospitals in certain regions, and has not focused on AHCs as a distinct population. This study will address this gap through an examination of the effects of HRRP and VBP on AHCs and non-AHC financial margins.

When viewed as a whole, there is a clear gap in the research for the effect of HRRP and VBP on AHCs financial performance. This study attempts to address this gap by using contingency theory as a framework to explore AHCs organizational financial performance around HRRP and VBP.

Chapter 3: Theoretical Framework

The conceptual framework for the study is contingency theory. Contingency theory is used to examine the organizational fit and performance for AHC and non-AHCs pre and post HRRP and VBP. Contingency theory provides a framework which can be used to understand and explain the varying levels of organizational performance even for those hospitals operating in the same environment. This chapter starts with a background on contingency theory, its constructs, and framework. Then, it discusses the contingent relationships that affect hospital performance and the unique contingencies for AHCs and non-AHCs. Next, a conceptual model is developed through the linking of contingencies and financial performance of the two hospital groups. Finally, the chapter discusses the hypotheses that are formed based on contingency theory framework.

A Background of Contingency Theory

Contingency theory, also referred to as structural contingency theory, is a theory that address organizational structure, design, and performance. It suggests that organizational performance is related to the balance, or fit, between an organization's structure and the varied contingencies it faces. Contingency theory was developed and advanced in the 1960s through works by Burns and Stalker in 1961, followed by Woodward in 1965, Lawrence and Lorsch in 1967, and Thompson in 1967 (Hatch & Cunliffe, 2006). Contingency theory has three main tenets: 1) there is no one best way to organize for every situation; 2) different ways of organizing are not equally effective for a given situation; and 3) for a given situation, the best way to organize depends on the dominant environmental characteristic (Scott & Davis, 2007).

In contingency theory's earliest writings, potential contingencies were defined as an organization's size, task uncertainty, and task interdependence (Burns & Stalker, 1961; Lawrence & Lorsch, 1967; Thompson, 1967). An organization's size, or the number of members to be organized with in an organziation, dictates the bureaucratic structure of the organization. Donaldson (2001) defines a bureaucratic structure as the level of delegation for decision making. Smaller organizations perform better with a decentralized structure, whereas larger organizations perform better under a centralized structure (Donaldson, 2001). Task uncertainty refers to the uncertainty that external factors such as the environment and technology bring to the accomplishment of tasks within organizations. Task uncertainty can lead to confusion for managers and leaders in how tasks should be conducted inside the organization (Donaldson, 2001). The third contingency is task interdependence**,** which is the way activities performed within an organization are connected with one another. Task interdependence can be described as pooled, sequential, or reciprocal, and contingency theorists suggest that the different ways that activities are arranged and connected to one another are better suited by different structures (Donaldson, 2001; Thompson, 1967).

These three contingencies were later expanded into four organizational contingencies: organizational size, strategy, technology, and environment (Chandler, 1962; Scott & Davis, 2007). Under the expanded contingencies, organization size remained linked to simple and complex structures. Strategy is linked to structures and organizational management. Some organizations group departments by function (i.e., Human Resources or Finance) or by product line. Technology is not used in the modern sense as a reference to computers and programs, but rather represents the

communication and work that is performed within an organization. An environment that has multiple products is better suited to have a structure that is organized by those product lines (Chandler, 1962; Scott & Davis, 2007).

Contingency theory later evolved to include contingencies as any variables that moderate the effect of an organizational characteristic on organizational performance (Pugh & Hickson, 2007). Contingencies are now considered to be a wide range of environmental and market variables and influences. In the application of contingency theory in research, the key variable(s) of interest are defined as contingencies. Researchers may use other control variables in answering research questions such as geographic locations, regulation, organization mission and pressures, and customer mix in addition to primary contingency variables (Pugh & Hickson, 2007). Contingencies range from factors that can be internal or external to the organization. Internal contingencies can be areas such as task uncertainty, internal interdependence, or organizational size. External contingencies can be the environment in which the organization operates, or the influences on customers and environmental policies (Donaldson, 2001). The external contingencies influence internal contingencies, thus influencing organizational structures.

Contingency Theory and Performance

Contingency theorists posit that the better fit between an organization's structure and its contingencies, the higher performance that organization will obtain (Donaldson, 2001; Lawrence & Lorsch, 1967; Scott & Davis, 2007). If an organization has a poor fit with its contingencies, then that organization will have poor performance. As contingencies change, an organization's previous structural fit with previous

contingencies could turn to a misfit, which would lead to poorer performance unless the organizational structure changes. The link between misfit with poor performance and fit with high performance is what motivates organizations to have the most optimal fit they can obtain (Donaldson, 2001; Lawrence & Lorsch, 1967; Scott & Davis, 2007).

An important addition to contingency theory is the concept of Structural Adaptation to Regain Fit (SARFIT), as described by Donaldson (2001). SARFIT recognizes that as contingencies shift and change, organizations will adapt their structure to meet the new and changing demands of the contingencies. SARFIT is a disequilibrium theory, as it recognizes that as performance changes, it affects the equilibrium point, causing 'misfit,' at which time the organizational structure will change to meet the new demands. Fit and misfit cause the organization to go through constant phases of stasis and change to achieve maximum performance (Donaldson, 2006).

In summary, SARFIT and, more broadly, contingency theory focus on the contingencies of the organization, the organizational structure, the fit to the environment in which the company is competing, and the high or low performance of those organizations. In Figure 1, these relationships are shown. The contingencies on the top left along with the organizational structure on the top right feed into the organization's fit in the market. If fit leads to high performance, then the organization's structure will remain static, as shown on the bottom left. If the organizational fit leads to low performance, then the organization will need to change to obtain a better fit, bottom right. The fit and misfit approach, and its effect on an organization's structure and performance, helps to explain why AHCs and non-AHCs perform differently in the

environment and how the changes in contingencies, such as the change in regulations, can affect that fit and the performance of organizations.

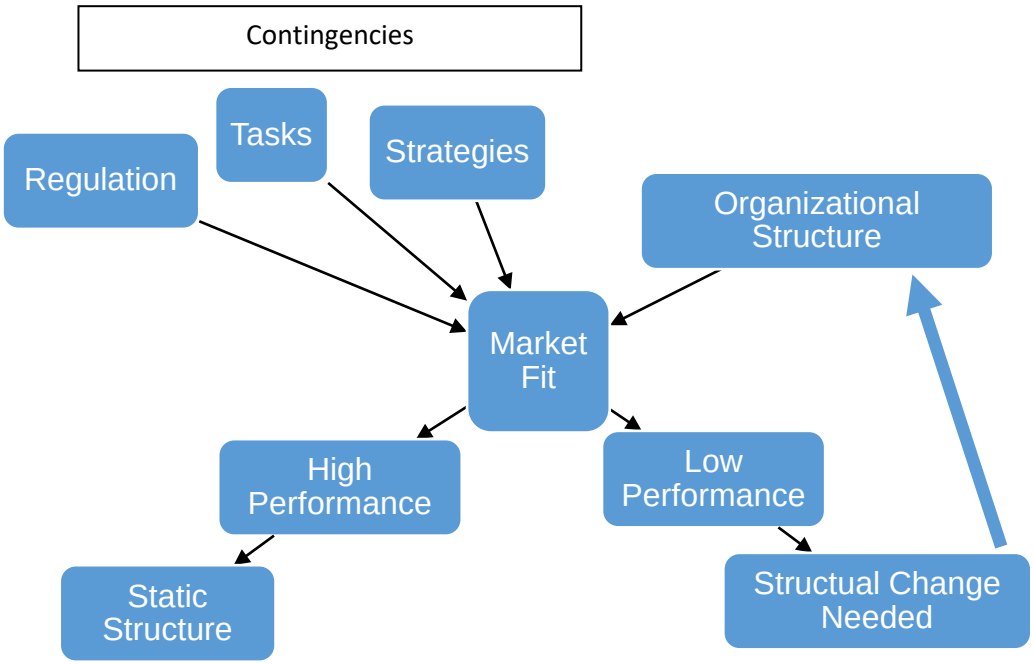

Figure 1. Visualization of contingency theory.

The Health Care Industry and Fit

In the United States, there are many types of structures that health care organizations employ. For example, among hospitals, structures vary from large, for-profit health systems with multiple hospital facilities in large cities, to small, independent, community-based not-for-profit hospitals located in rural areas (Fleming, 1981). Per contingency theory, hospitals adopt structures based on their environmental contingencies, which are then modified over the years to maximize hospitals' performance with changes in their contingencies. Several studies have looked at the relationship between fit and performance for health care organizations.

For example, Wang and colleagues (2001) used contingency theory as a conceptual framework to examine the association of managed care with hospital vertical

integration and the relationship between that integration and the hospital's efficiency and financial performance. The researchers used the contingency-based strategic adaptation model to select factors that have important influence on strategic choice with performance implications. Contingent factors of environment were used as variables to represent managed care concentration while level of forward and backward integration was used as the variables to represent profitability and productivity. In addition to these contingent variables, the researchers incorporated several control variables including market and hospital characteristics. With contingency theory as a framework, the researchers found strong support for the association between managed care and vertical integration. Backward integration was correlated with higher profitability while forward integration was not**;** however**,** forward integration was associated with higher rates of productivity.

Trinh and O'Connor (2002) used contingency theory as a theoretical framework to understand the impact of strategic change on the performance of U.S. urban hospitals. The researchers used external pressures as contingencies that influence hospitals to change their strategic direction**,** leading to changes in performance. Strategic change was measured as changes in HMO affiliations and contracts along with strategies to control costs. Performance was measured as changes in market share, operation efficiencies, and financial performance. The researchers also incorporated two main groups of control variables**:** environmental characteristics and organizational pressures. Environmental characteristics were measured through competition, population density**,** and Medicare/non-Medicare HMO market penetration. Organization pressures were measured through proxies such share of Medicare

services, stringency of Medicare payment, bed size, case mix severity, occupancy rate, and for-profit orientation. The researchers found that while hospitals respond with strategic change when faced with changing contingencies, those changes do not always result in positive outcomes, at least in the short term (less than 5 years). The researchers also recognized that changes in strategies to address changes in certain contingencies might improve one outcome at the expense of another. Such conflict requires that organizations improve their strategic coordination (Trinh & O'Connor, 2002).

Payne and colleagues (2007) reviewed the relationship between medical groups' external and internal fit and its impact on financial performance. Fit was assessed based on the strategy and structure of the type and level services provided for external fit. Internal fit was based on structural complexity along with realized strategy. Structural complexity was measured by medical groups' size and integration with other medical groups. Realized strategy was measured as funds spent on advertising, travel and meeting expenses spent toward research and development, and the level of differentiation and market scope. Financial performance was measured through sales, equity and investment, assets, and margin and profit. The researchers used four control variables of regional concentration of competitors, buyers, suppliers, and the general munificence of the region. Payne and colleagues (2007) found that organizational fit between strategy and structure was related to medical group financial performance.

The study by Payne and colleagues (2007) is particularly relevant to this study, as they identified five critical findings: 1) the success of health care organizations is determined in part by their local markets and the broader health care industry; 2)

external regulations and payment systems may restrict a health care organization's ability to freely select its structure or strategy; 3) within health care, focused strategies as well as strategies of high differentiation may be more successful than other organizational strategies; 4) within health care, smaller structures as well as more flexible structures may be more successful than other organizational structures; and, 5) the fit of strategy and structure to the external task environment, as well as the fit between strategy and structure within the organization, can prove to be elusive for health care organizations. While the researchers assessed the importance of the contingencies on the fit and performance of medical organizations**,** the researchers suggest that it is the contingencies themselves that have a stronger impact on performance than the potential fit. This study will build upon Payne and colleagues' (2007) work by focusing on internal and external contingencies that impact the fit and performance of hospitals**,** both individually and collectively.

Zinn and colleagues (2007) used contingency theory to evaluate the differences in performance of nursing homes that had little to no innovation versus those who engaged in extensive innovation. The researchers used contingency theory as their framework**,** citing the idea that as the environment changes**,** firms will make changes in their strategy and/or structure, which leads to the implementation of innovations. In turn, innovation should lead to better environmental fit. Through a contingency theory framework**,** the researchers hypothesized that investment in innovations would lead to improved performance. The researchers evaluated innovation by the changes and investment in technical innovation by nursing homes. Technical innovation was defined as innovation that impacted care for residents. The researchers used occupancy rate

and payer mix along with other measures to evaluate performance. With nursing homes having gone through substantial changes in case mix in the 1990s, the creation and expansion of technical programs were deemed to represent the nursing homes investing in innovation. The researchers did not employ any control variables in this study. Zinn and colleagues (2007) found significant differences in performance between nursing homes that engaged in substantial innovation compared to those that did not, consistent with arguments developed from contingency theory. With the investment in innovation**,** nursing homes were able to respond to changes in their market contingencies and improve their subsequent fit and performance.

In his dissertation, Swofford (2011) evaluated the effects of rural hospital system affiliations on rural hospital financial performance, applying contingency theory to assess environmental contingencies, such as hospital affiliations, and the fit between a rural hospital's environment and its performance. Swofford (2011) measured financial performance through hospital total margin and a productive efficiency score using Data Envelopment Analysis. Environmental contingency was measured through four contingent relationships which contained two parts, the contingency and the corresponding organizational structure (Swofford 2011). These four relationships were 1) environmental munificence and system membership 2) hospital location and system configuration 3) proximity to larger hospital and system hierarchy 4) critical access hospital status and proximate hierarchical system partner. Swofford (2011) used hospital characteristics (such as size, ownership types, and teaching status) as well as environmental and market characteristics as control variables. The study's results supported contingency theory overall, particularly with respect to the positive

relationship between rural hospitals' system affiliations and improved performance compared to those without such affiliations. The Swofford dissertation is important for this study as it clearly how contingency theory is an effective framework for predicting the relationship between an organization's structure, its environment, and its financial performance.

Van De Ven and colleagues (2012) used contingency theory and the concept of fit to evaluate the effect of organizational factors and corporate-wide policies on the performance of 32 local community clinics. The researchers hypothesized that greater corporate control would lead to less independence of local clinics, affecting the ability of those clinics to make decisions and adapt to local contingencies to maximize their fit and performance. Thus, the greater the corporate control, the poorer the fit and lower performance. The contingency of central office influence on the local community clinics was measured through four measures of clinic autonomy, work standardization, clinic-group interactions, and headquarters-subsidiary integration, all collected through an employee survey. Performance, or fit, was measured through net income, productivity, patient satisfaction, and care quality. Covariates of clinic resources measured through full-time equivalent positions and clinic environmental complexity measured through the mix of patient were also used. The researchers found that clinics that had a more focused clinical population performed better than those who had more broad patient populations. Clinics with characteristics that were associated with poor performance performed better under increased corporate involvement and control**,** and clinics that had characteristics that were associated with higher performance had less corporate involvement. The researchers concluded that their findings support contingency theory**,**

as organizations that allow subsidiary units to design their business processes to fit their local environments are able to achieve better performance (Van de Ven et al., 2012).

Shay and Ozcan (2013) used contingency theory as a framework to evaluate how freestanding inpatient rehabilitation facilities responded to a change in Medicare's 60% rule. The researchers hypothesized that the 60% rule would result in a substantial change in rehabilitation facilities' external contingencies, leading to a change in fit. The degree of their new fit would be determined based on their organizational characteristics and how well their structure fit within the new regulatory environment. The researchers measured fit through the facility's performance on the Malmquist Index score, calculated as the product of the change in technical efficiency and the change in technology or innovation. Several control variables were used including ownership status, regional location, and local market size. The researchers found that while there was an average decrease in the index following implementation of the 60% rule, there were a number of structural characteristics that were found to be associated with higher index scores. Freestanding, independent, regional facilities demonstrated consistent improved performance in contrast to the majority of rehabilitation facilities. The researchers noted that other literature recognizes the difficulty in larger centralized organizations responding to changes in contingencies and maintaining a level of fit that maximizes their organization performance, especially in uncertain environments. To better test contingency theory, the researchers performed a final fit test where they created a composite score adding relationships that were associated with fit and subtracting those that were associated with misfit. The researchers found that while there was a statistically significant difference between the groups that had high fit scores compared

to those that had low scores, the facilities that had mid-level scores and those with high scores did not have a statistical difference in their composite scores. This finding partially supports their hypothesis that organizations with characteristics that fit their new or changed environmental contingencies are able to be more successful. This research study will use contingency theory to advance the concept that an organization's characteristics will impact its ability to be successful when regulatory contingencies are changed.

To date, research has shown that contingency theory is an effective framework for predicting fit in the health care industry. Researchers have found that organizational structures, interconnecting relationships, and changes in laws and regulations can directly affect an organization's fit and subsequent performance. Research has also shown that financial performance can be effectively measured through operating and total margins. This research will build off the work and use of contingency theory to date by applying variables that relate to environmental and organizational contingencies and evaluating fit through financial performance using margin. By investigating these relationships and variables, this study will advance the knowledge of regulatory contingencies, hospital status, and AHC status on their financial performance.

Hospital Contingencies and a Conceptual Model for Fit and Performance Among AHCs and Non-AHCs

This study's research questions focus upon the contingencies of regulation, specifically regulation in the form of the HRRP and VBP programs**,** and organizational structures, specifically AHC status as it relates to a hospital's structure and mission. Through the use of contingency theory, it can be hypothesized that each hospital will be

structured to work within their existing contingencies to obtain a high level of performance. A hospital's status as an AHC represents a different set of contingent relationships than non-AHCs. These relationships include the services they offer to customers, regulatory pressures, the local competitive environment, and unique contingencies through their tripartite mission and patient populations. These unique contingencies may result in decreased fit as measured by financial performance compared to their non-AHC competitors.

With the introduction of new and changing contingencies, such as the introduction of HRRP and VBP, both groups of hospitals will need to restructure to maintain performance or face a reduced market fit leading to poorer performance. HRRP and VBP are environmental contingencies and may cause fit or misfit issues that will affect organizational performance. The effects of HRRP and VBP are unique to each hospital since the level of the penalty is related to their performance according to metrics upon which the penalties are calculated. Additionally, the severity of the penalty, financially, will depend on that hospital's level of Medicare funding.

A hospital with low Medicare funding coupled with a high penalty rate will experience less of an impact on their financial performance than a hospital with high Medicare funding and a high penalty rate. The introduction of HRRP and VBP represents a potential impact on hospitals' performance if hospitals do not change their structure to address it. In the case of AHCs, HRRP and VBP could pose a much larger impact given their high reliance on Medicare as a payer, their provision of complex patient care, and the associated costs of their tripartite mission affecting their level of financial performance. To evaluate if AHCs are more affected by HRRP and VBP

relative to non-AHCs, operating and total margin will be used as the performance indicator. A change in the contingencies with a subsequent improvement or no change in performance, as measured through operating and profit margins, would represent a hospital changing its organizational structure to match the change in contingencies. This study will explore the relationship between the contingencies of regulation and AHC status as the primary independent variables to understand their fit and subsequent effect on the dependent variables of hospital operating and total margin for the period of 2011 through 2015**,** as outlined in Figure 2.

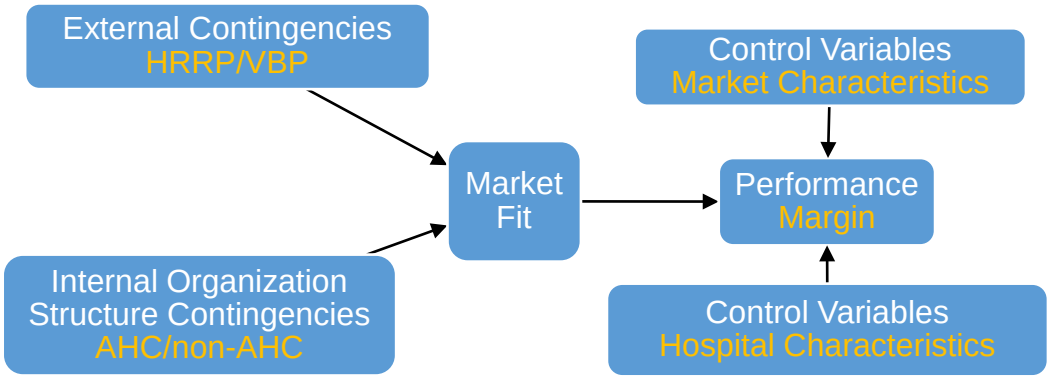

Figure 2. Application of contingency theory.

Hypotheses

Research Question 1. *Are historical operating and total margins of AHCs statistically different from non-AHCs?*

Based on contingency theory, AHCs and non-AHCs have different contingencies primarily related to additional demands and expectations from AHCs' tri-part mission that lead to different organizational structures affecting performance. Their structures

will be different due to the difference in contingencies in both costs and revenues. These contingent relationships lead to the first hypothesis:

H1: AHCs will have statistically different operating and total margins compared to non-AHCs before (period 1) and after (period 2) the implementation of HRRP and VBP.

The first research question and hypothesis are important as no research to date has been performed on AHC**s** comparing then to non-AHCs on the area of financial performance through operating and total margin for the two periods referenced. To better understand this relationship at a high level**,** a descriptive analysis will be performed to investigate this hypothesis. This will not address the main question of the impact of HRRP and VBP on the hospital populations**'** financial performance but will provide valuable feedback if there is a difference. It is expected that there will be a statistically significant difference in the two populations within and between the two periods on operating and total margin. If this hypothesis is found to be true**,** it will provide a foundation to investigate research question 2.

Research Question 2.

Is the operating and total margins of AHCs more significantly negatively affected from 2011 to 2015, with the implementation of HRRP and VBP, compared to non-AHCs?

Research question 2 will use a multivariate analysis that will assess the impact of the HRRP and VBP program on AHCs' and non-AHCs' operating and total margins over time. Contingency theory would hypothesize that over time, as contingencies change, hospitals will adjust their structures to fit new contingencies and improve their performance in the environment. Non-AHCs will be able to adapt to their changed

contingencies by restructuring to better deal with their environmental changes through payer mix, cost savings, and other initiatives. AHCs will not have the same ability to change due to their dependence on Medicare payments and high mission-related costs that limit their ability to change. As the penalties increase over time, they will see a larger decline in their financial performance, leading to the third hypothesis:

H2: AHCs will experience a larger negative impact on their operating and total margins after the implementation of HRRP and VBP when compared to non-AHCs.

Control Variables

As with previous research, it is important to control for other factors that may influence a hospital's financial performance. Research, outlined further in the literature review section titled *Prior Research on Hospital Profitability*, has identified factors such as a hospital's location and its state's expansion of Medicaid that may influence financial performance. To address these other factors, this study will control for state Medicaid expansion, Herfindahl-Hirschman Index on competitiveness, not for profit and for profit status, and health system affiliation.

As a result of the Affordable Care Act, Medicaid expansion increased eligibility to include all individuals below 138 percent of the federal poverty level (Gottlied & Shepard, 2017), growing the Medicaid population from 34.2 million in 2001 to 55 million in 2013 (Wachino et al., 2014). To make the program more financially acceptable to states, newly eligible adults (parents and childless adults) would have their costs funded 100% by the federal government from 2014 to 2015. The federal funding rate would then drop to 95% in 2017 followed by rates of 94, 93, and 90 percent in the subsequent

years, stopping at 90% in 2020 and later years (MECPAC, 2018). The expansion was complicated when the Supreme Court ruled in National Federation of Independent Business V. Sebelius that the federal government could not require the states to expand Medicaid (C. Thomas, 2012).

The Medicaid expansion judgment caused a parting of the states in their implementation of Medicare expansion. As of March 2014, 29 states and the District of Columbia had expanded Medicaid (Wachino et al., 2014). A study found that hospitals in states that expanded Medicaid saw a $5 million increase in Medicaid revenue, a $3.2 million decrease in uncompensated care, and operating margins improved by 2.5% (Blavin, 2017). The Kaiser Family Foundation also found that uncompensated care costs were relatively equal among states before the Medicaid expansion but have since declined by $2.0 million in expansion states and increased by $180,000 in non-expansion states (Antonisse, Garfield, Artiga, & Rudowitz, 2017). These studies show the impactful effect that Medicaid expansion can have on hospital profitability. To control for this factor, this study will incorporate a variable for the expansion of Medicaid each year by state for each hospital.

Another variable that previous research has controlled for has been the competitiveness of the environment. The Herfindahl-Hirschman Index (HHI) is a commonly accepted measure of market concentration and is often used in healthcare research for hospital market competitiveness (Wright, Tergas, & Hou, 2016). HHI is used by the U.S. Justice Department to evaluate the effect on the competitiveness of markets for potential acquisitions and mergers (Investopedia, 2003). HHI is used to understand the impact of market competitiveness on the performance of an

organization. As the market becomes more competitive**,** hospitals will have to compete on price and services, thereby affecting their financial performance. A lower HHI is an indication that market concentration is decreasing and competition is increasing which can led to lower financial performance. To control for this, this study will use the HHI measured at a county level as a control variable.

In addition to external influences, a hospital's structure and business models can impact their financial performance. The healthcare industry consists of three primary business models for hospitals: government, not for profit, and for-profit (Becker, 2014; Horwitz, 2005). These hospitals provide standard levels of care to their patient populations but do so with different business models. Not for profit (NFP) and for-profit (FP) hospitals are the most common, and are often the most compared (Horwitz, 2005). The FP business model is defined as a corporation that offers ownership shares and is primary responsible to its shareholders who are often profit driven individuals. (Anand, 2012). A NFP organization is prohibited from selling shares and has responsibility to a variaty of stakeholders and whos main purpose is one of a chariable nature (Anand, 2012). It is common to see NFP hospitals focus on providing care for underserved populations by being located in areas that do not have the most affluent patient mix (Becker, 2014). FP hospitals are commonly located in areas that are more affluent with a patient population that has insurance, allowing them to pay at a higher rate (Becker, 2014). Additionally, there are differences observed across both hospital forms, with some FP hospitals operating in ways that aggressively target affluent markets, while examples of NFP hospitals exist that aim to truly help their communities beyond the

profit motive (Galewitz, 2015). Due to the differing missions and profit motives, profit status is included as a control variable.

Profit status is not the only structure that can influence a hospital's financial performance. A hospital's membership as part of a larger health care network has been found to be correlated with higher profitability due to economies of scale and bargaining power that is obtained when one is part of a larger group (Swofford, 2011). Bazzoli and colleagues (2000) found that hospitals that were not in health care networks had higher costs overall compared to those that were in a network. Additionally, the researchers found that hospitals in a network or system were more profitable with lower costs. Hospitals that were not in networks were among the least profitable hospitals. Finally, the study found that hospitals that were part of a larger network were in a better position to pay long-term obligations (Bazzoli et al., 2000). In a more recent study, it was found that hospitals that were affiliated with a larger system with greater regional power were more profitable (Bai & Anderson, 2016). The study also found that hospitals that were part of a larger system could negotiate a higher price (Bai & Anderson, 2016). These studies demonstrate the power that structure can have on a hospital's profitability. This study will incorporate a control variable for hospital system affiliation to control for this factor.

Summary of Theoretical Framework

This study uses the theoretical framework of contingency theory to investigate the impact HRRP and VBP has had on AHCs compared to non-AHCs. Contingency theory provides a structure to address organizational design and how that design is responsive to an organization's environment. An organization's performance is directly related to that organization's ability to find fit with its environment. Contingency theory

recognizes an organization's environment through external and internal contingencies. Contingencies are influences that cause an organization to respond and develop its strategy to maximize its ability to achieve fit and high performance. Thus, differences in how organizations respond to their environmental contingencies will impact their ability to achieve fit.

This study conceptualizes contingences through two factors, an internal factor and an external factor, operationalizing them as the study's independent variables. The external contingency is the combined HRRP and VBP program**,** and the internal contingency is AHC or non-AHC designation. The study employs operating and total margin as the dependent variables. When combined**,** these contingent relationships provide a conceptual model for AHCs**'** fit or misfit with their environment and their ability to maximize performance. The study will follow previous research using other factors as control variables. These control variables are classified as market characteristics (HHI and Medicaid expansion) and hospital characteristics (health system affiliation and ownership structure).

From this conceptual model, two hypotheses are derived. Each of the two hypotheses will be tested using statistical analysis to investigate the research questions. The subsequent chapter will address the identification and measurement of variables that represent the constructs in the theoretical framework outlined in this chapter. It will also outline the procedures for testing the hypotheses.

Chapter 4: Methods

The following chapter will discuss the research design, threats to internal and external validity, data sources, study population, the variables and how they will be measured, analytic methods, and limitations of the study.

Research Design

This study is a non-randomized, quasi-experimental, retrospective study. Figure 3 depicts the study design. Historical and longitudinal data are used to review the impact of HRRP and VBP on hospital operating and total margins over a period of time. The study period covers 2011 through 2015 with independent, dependent, and control variables measured in each year. The primary objective is to demonstrate the unique financial performance of AHCs compared to non-AHCs and elucidate the impact HRRP and VBP have on AHCs' long-term operating and total margins.

The first stage is the comparison of financial performance between AHCs and non-AHC's prior to and after HRRP and VBP. The comparison is important to determine a baseline of performance before the contingencies of HRRP and VBP would have affected the hospitals' environments. By understanding hospital performance prior to these policies, there can be a comparison after these policies. This first stage of descriptive analysis will set the stage for the exploration in the study's research questions.

To analyze the research questions, the study will follow Donaldson's (2001) recommendation for contingency theory, which recommends lagging the performance measures that are used to evaluate performance. Therefore, hospital performance measures will be taken during the duration for the study period of 2011 through 2015. For the study period of 2011 and 2012, the performance measures are in isolation of

penalty rates, as HRRP and VBP were not yet implemented. For the study period from 2013 through 2015, as HRRP and VBP are implemented, a net penalty rate for HRRP and VBP will be taken to measure the impact on hospital performance. By using a two-stage process, it will be possible to evaluate the effect of HRRP and VBP on AHCs' operating and total margins compared to non-AHCs.

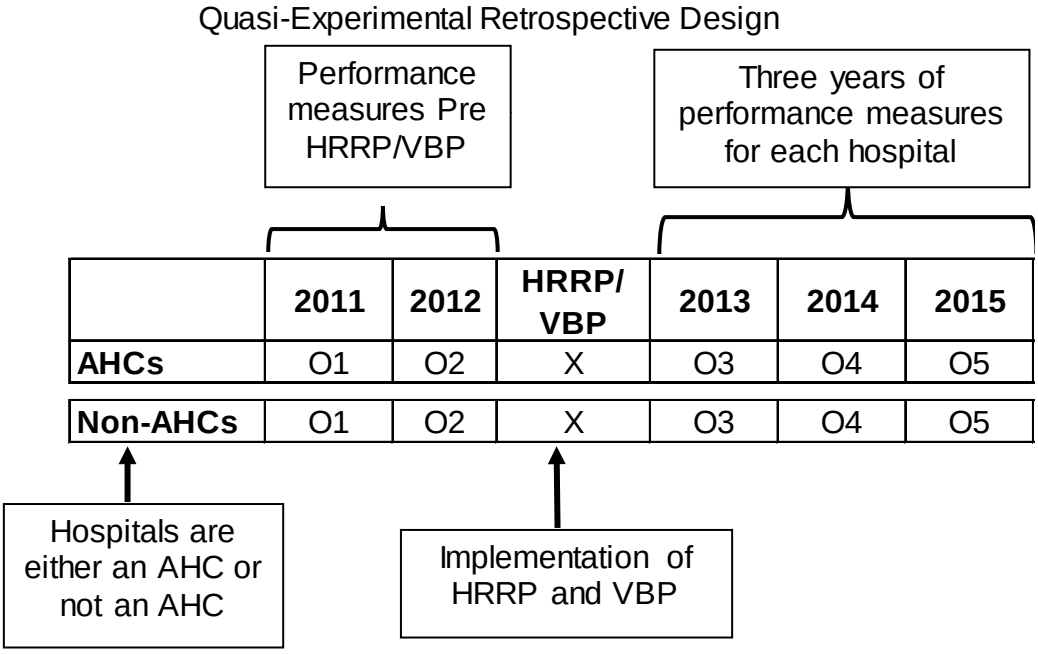

Figure 3. Visualization of study design from 2011 through 2015.

Threats to Internal and External Validity

The quasi-experimental retrospective design is a common design with hospital financial performance research. However, with this study, there are some threats to internal and external validity that limit the ability of this design to establish causality. The potential threats include testing, instrumentation, selection bias, regression, history, maturation, measurement, and attrition. How these validity concerns will be minimized will be discussed in the following paragraphs.

Threats that are minimized through the study design include testing, instrumentation, selection bias, and regression. Testing validity refers to the effect on performance on a posttest because a pretest was taken; the act of collecting data on people or organizations changes them. The study design eliminates the testing threat as all data is retrospectively collected. Subsequently, even though the study measures the performance of hospitals prior to the implementation of HRRP and VBP, the collection of the data will not influence the performance post HRRP and VBP.

Instrumentation validity refers to the changes in measuring instruments or methods of measurement between two points of data collection. The instrumentation threat can occur even if the same instrument is used. The instrumentation threat is similar to criterion validity, if the measure is related to the outcome. In other words, the degree to which scores on an instrument are correlated with some external criterion. To combat the instrumentation issue, the study will use methods with high test-retest reliability and that have been shown to relate to hospital financial performance; margin. Margin has been shown to be a reliable measure for hospital financial performance. For more information on these findings refer to the Methods Chapter section on the *Measurement of Variables* subsection *Hospital Profitability and Dependent Variables*.

Selection bias, another threat, arises due to a factor that is unobserved and thus cannot be controlled for affecting decisions to participate in something versus not to participate. Selection bias is an omitted variable issue. Selection bias is most problematic and frequently encountered when a study does not use an experimental design. Selection bias is not an issue for this study as the study focuses on the difference between hospital groups, AHCs and non-AHCs, which is not a factor that

changes. This is due to the commitment of resources, accreditation process, and reason for a hospital's creation, which is required to become an AHC or non-AHC. Once a type of hospital is created it does not typically change. These reasons and the use of covariates in the statistical analysis will reduce potential selection bias.

Finally, regression validity is the tendency of posttest measures to return to population averages. Regression validity often occurs when groups are selected based on pre-test scores. The study addresses regression validity through group selection based on AHC verses non-AHC and does not rely on pre-test scores.

Threats that are minimized through the use of covariates are history and maturation. The history threat refers to the occurrence of external events that take place concurrently with the independent variable that can affect the dependent variable. History threat takes the form of other actions that can affect a hospital's profitability. These can be items like other regulations, the economy, market competitiveness, or ownership structure. A key to the success of the project is to isolate many of those variables as possible, specifically by controlling for various types of variables such as location and regional competitiveness. See more below on the control variables used.

Similar to the history threat, maturation occurs within subjects during the course of a study as a result of the passage of time rather than as a result of a treatment or independent variable. Maturation occurs as a function of time. To address maturation, the study design employs a comparison group model. This refers to the two groups of hospitals being compared during the same periods of time. Any actions that impact one group over the time will have the same effect on the other group. This helps to have these two hospitals as comparable as possible for this study.

Another challenge in the study that relates to history and maturation threats is how the HRRP program was implemented with the readmission rate penalties being staged over time increasing one percent over three years to a maximum of 3%. The rate increase poses a problem as the penalties will affect profitability for each hospital differently over the course of those three years. To address the issue of these threats pre/post design will take data from 2011 (prior to the implementation of both events) through 2015.

Threats to validity that remain are measurement and attrition. Measurement validity refers to the ability of the tool to measure what it purports to measure. The measurement validity threat is a challenge for the study for several reasons; the first being the way financial data is reported. Data reporting on Hospital Compare and the Medicare cost reports is self-reported by the hospitals and may be inaccurate or inconsistent. To resolve the threat, the data will be reviewed for outliers and inconsistences. If outliers and/or inconsistences are found their traits and characteristics will be analyzed and their impact on the analyses determined. Based on this analysis they may remain in the study or may be removed.

The second issue related to measurement is the need to combine data from multiple sources. Data is collected by various groups and, defining common variables that will link various data sets, is critical for accuracy and consistencies in the analysis. To address the data issue, the study will use Medicare provider number and American Hospital Association identification number, common metrics and variables included in most data tables, to combine information. In instances where the Medicare or AHA

provider number is not available, hospital names and locations/addresses will be used to match hospital data.

The threat of attrition occurs when members of groups fall out over the course of the study, which can cause groups to lose comparability. The risk is greatest when the length of time between data collection points is long. If attrition occurs randomly, then there is no bias and not an issue with the validity of the study. However, if it is not random or is widespread, then the comparison of the groups is threatened. Attrition will be prevented by reviewing the groups and membership thoroughly before the conduct of statistical analysis. Each hospital that drops out of the study will be analyzed through descriptive statistics to ensure other factors are not influencing the attrition that may skew the data.

Table 1

Threats to Internal Validity

Threat	Mitigating Factor
Testing	Study design through the use of a retrospective study
Instrumentation	Use of margin as a performance measure, a proven measure used in similar studies
Selection Bias	Grouping of hospitals based solely on COTH AHC status and use of covariates to control for other factors
Regression	Use of two groups, AHC and non-AHC and not relying on pre-test results
History	Use of control variables
Maturation	Use of comparison groups
Measurement	Data review for outliers and inconsistences and use Medicare provider number for accuracy and consistency in the analysis
Attrition	Review data set for issues that may have caused hospitals to drop out of the analysis

Data Sources

The data for will come from several sources including the Medicare Cost Report Information System Minimum Data Set (HCRIS MDS), AHA Annual Survey of Hospitals, and American Association of Medical Colleges Council of Teaching Hospitals and Health Systems (AAMC COTH) reporting, and state data on Medicaid expansion.

The dependent variable of operating and total margin will be calculated using financial data from HCRIS MDS for each fiscal year from 2011 through 2015. The financial data is publicly available through CMS and provides key information on

hospital sales and services and costs to calculate operating and total margin. The operating and total margin data will be used to calculate each hospital's performance before and after the implementation of HRRP and VBP.

The independent variables of HRRP and VBP penalty rates will be taken from Medicare data. The data and penalty rate information will be combined for a net score, allowing for the calculation of the penalty rates and a single impact as it affects hospitals. Each year of HRRP and VBP penalties will be paired with the corresponding fiscal year it was applied. For more information on the combination of the two variables, refer to the Methods Chapter section on the *Measurement of Variables* subsection *Independent Variables*.

The variable of AHC will be taken from AAMC COTH reports as of January of 2018. The COTH listing will be cross referenced on the AHA reports which also includes an indicator for COTH teaching hospital for each year of data. The data validation process will ensure consistency of reporting for COTH members and an accurate listing of applicable hospitals.

The covariate variables of not-for-profit and for-profit status along with health system affiliation will be taken from AHA Annual Survey data. These data provide various metrics and key demographics of US hospitals and provide data by year allowing for the collection and use of data from 2011 through 2015. Information on Medicaid expansion by state will be obtained through the Kaiser Family Foundation reporting on Status of State Action of the Medicaid Expansion Decision. The Kaiser Family Foundation report is regularly updated when changes occur and states expand

Medicaid, as Virginia did in 2018. The report provides valuable information on the date the expansions went into effect allowing for the historical comparison.

The Herfindahl-Herfindahl Index (HHI) is a measure of market concentration and is calculated through the sum of squared market shares. The results range from zero to 1. An HHI of less than .15 is considered a competitive marketplace, .15 to .25 is moderately concentrated, and .25 and higher is considered to be highly concentrated (Wright et al., 2016). Data to calculate the HHI on competitiveness is available through the American Hospital Association Annual Survey. HHI for this study was calculated based on admission at the county level. The data has been compiled by the VCU Health Administration department and will be used in the study's analysis. Once the data are obtained from these multiple sources, they will be organized by a common field of Medicare provider number. Medicare provider number is a standard federally assigned identifier that will allow for the combination of data from multiple sources.

Study Population and Sampling Strategy

The studies sampling strategy is to maximize the number of comparable hospitals years in the sample. Data is publically available and is required to be reported to CMS by almost all hospitals. The study population includes all non-federal, acute care, urban hospitals that are eligible for the HRRP and VBP under the CMS final rule within the United States from 2011 through 2015 (CMS C, 2011). 2011 and 2012 will be used as the comparable years since HRRP and VBP did not take effect until 2013. By using two years of historical data, prior to HRRP and VBP, the study will have a large recent population to compare to. Going further into the past may cause other historical factors to be included that cannot be controlled for affecting the study results.

2013 through 2015 are used to assess the impact of HRRP and VBP on hospital operating and total margins. This time frame is used as 2013 was the first year of these programs and 2015 is the last year used since it is the most recent data set available. Using the three years of data is also beneficial as it will capture the penalty increase from a maximum of 1% in 2013 to a maximum of 3% in 2015. Finally, five years of data should provide a significant study population and allow for the degrees of freedom required without sacrificing power.

Urban and non-urban status will be determined through the Medicare designation as outlined in the impact file from CMS. The two primary groups of interest are AHCs and non-AHCs, both of which were affected by HRRP and VBP and regularly report their information as part of the Medicare Cost Reports program.

While the primary group of interest is hospitals that were active and in service from 2011 through 2015, ones that were no longer in service will be reviewed to better understand the reason for the change. Some could be products of hospital mergers or closures due to financial trouble. A benefit of using such a broad group is that all AHCs and non-AHCs are able to be a part of the study.

As noted in the literature review section, determining what “is” an AHC can be a challenge. To address the AHC issue, the study will use the American Association of Medical Colleges’ full members of the Council of Teaching Hospital and Health Systems (COTH) listing of teaching hospitals in the United States. Full members are used for the study as other hospitals can be members but are not considered full members if they do not meet the full criteria. For more information on the membership requirements, refer to the literature section *Academic Health Centers Overview*. As of February 2018, there

were 221 full COTH members that were eligible for HRRP and VBP. The use of all available COTH and HRRP/VBP eligible urban hospitals strengthens the power of the study and its generalizability.

With these parameters, the study population started with a total of 3,693 total hospitals across all years. Under CMS's rule, there were 3,414 hospitals that were eligible for HRRP and VBP in all years 2013 through 2015. Hospitals that were added or removed from any of the three years will not be included in the final analysis. From the data set, there were 2,406 hospitals that were designated by CMS as 'urban'. Hospitals that were not classified as 'urban' will be removed from the study population. Urban includes the CMS designation of 'LURBAN' and 'OURBAN'. There are three COTH hospitals that will be removed from the study population as they are designated as rural hospitals. The remaining hospitals will be examined to identify ones with missing data elements, extreme values, and/or nonsensical data values.

Extreme values will be defined as ones with that are more than three standard deviations from the variable mean and will be reviewed to determine their influence on the analyses. If hospitals have significant missing data included the independent, dependent variables they will be eliminated from the sample.

Measurement of Variables

Following the conceptual framework outlined in chapter 3, the study uses constructs of hospital performance measured by operating and total margins to analyze the effect of HRRP and VBP on AHCs compared to non-AHCs. The section outlines the variables that will be used to conduct statistic testing of the hypothesis.

Hospital profitability and dependent variables. Assessing the influence of multiple factors affecting hospital profitability is not uncommon in hospital research. When examining hospital profitability, common financial metrics are used that can be standardized across multiple types of providers. Common profitability measures are: net income from patient care services; the sum of government appropriations; the difference between net patient revenues and total operating expenses; operating and total margins, return on total assets; and financial flexibility ratios (Bai & Anderson, 2016; Cleverley, 1994; Cleverley & Harvey, 1992).

Different studies have used multiple types of financial measures to determine the financial health of hospitals. When working with hospital profitability related to HRRP, financial operating and total margins have been the primary metric used (Bazzoli et al., 2018; Chen et al., 2017; Gu et al., 2014). The use of financial margin is prevalent as it allows for the analysis of the financial health of a hospital regardless of the size or complexity of the services they provide. Additionally, margin is easier to calculate for a representative sample**.** Financial margin allows the review of each hospital and represents the ability of that hospital to generate revenues while keeping costs low (Solution Matrix Ltd, 2016).

Financial margin is calculated as revenue minus cost in obtaining that revenue. The product of the calculation is referred to as “net revenue.” Net revenue is then divided by revenue and then multiplied by 100 to calculate the margin (Chen et al., 2017).

When working with hospitals, financial margin can be calculated in two different ways. The first is performed taking total patient revenues minus contractual

allowances/discounts on patients accounts and total operating expenses then dividing that product by total patient revenues. The calculation is referred to as operating margin as it focuses on the primary operating revenues and expenses related to patient care. Operating margin can be an important measure if the researchers are only focused on the patient care activities of the hospital.

In contrast, margin can be calculated by using total revenue minus total expenses and dividing that product by total revenue. The product is referred to as total margin as it the same components as operating margin with inclusion of other revenue such as donations, investment income, parking lot receipts, rental of space, among other revenue items along with the expenses for operating non-patient care activities. The final calculation includes all revenues and expenses related to a hospital. (Chen et al., 2017). The calculation will show the complete financial health of a hospital including all revenue streams. Much like operating margin, total margin can be an important indicator of total health of a hospital and demonstrate the ability of a hospital to remain financially healthy despite potential losses based solely on operating costs and revenues.

In the context of the study, both measures will be used allowing for the analysis of HRRP and VBP on the operations of a hospital and on the total flow of funds. By examining total margin, one can investigate the ability of hospitals to raise and use other funds, such as philanthropy, to supplement decreases in their core operations.

An article by Kruse et al. (Kruse, Polsky, Stuart, & Werner, 2012), used total margin to evaluate Medicare's pay for performance programs. The researchers examined revenues and costs separately to evaluate the program's impact. They

calculated hospital total margins as the difference between hospital total revenues and total costs. In the study, hospital total margin was shown to be a valuable indicator of financial health of hospitals. Hospital operating and total margin will be calculated and incorporated in the analysis form 2011 through 2015 to allow for the comparison of change year to year.

Independent variables. The independent variables for the analysis will be HRRP penalty rates, VBP incentive rates, and hospital type. HRRP penalty rates will be recorded as the actual assessed penalty rates for each hospital. These rates range from 0% to 1% in 2013, 0% to 2% in 2014, and 0% to 3% in 2014 and 2015. In terms of VBP, hospitals were docked 2% of annual Medicare operating revenues with the potential to earn back up to 3% of their Medicare revenues. If a hospital received no incentive credit, their net effect would be a -2% reduction in revenues. If they received the full credit, they would receive an additional 3% on top of their Medicare revenues. The combine net effect of these two programs could mean a potential penalty rate of up to -5% (-2% VBP and -3% HRRP in 2013) or a net positive of up to 3% (3% VBP and 0% HRRP).

By combining these two programs, the study will explore the net effect of these two programs on operating and total margin. The combined variable will be a continuous variable and will be coded based on the combined metric.

The independent variable of hospital type is based on AHC or non-AHC from the COTH membership listing. The AHC variable will be coded as a dichotomous variable with “1” being an AHC and “0” not.

Control variables. In line with other research, the study will control for several variables historically linked with hospital profitability. These variables related to market characteristics and hospital characteristics. Market characteristics include HHI on competitiveness and each US states status on Medicaid expansion. Medicaid expansion will be recorded for each year taking into consideration the staggered implementation of Medicaid by the states. Hospital characteristics will comprise of health system affiliation and ownership structure (public, for-profit, and not-for-profit).

Market characteristics of HHI and Medicaid expansion will be used to control for instances of external influences on hospital financial performance. HHI is calculated for each year 2011 through 2015 from county level data and is used to control for a market competitiveness. The variable is a continuous measure equal to the sum of squared county level market shares. Medicaid expansion will be used in each of the five years of the analysis. The variable will be updated as states expand Medicaid and will be coded as a dichotomous variable with “1” being an expanded and “0” not.

Hospital characteristics of health system affiliation will be coded as a dichotomous variable with “1” being a part of a system and “0” being not. The variable will be updated and taken annually to account for any hospital that may have changed their status with regard to system membership. The system affiliation and ownership structure have been shown to impact profitability through more purchasing power and economies of scale, along with different missions that can focus more on profit generation. The variable of ownership structure is based on the American Hospital Association designations. The hospitals that are included in this study are public (state

or government owned/operating), for-profit, and not-for-profit. Ownership structure will be coded with “1” being public, “2” being for-profit, and “3” being not-for-profit. The variable will also be updated annually in case there are instances of hospitals change ownership structures. The variable is important as for profit entities have been shown to have more of a motivation to raise revenues and reduce costs while not for profit are more mission and community focused with less attention toward profit. By controlling for these variables, we will be able to better isolate the impact that HRRP and VBP has had on hospital profitability. Table 2 provides a summary of the variables included in this study and their construction.

Table 2

Overview of Variable Construction

Variable	Data Source	Construction
Dependent Variables		
Total Margin	CMS HCRIS MDS (2011-2015)	Calculated for each fiscal year based on total patient and other revenue minus total expenses divided by total patient and other revenue with a variable range from -.69 through .64 for all years
Operating Margin	CMS HCRIS MDS (2011-2015)	Calculated for each fiscal year based total patient revenue minus contractual allowances, discounts on patients accounts and total operating expenses by total patient revenue with a variable range from -1.17 through .67 for all years
Independent Variables		

Combined Rate for Value Based Purchasing and Hospital Readmission Rate Penalty	Reporting from Centers for Medicare and Medicaid (2013-2015)	Percentage combined rate is the HRRP penalty rate plus the assessed VBP rate creating a combined rate range from -3% to +3% in 2013, -4% to +3% in 2014, and -5% to +3% in 2015 using the actual adjusted percentage
Hospital Type	American Association of Colleges of Medicine (January 2018)	Dummy coded COTH Academic Health Center status as 1=COTH AHC hospital 0=Non-COTH AHC hospital
Covariates		
Competition	American Hospital Association Annual Survey (2011-2015)	Calculated HHI as the sum of squared county level market shares and represented as a continuous variable from .04 to 1.
Medicaid Expansion	Kaiser Family Foundation Report (2012-2015)	Dummy coded status of Medicaid expansion in each state assessed each year as 0=not expanded 1=expanded
Health System Affiliation	American Hospital Association Annual Survey (2011-2015)	Dummy coded status as part of a health system in each year; 1=Part of a health system 0=Not part of a health system
Ownership Structure		
Public	American Hospital Association Annual Survey (2011-2015)	Dummy coded ownership status as a 1 if public in each year
For-Profit	American Hospital Association Annual Survey (2011-2015)	Dummy coded ownership status as a 2 if for-profit in each year
Not-For-Profit	American Hospital Association Annual Survey (2011-2015)	Dummy coded ownership status as a 3 if not-for-profit in each year

Variable management. Once the data is organized, all variables will be plotted to review consistency of data and outliers and will be tested for issues of multicollinearity. Data outliers and inconsistencies will be reviewed and evaluated, using SPSS with descriptive statistics. The data will also be tested to ensure the predictors are linear with the dependent variables. The study data will be managed in SPSS. The benefit to the data management process used for the study is that the same rules and data transformations can be done to a small sample just as easily as they can be done to the entire population. Since there is no benefit to reducing the size of the population, the study will use the entire available hospital population.

Analytic Methods

To address the two research questions, two separate statistical analyses will be performed. The following sections outline those analyses as the related to the research questions and hypotheses.

Research question 1. *Are historical operating and total margins of AHCs statistically different from non-AHCs?*

Hypothesis: AHCs will have statistically different operating and total margins compared to non-AHCs before (period 1) and after (period 2) the implementation of HRRP and VBP.

Before the study can address the second research question, there will be a preliminary descriptive data analysis and investigation into the differences between AHCs and non-AHCs prior to and after HRRP and VBP. The initial analysis will consist of comparing the two hospital groups on financial operating and total margin in these two periods with no control variables and without the HRRP/VBP penalty rates. The first

stage analysis is important as it will provide a descriptive, global, analysis of the two hospital groups. The analysis will answer an important question: *Are historical financial operating and total margins of AHCs statistically different from non-AHCs?* The answer to the question will establish if there is a statistical difference across these two hospital types.

To address research question one, a repeated measures analysis of variance (RMANOVA) model will be used, with the independent variable being period with the dependent variable being hospital operating and total margin. The data will be structured so that each year represents an independent sample of the data and metrics. This will solve an issue of missing data in individual years, as is an issue with these varying data sources and the long term recording of the data. By allowing individual years of data to be excluded without losing the entire hospital this study is able to maintain a larger sample size. The RMANOVA model will be a two-way model including the interaction between the two factors (hospital-type and period). The between units factor is Hospital-Type (AHC or non-AHC) and the within unit factor is period (Period 1 is years 2011-2012 (Pre-HRRP and VBP), Period 2 is years 2013-2015 (post-HRRP and VBP)). The analysis will be conducted twice with operating and total margin as the dependent variables.

Research question 2. Once the initial question is answered, the study will address the primary research question:

Is the operating and total margins of AHCs more significantly negatively affected from 2011 to 2015, with the implementation of HRRP and VBP, compared to non-AHCs?

Hypothesis: AHCs will experience a larger negative impact on their operating and total margins after the implementation of HRRP and VBP when compared to non-AHCs.

A RMANCOVA model will be used to analyze the main hypothesis, with independent variables being year, hospital-type, and the combined HRRP and VBP penalty rates with the dependent variables being hospital operating and total margin. The RMANCOVA model combines both ANOVA and regression in the predictive model. A benefit of the RMANCOVA is that each year's penalty rate is incorporated into the prediction model for margin. The RMANCOVA model will include a between units factor (Hospital-Type; AHC or non-AHC) and a within units factor (Year: 2011, 2012, 2013, 2014, and 2015 along with combination of HRRP penalties and VBP incentives), as well as the interaction between hospital type, HRRP and VBP penalty, and year. The model will then be adjusted for covariates, mentioned earlier in the chapter, to determine a predictive model for margin. The level of the change will be determined by the final formulaic model produced by the RMANCOVA along with the F-value.

Limitations of the Study Methods

As with any research project, there are many challenges faced in the empirical analysis, to have an effective study, these challenges must be understood and addressed prior to undertaking the study. A drawback of stage one of the analysis is the focus on the difference in period one and two and not the cause of the difference. While the two periods are based on the pre and post implementation of HRRP and VBP, there could be other factors influencing the change. The other factors that can impact profitability are addressed in the second hypothesis where covariates along with the use

of the actual years (not periods) and actual HRRP and VBP penalty rates are used for each hospital to better understand unique HRRP and VBP impact.

The study being able to control for all actions that can impact a hospital's financial health is yet another concern. Over the five years of data there were market changes such as other changes in health care policy and laws, along with other market impacts that could have an effect on hospital profitability. The issue around what impacts financial performance is a common problem often found in research relating to organization performance**,** and controlling for other variables will help reduce the issue. However, it is impossible to control for all variables that can affect every hospital. If through the evaluation of the hypotheses and their statistical tests (outlined above) it is found that unobserved variables account for a materially significant amount of variation and econometric analysis is required then panel data will be used through SPSS Estimator to address these other variables. The large data set will help to address the performance measurement issue as all similar hospitals should be impacted by similar changes in the environment.

A common limitation that the study and other studies face in organizational research is the use of secondary data. As mentioned earlier the Medicare Cost Report, data is self-reported and can have issues with reported values as they only receive desk reviews by CMS (Guadagnino, 2012). Additionally, the metrics and other information are from reports collected by other agencies and associations. To address the secondary data issue, control variables and data will need to be reviewed for outliers to ensure its consistency.

Summary of the Methods Chapter

This chapter describes the methods used to address the two research questions through two stages of analysis. The research design has been selected to mitigate threats to internal and external validity. The data sources and study population along with the sampling strategy have been selected to minimize error and provide a representative sample to address the research questions. Finally, the measurement of the variables and analytical methods allow for testing of the hypothesis. The follow chapters will present the study results and provide a discussion of those results.

Chapter 5: Results

The results chapter outlines the preparation of the data for analysis and the results of the statistical tests for each of the research questions. The first section of the chapter will discuss how the data was managed, the method for excluding hospital years, an analysis on missing data and data outliers, along with descriptive statistics for all variables. The second section discusses the statistical tests that were used, and how JMP was implemented to perform them. The third section presents the results of the statistical tests for each research question. The fourth section presents additional analyses that were performed as a follow-up to the main analysis for the research questions. The chapter concludes with a summary of the results.

Data Preparation and Calculation of Study Measures

Data management. When completely compiled, the overall data set for the study consisted of 3,693 total hospitals, with instances of data from 2011 through 2015, creating the potential for 18,465 data points, with 1,175 being AHC hospital years. With this quantity of data being compiled from several sources, there were many instances of missing data over the five years for the sample. To prevent excluding a single hospital for all five years, when only select data was missing, each hospital and its characteristics were broken down into per year instances. For example, each hospital would have five lines of data, each line representing a separate year from 2011 through 2015. This allows for the elimination of a single year of data due to missing values or meeting exclusion criteria, which maximizes the sample.

The data was merged using the Medicare ID field. The multiple data sources all provided Medicare ID, which allowed for the compilation of data. All data was calculated

and prepared in line with the methods section, as outlined in Table 2. One additional variable, a ‘wave’ dummy variable, was added to assist in the use of JMP in statistically testing the data. Wave was calculated as the year minus ‘2010’ to create a value of 1 through 5 for each year 2011 through 2015. This assisted in the linear modeling for JMP by identifying which Medicare ID records were repeating themselves through the study period.

The combined rate for VBP and HRRP was used as one of the primary independent variables, but the individual rates for VBP and HRRP were included in the data set to allow for additional supplementary analysis to investigate the impact of these programs on the hospitals’ financial viability. All values for each hospital year were used as unique values and were not averaged over several years.

Exclusions. Hospitals were first screened on the exclusion criteria of ‘rural’, as identified through the AHA designation. In the methods section of the study, it was outlined that the study population would only include urban hospitals, as AHCs are primarily located in urban settings. Prior research has shown a difference in the profitability of urban versus rural hospitals, and the inclusion of rural hospital types has the potential to skew the data (Bai & Anderson, 2016). Upon review of the data, there were a total of 4,737 hospital years where hospitals were designated as being located in the AHA variable of ‘rural’, 14 of which were AHCs and were removed.

Next, hospitals that had missing data points for total margin and operating margin, the primary dependent variables, were eliminated. This removed 3,066 hospital years, including 164 AHC years. Missing years of the combined VBP and HRRP rates were also eliminated. This removed 70 hospital years, none of which were AHC hospital

years. Puerto Rico's hospital years were eliminated as they are outside of the United States, the focus of the study. This eliminated 212 hospital years, none of which were AHC. There were 223 hospital years (6 AHC years) of other instances of missing data in health system affiliation, hospital ownership structure, and HHI. This brought the total study population to 10,157 hospital years, including 991 AHC hospital years.

Descriptive statistics. Table 3 provides descriptive statistics for the dichotomous variables.

Table 3

Descriptive Statistics for Dichotomous Variables

Variable	Number	Proportion
Independent Variables		
Hospital Type		
AHC	991	9.8%
Non-AHC	9166	90.2%
Year		
2011	2050	20.2%
2012	2251	22.2%
2013	2246	22.1%
2014	2247	22.1%
2015	1363	13.4%
Covariates		
Medicaid Expansion*		
Expanded Medicaid	2779	27.4%
Not Expanded Medicaid	7378	72.6%
Health System Affiliation		
Affiliated	2972	70.7%
Not Affiliated	7185	29.3%
Ownership Structure		
Public	1138	11.2%
For-Profit	2516	24.8%
Not-For-Profit	6503	64.0%

*Medicaid expansion based on all hospital years in the dataset

Overall, the AHC population consisted of 991 hospital years (9.8%) of the 10,157 total hospital years. The result is to be expected, as there are significantly fewer AHCs than non-AHCs. The variable of year had an even distribution of hospital years from 2011 through 2014, with the exception of 2015. 2015 irregularity is due to the HCRIS data, and the level of missing data in 2015, compared to other years. It is to be expected since it is the most recent year of reporting and data for this year are still in process of being reviewed and posted. Medicaid expansion only accounted for 2,279 (27%) of the hospital years. The distribution is expected due to the slow adoption of Medicaid expansion in the US from 2012 through 2015 (Chen et al. 2017). When reviewing health system affiliation, 2,972 (71%) of hospitals were affiliated with these systems. The majority of the hospitals (64%) were not-for-profit hospitals compared to 11.2% public and 24.8% for-profit.

Table 4 provides descriptive statistics for the continuous variables of operating profit margin and total profit margin.

Table 4

Descriptive Statistics for Continuous Variables

Variable	Minimum	Maximum	Mean	Standard Deviation	Standard Error
Dependent Variables					
Total Profit Margin	-0.6687	0.6407	0.0591	0.1111	0.0011
Operating Profit Margin	-1.1966	0.6660	0.0020	0.1601	0.0016
Independent Variables					
VBP HRRP Combined Rate	-0.0330	0.0105	-0.0016	0.0041	0.0000
Covariates					
HHI	0.0467	1.0000	0.4656	0.2846	0.0028

The dependent variables have means of .002 and .059, respectively. Operating margin and total profit margin are negatively skewed with operating margin more negatively skewed than total profit margin.

Both variables have low standard errors, giving validity to the analysis and representation of the population. The combined VBP/HRRP penalty rate has a positive kurtosis with a highly negative skewness. The skewness is to be expected, as the potential of -3% penalty for HRRP, and a standard -2% reduction for VBP, would lend toward a negative skewness. The combined rate has a very low standard error and standard deviation, making it representative of the population. HHI has a standard curve, overall, with moderate skewness and kurtosis.

Missing data. Of the 3,571 hospital years that were excluded after rural hospitals were removed, the majority of hospitals were located in states that had not expanded Medicaid, consistent with the final population. Health system affiliation had proportionally higher numbers in the excluded population than the final population, but not at a significant level. Finally, the ownership structure was distributed similarly to the final population. Upon review and analysis of the excluded population, there were no groups excluded that would cause concern that the excluded hospitals would lead to biased results, or indicate an issue with the study sampling methodology as shown in Table 5.

Table 5

Descriptive Statistics for Excluded Hospitals

Variable	Number	Proportion
Independent Variables		
Covariates		
Medicaid Expansion		
Expanded	815	22.8%
Not Expanded	1753	49.1%
Not Reported	1003	28.1%
Health System Affiliation		
Affiliated	1167	32.7%
Not Affiliated	745	20.9%
Not Reported	1659	46.5%
Ownership Structure		
Public	200	5.6%
For-Profit	579	16.2%
Not-For-Profit	1131	31.7%
Not Reported	1659	46.5%

Data outliers. Given the final study sample of 10,157 hospital years, the variables of combined rate, total margin, operating margin, and HHI were analyzed for outliers. An outlier was considered to be a variable that was more than 3 standard deviations from its mean, either higher or lower, in line with JMP default analysis. Of the total population there are 158 hospitals years for the combined rate, 171 for total margin, 184 for operating margin, and none for HHI that were outside of three standard deviations. There was a total of 447 hospital years (4.4% of the total sample) that were affected, as several hospitals had outliers for more than one variable. Table 6 shows a comparison of the distribution of variables compared to the total data set.

The statistical methods were run with and without these outlier observations to test if they caused a change in the significance tests for hypothesis one and two. There was no impact or change in the statistical results when these outliers were removed.

Table 6

Outliers Compared to Final Population for Dichotomous Variables

Variables		Outliers		Total Population	
		Count	%	Count	%
AHC	Yes	56	13%	991	10%
	No	391	87%	9166	90%
Year	2011	41	9%	2050	20%
	2012	59	13%	2251	22%
	2013	82	18%	2246	22%
	2014	112	25%	2247	22%
	2015	153	34%	1363	13%
HS Affiliation	Yes	244	55%	7185	71%
	No	203	45%	2972	29%
Ownership Structure	For-Profit	132	30%	2516	25%
	Not-for-Profit	191	43%	6503	64%
	Public	124	28%	1138	11%

These hospital years will be included in the study, as it was unclear if their outlier values were due to true data anomalies or justified extreme values.

Statistics

To test both hypotheses, JMP Pro v.14 was used. A linear mixed model was employed, and the hospitals were identified through their Medicare ID numbers and were tracked on repetitions through the use of the dummy variable wave. A repeated covariance type of autoregressive 1 was used as the data structure has homogeneous variances and correlations that decline exponentially with distance. Using the autoregressive function means that the two measurements (period/years) that are next to each other (i.e. 2011 and 2012) in time series are correlated, and that correlation

declines as the measurements get father apart (i.e. 2011 and 2014 have a lower correlation). Statistical significance was based on a p-value of .05 for the study.

Hypothesis 1 Results

Hypothesis one is focused on the difference between AHCs and non-AHCs from period 1, 2011 and 2012, and period 2, 2013 through 2015 on operating and total margin. The models main effects were AHC and Period, with AHC by Period as the factorial effect. The estimated marginal means of fitted models was run on the factor of AHC by Period.

Period by operating margin. For the first analysis, the dependent variable was operating margin with factors of period and AHC status. Table 7 shows the fixed effect parameter estimates.

Table 7

Fixed Effects Parameter Estimates for Operating Margin by Period

Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	-0.020657	0.005036	-4.10	<.0001*
AHC[0]	0.028512	0.005036	5.66	<.0001*
Period[1]	0.003406	0.001657	2.06	0.0398*
AHC[0]*Period[1]	0.001659	0.001657	1.00	0.3167

Table 7 shows that AHC status is significant with a p-value of less than .000. The low p-value indicates that the status of a hospital as an AHC is significantly different from that of non-AHCs on the dependent variable of operating margin. Period is also statistically significant with a p-value of .04. However, the factorial component of AHC by period is not significant. The result shows that while AHCs and non-AHCs are different, and period 1 is different from period 2, the combined effect of AHC by period was not significant for operating margin. Non-AHCs have an estimated operating margin

that is .029 higher than the operating margin for AHCs, indicating that AHCs perform worse on operating margin compared to non-AHCs. Period 1 also has a higher (.0034) operating margin than period 2, indicating that period 1 has higher operating margins than period 2. The estimated marginal means are plotted in Figure 4. Between period 1 and 2, non-AHCs had a drop of .01 for their operating margin means, while AHCs had a drop of .004, neither of which was statistically significant.

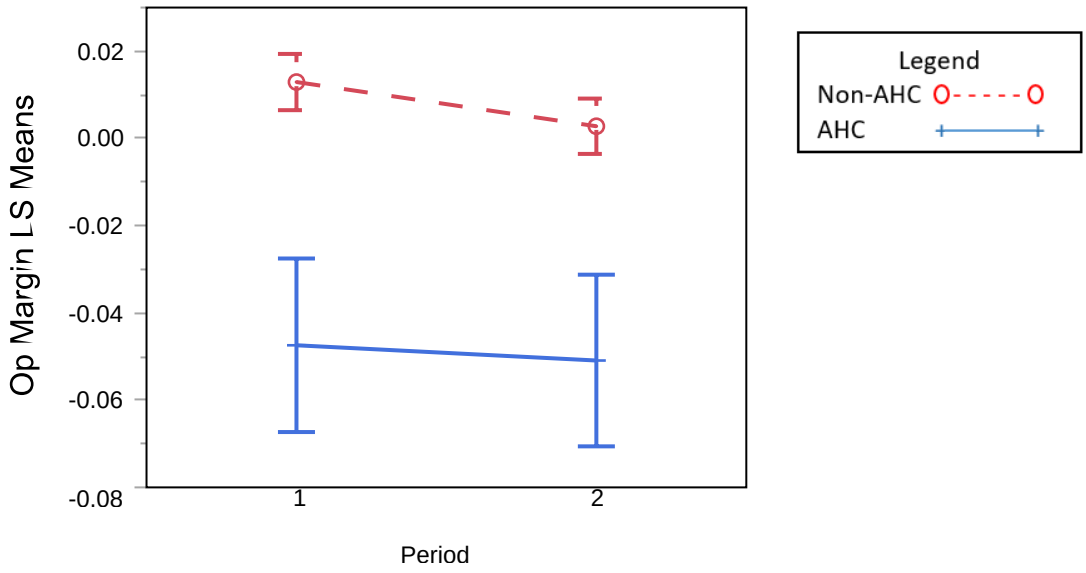

Figure 4. Least squares means plot for operating margin by period.

These results only partially support hypothesis one in that there is a significant difference from period 1 to period 2, and there is a significant difference between AHCs and non-AHCs. However, there was not a significant result when comparing the factorial effect of AHC by period. This results suggests that the factorial effect of AHC and period did not influence hospital operating margin, which does not support hypothesis one.

Period by total margin. For the second part of hypothesis one, the analysis changed the dependent variable to total margin, with a factor of AHC status by period. The results are show in table 8.

Table 8

Fixed Effects Parameter Estimates for Total Margin by Period

Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	0.057844	0.003196	18.10	<.0001*
AHC[0]	-0.000742	0.003196	-0.23	0.8165
Period[1]	-0.002760	0.001457	-1.89	0.0582
AHC[0]*Period[1]	0.001400	0.001457	0.96	0.3346

The most interesting result was the insignificance of the variable AHC. Compared to Table 7, Table 8 shows the decrease in significance from .000 for operating margin, to .817 for total margin. Period 1 to period 2 also lost significance, even though period was close to the significant p-value of .05. AHC by period continued to be insignificant. Figure 5 plots the estimated marginal means.

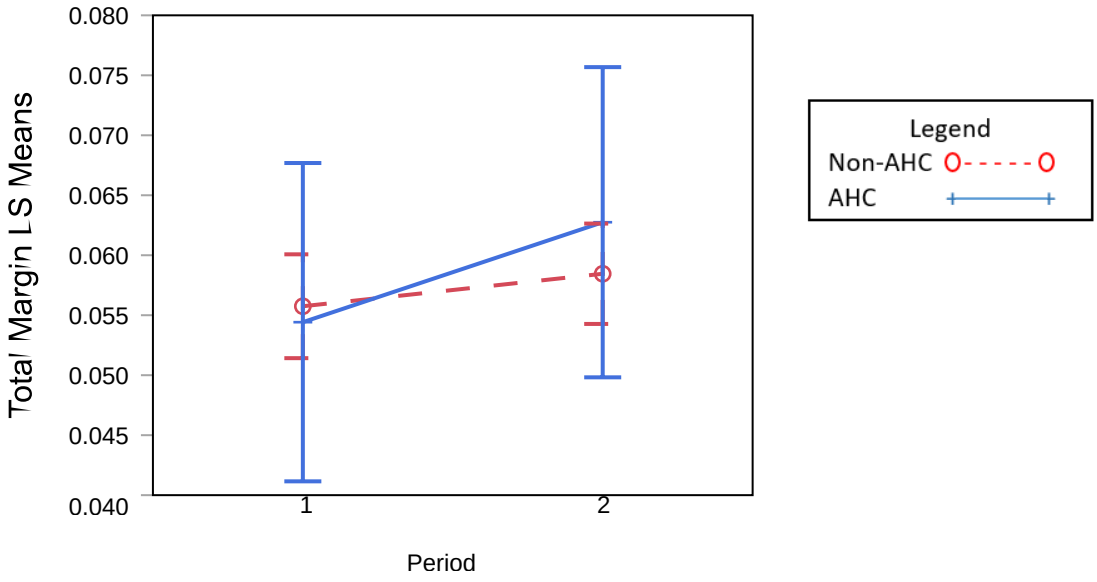

Figure 5. Least squares means plot for total margin by period.

Non-AHCs increased .002 from period 1 to 2, along with AHCs increasing .009 from period 1 to period 2, however neither change was statistically significant. The result indicates that the two types of hospitals did not experience a change over the two study periods, not supporting hypothesis one that there would be a significant decline

from period 1 to period 2. These analyses and the contradiction of hypothesis one on total margin left some question as to the significance and importance of incorporating period 1 and period 2 in the analysis, as opposed to year. To better understand and analyze these results, period was substituted with year, and the analysis was performed again following the same procedures as with period.

Year by operating margin. With the more detailed variable of year, AHC status, and the factorial analysis of AHC by year, some variables achieved a significant p-value under .05, as shown in Table 9.

Table 9

Fixed Effects Parameter Estimates for Operating Margin by Year

Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	-0.022331	0.005080	-4.40	<.0001*
AHC[0]	0.026860	0.005080	5.29	<.0001*
Year[2012]	0.002069	0.002558	0.81	0.4186
Year[2013]	-0.004830	0.002238	-2.16	0.0310*
Year[2014]	-0.006827	0.002579	-2.65	0.0081*
Year[2015]	0.004097	0.003927	1.04	0.2968
AHC[0]*Year[2012]	-0.003106	0.002558	-1.21	0.2248
AHC[0]*Year[2013]	-0.007605	0.002238	-3.40	0.0007*
AHC[0]*Year[2014]	0.001449	0.002579	0.56	0.5743
AHC[0]*Year[2015]	0.010203	0.003927	2.60	0.0094*

As year replaces period, the AHC by year interaction becomes significant. This significant interaction term indicates that AHCs and non-AHCs differ with regards to operating margin, but the magnitude of the difference depends upon the year. Similarly, the significant interaction term indicates that the years differ with regards to operating margin, but the magnitude of the difference in years depends on the type of hospital you are examining. The AHC by year interaction term p-values indicate that the compression of the years into two periods was hiding some effects that are present in

each year. With the expansion of years, it shows that there is a difference between the two periods but it depends on the year. The result is not surprising as the variable of year allows for more nuanced tracking of operating margin than just period 1 and 2.

The estimated marginal means tells more of the story of AHCs and non-AHCs over the years than the first interaction of period with the first research question. Figure 6 shows the long-term performance of AHCs compared to non-AHCs.

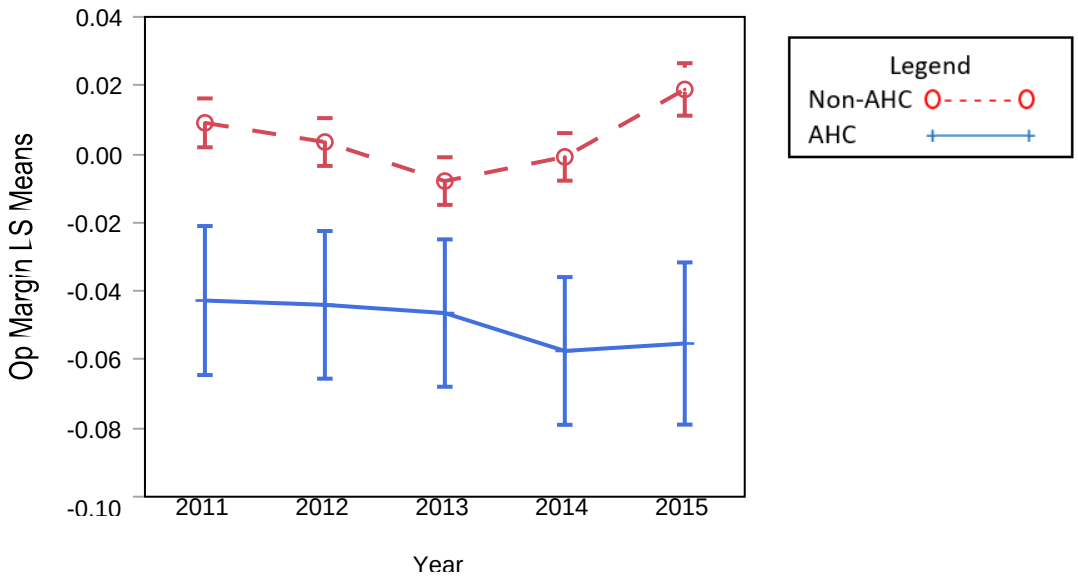

Figure 6. Least squares means plot for operating margin by year.

As shown in figure 6 and supported by the statistical analysis, AHCs did not have a statistically significant change in their performance from 2011 through 2015. The statically significant effect on the interaction terms was primarily due to the fluctuations in performance for non-AHCs. Non-AHCs experienced the largest change from 2011 compared to 2013 and 2015 and were able to recover to their 2011 levels in 2015. The result is in line with contingency theory and the concept that as the penalties are implemented, non-AHCs will be impacted to a lesser degree and have the ability to

change their organizations to minimize the impact of the changing contingencies, compared to AHCs.

By including year, the analysis has provided a clearer picture of the financial performance of AHCs and non-AHCs on operating margin over the 5 years of the study. The more detailed analysis partially supports the hypothesis that AHCs are significantly different in operating margins than non-AHCs. When year and AHC are factored the analysis suggests that 2013 and 2015 were the only years where the combined effect was significant also partially supporting hypothesis one.

Year by total margin. When applying the same analysis, trading period for years, on total margin, the outcome of the analysis is different from the two period analysis. Most significantly, the factorial analysis of AHC by year shifted from being insignificant for periods with a p-value of .335 in Table 8, to being significant in 2013 with a p-value of .002 and in 2015 with a p-value of .001, as shown in Table 10.

Table 10

Fixed Effects Parameter Estimates for Total Margin by Year

Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	0.058541	0.003228	18.13	<.0001*
AHC[0]	-0.001261	0.003228	-0.39	0.6961
Year[2012]	-0.001473	0.002250	-0.65	0.5129
Year[2013]	0.005469	0.002031	2.69	0.0071*
Year[2014]	0.000666	0.002270	0.29	0.7690
Year[2015]	-0.004308	0.003337	-1.29	0.1968
AHC[0]*Year[2012]	-0.001109	0.002250	-0.49	0.6224
AHC[0]*Year[2013]	-0.006355	0.002031	-3.13	0.0018*
AHC[0]*Year[2014]	0.000209	0.002270	0.09	0.9265
AHC[0]*Year[2015]	0.010802	0.003337	3.24	0.0012*

Again, as year replaces period, the AHC by year interaction becomes significant. This significant interaction term indicates that AHCs and non-AHCs differ with regards to total margin, but the magnitude of the difference depends upon the year. Similarly,

the significant interaction term indicates that the years differ with regards to operating margin, but the magnitude of the difference in years depends on the type of hospital you are examining. Least square means (Figure 7) tell a much different story for AHCs and non-AHCs, compared to period used before.

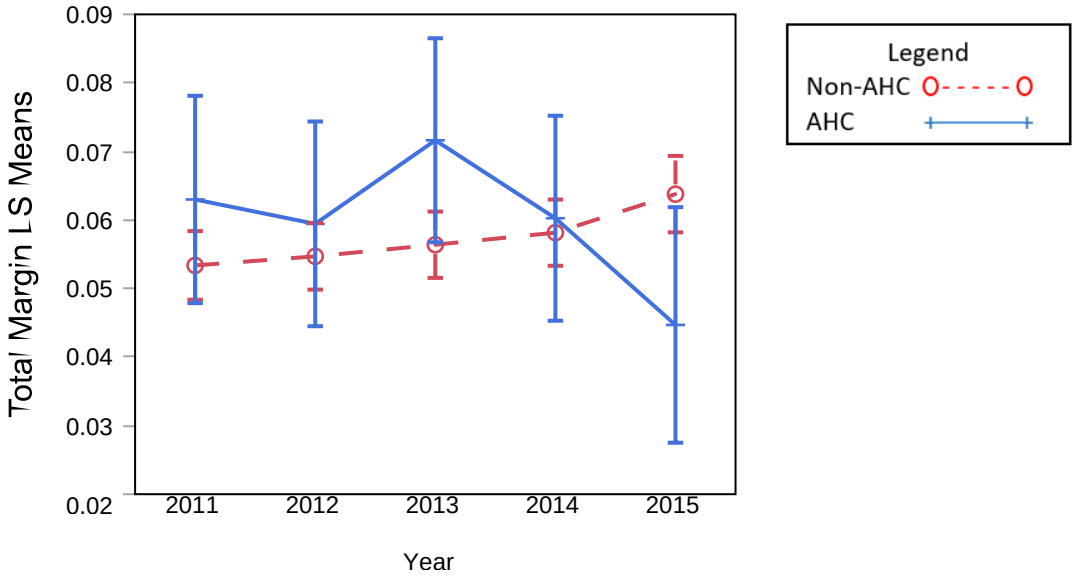

Figure 7. Least squares means plot for total margin by year.

For non-AHCs, they show a statistically significant growth from 2013 to 2015 in total margin, while AHCs had a spike in 2013 in total margin, followed by strong and significant drops in 2014 and 2015 with a statically significant drop from 2011 through 2015. The sharp decline in total margin for AHCs is a noteworthy decline that may be explained with additional variables to be analyzed in hypothesis two.

Hypothesis 2 Results

Hypothesis two expands on hypothesis one by including the HRRP and VBP combined rates, along with control variables, and year. Following contingency theory, the statistical methods will focus on the primary relationship between the independent variables on operating and total margin. The analyses will also test the significance of

the interactions of the independent variables (AHC by combined rate and AHC by year) on operating and total margin to determine the influence of organizational fit. Throughout this chapter, the estimated means are plotted to provide a visualization of the interactions over the study period.

Combined rate by operating margin. Table 11 outlines the results from the linear mixed model for fixed effects on operating margin.

Table 11

Fixed Effects Parameter Estimates for Linear Mixed Model and Operating Margin with Combined Rate

Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	-0.045960	0.006445	-7.13	<.0001*
AHC[0]	0.011049	0.004905	2.25	0.0244*
Year[2012]	0.000293	0.002996	0.10	0.9220
Year[2013]	-0.004180	0.002473	-1.69	0.0911
Year[2014]	-0.007440	0.002690	-2.76	0.0057*
Year[2015]	0.006383	0.004155	1.54	0.1245
HSAffiliation[0]	-0.010824	0.002304	-4.70	<.0001*
HHI	0.042208	0.009129	4.62	<.0001*
MedicaidStatus[0]	-0.000863	0.001644	-0.52	0.5996
OwnerStruc[Public]	-0.083944	0.005195	-16.16	<.0001*
OwnerStruc[FP]	0.073896	0.004264	17.33	<.0001*
Combined Rate	1.559110	0.561913	2.77	0.0055*
AHC[0]*Year[2012]	-0.003005	0.002817	-1.07	0.2862
AHC[0]*Year[2013]	-0.007932	0.002424	-3.27	0.0011*
AHC[0]*Year[2014]	0.001258	0.002616	0.48	0.6307
AHC[0]*Year[2015]	0.010354	0.004047	2.56	0.0105*
AHC[0]*Combined Rate	0.063158	0.560651	0.11	0.9103

Overall, when focusing on the primary variables of interest, the difference between AHCs and non-AHCs was significant in the model with non-AHCs associated with statistically higher operating margins in 2014 and 2015. Combined rate was also significant, indicating that as the combined rate variable declines in its value the penalty for a hospital is increasing. Conversely, a positive change in the combined rate variable

(e.g., going from -1% to -0.5%) means that the penalty is decreasing. In table 11, the estimate of 1.559 implies that as the penalty rate declines and potentially moves to a bonus under VBP, profitability increases.

The interaction of combined rate by year was not performed due to the lack of values (‘0’) in 2011 and 2012 since HRRP and VBP had not taken effect. If the factor of year by combined rate would have been performed in JMP the lack of none zero values for these two consecutive years would create a linear dependency on all of the estimates leading to a lack of model fit when logistic regression is used.

AHC by combined rate was not significant indicating that while AHC and combined rate are significant individually, the interaction of the two does not influence operating margin. This result does not support hypothesis two that AHCs were more significantly affected by increases in the HRRP/VBP penalty rate compared to non-AHCs.

HHI is significant, which is expected since the competitiveness of the hospital’s market has been shown in prior research to impact hospital profitability (Wright, Tergas, & Hou, 2016). Medicaid Status was not significant but that could be an indication of many states not adopting it until 2014 and 2015 and each state adopting it in their own unique way. This late adoption may have skewed the results with ‘0’ values for much of 2011 through 2013. Ownership structure was significant with public and not-for-profit hospitals associated with lower operating margins compared to for-profit hospitals. Health system affiliation is significant with hospitals being part of a health system showing higher profitability.

Figure 8 visualizes the estimated means for AHCs and non-AHCs and suggests that AHC operating margins were more negatively trending from 2011 through 2014 compared to non-AHCs.

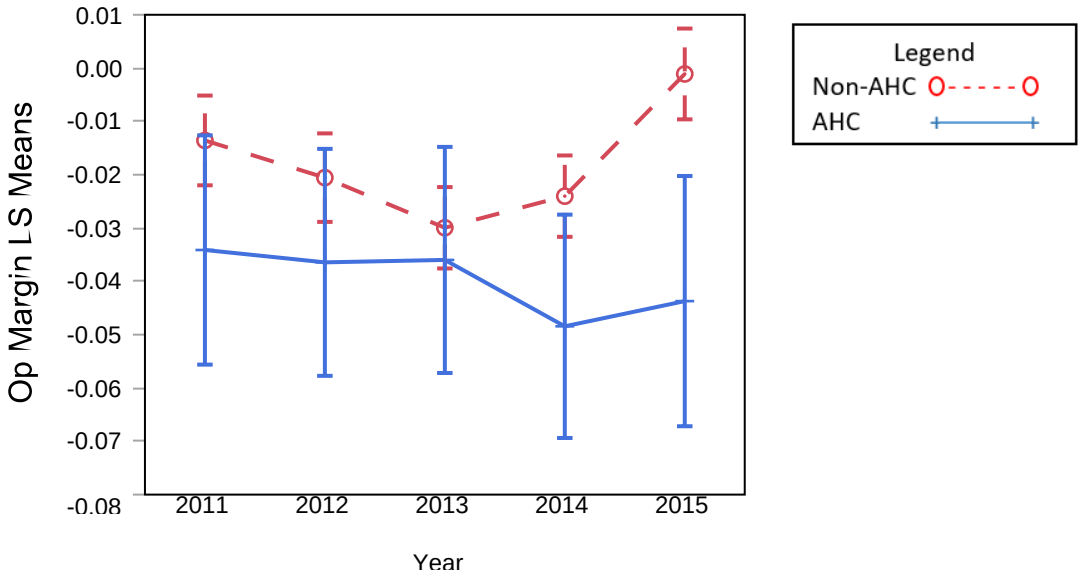

Figure 8. Least squares means plot for operating margin and combined rate from linear mixed model.

However, given the insignificance of the interaction of AHC and the combined penalty rate, the implication is that differential effects of HRRP/VBP penalties on AHCs versus non-AHCs are not the explanation for this divergence in operating margins across these two types of hospitals.

These results do not support hypothesis two for operating margin. While the combined rate of HRRP and VBP and AHC status are significant as are certain years, the interactions of these key variables indicate that something else in the environment is leading to the lower operating margin for AHCs from 2011 through 2015.

Combined rate by total margin. The second part of hypotheses two performed the same analysis, with the same variables, but with a dependent variable of total margin. Table 12 outlines the fixed effects parameter estimates. AHC continues to be significant

individually but it depends on the year. Non-AHCs are associated with lower total margin, a change from operating margin. Combined rate is no longer significant at p=.05 but with a p-value of .0601 this may not be an ignorable effect.

Table 12

Fixed Effects Parameter Estimates for Linear Mixed Model and Total Margin with Combined Rate

Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	0.054489	0.0044387	12.28	<.0001*
AHC[0]	-0.006828	0.0033475	-2.04	0.0415*
Year[2012]	-0.003183	0.0026139	-1.22	0.2233
Year[2013]	0.005858	0.0022200	2.64	0.0083*
Year[2014]	0.000625	0.0023631	0.26	0.7914
Year[2015]	-0.001775	0.0035325	-0.50	0.6154
HSAffiliation[0]	-0.003220	0.0017376	-1.85	0.0639
HHI	0.013305	0.0062927	2.11	0.0346*
MedicaidStatus[0]	0.000372	0.0014121	0.26	0.7921
OwnerStruc[Public]	-0.031927	0.0037285	-8.56	<.0001*
OwnerStruc[FP]	0.034125	0.0030297	11.26	<.0001*
Combined Rate	0.911120	0.4846283	1.88	0.0601
AHC[0]*Year[2012]	-0.002387	0.0024651	-0.97	0.3329
AHC[0]*Year[2013]	-0.005923	0.0021791	-2.72	0.0066*
AHC[0]*Year[2014]	0.000358	0.0023004	0.16	0.8761
AHC[0]*Year[2015]	0.012578	0.0034430	3.65	0.0003*
AHC[0]*Combined Rate	0.748900	0.4834479	1.55	0.1214

AHC by year is again significant for individual years, 2013 and 2015, as it was with operating margin. AHC by combined rate is not significant, continuing the findings from operating margin.

Health system affiliation changes relative to findings for operating margin, becoming insignificant for total margin with a p-value of .063. HHI and ownership structure continue to be significant as with operating margin. Medicaid status continues to be insignificant.

AHC estimated margin means presented in Figure 9, provides insights on the trends in total margin for AHCs and non-AHCs.

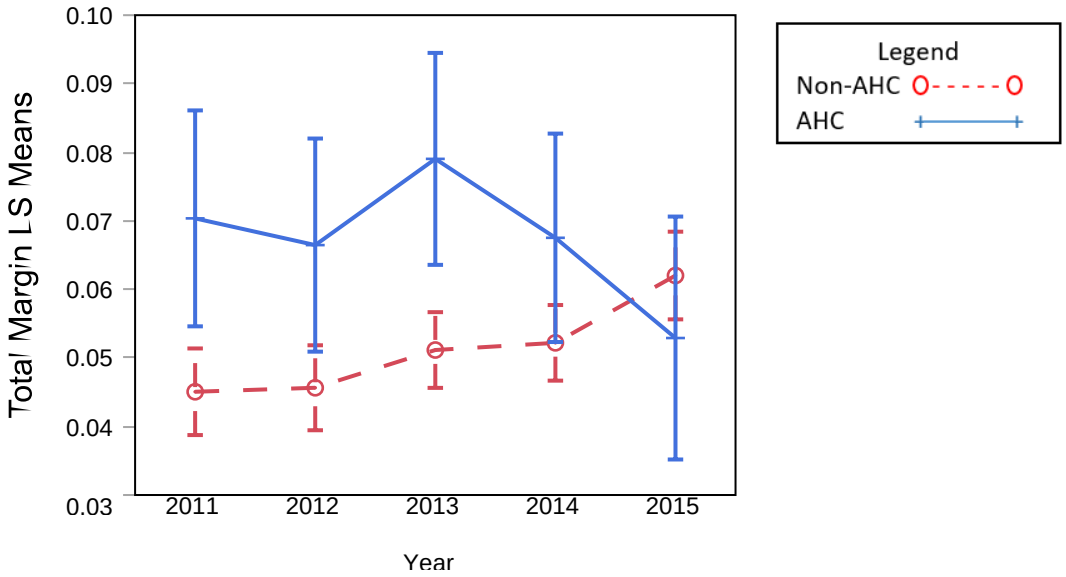

Figure 9. Least squares means plot for total margin and combined rate from linear mixed model.

While AHCs had sustained higher total margins than non-AHCs from 2011 through 2014, total margin experienced a decline from 2013 through 2015 similar to operating margin. Non-AHCs showed a better ability to maintain and increase total margin over that time, surpassing AHCs in 2015 for total margin. As with operating margin, hypothesis two is not supported in that HRRP and VBP had no differential influence on AHC's total margin when compared to non-AHCs. The results suggest that something in the environment is affecting the trends for AHCs and non-AHCs but it is unclear from this analysis what that may be.

Supplementary Analysis

In addition to the analysis for hypothesis one and two, a separate supplementary analysis was performed to review the individual impact of HRRP and VBP, using the same parameters as hypotheses two.

VBP by operating margin. Table 13 outlines the fixed effects parameter estimates using the linear mixed model with VBP instead of the combined rate on operating margin.

Table 13

Fixed Effects Parameter Estimates for Linear Mixed Model and Operating Margin with VBP

Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	-0.048293	0.006311	-7.65	<.0001*
AHC[0]	0.010777	0.004749	2.27	0.0234*
Year[2012]	0.003296	0.002786	1.18	0.2369
Year[2013]	-0.005920	0.002322	-2.55	0.0108*
Year[2014]	-0.008175	0.002671	-3.06	0.0022*
Year[2015]	0.002889	0.004025	0.72	0.4730
HSAffiliation[0]	-0.010669	0.002300	-4.64	<.0001*
HHI	0.041817	0.009107	4.59	<.0001*
MedicaidStatus[0]	-0.001106	0.001642	-0.67	0.5005
OwnerStruc[Public]	-0.083281	0.005187	-16.05	<.0001*
OwnerStruc[FP]	0.073418	0.004256	17.25	<.0001*
VBP	4.037350	0.998087	4.05	<.0001*
AHC[0]*Year[2012]	-0.002616	0.002563	-1.02	0.3076
AHC[0]*Year[2013]	-0.007793	0.002260	-3.45	0.0006*
AHC[0]*Year[2014]	0.000710	0.002591	0.27	0.7841
AHC[0]*Year[2015]	0.009989	0.003894	2.57	0.0103*
AHC[0]*VBP	-0.221280	0.997608	-0.22	0.8245

As with hypothesis two, health system affiliation, HHI, and the ownership structure are still significant. VBP is significant on its own with a p-value of less than .05. The positive estimate indicated that as VBP becomes more positive (i.e., as the VBP penalty declines) hospitals see a positive change in operating margin. AHC by VBP is insignificant with a p-value of .8 following the same trend shown in hypothesis two on operating margin. Figure 10 plots the least squares means by year comparing AHC and non-AHCs. Figure 10, when compared to Figure 8, shows a similar trend for both AHCs and non-AHCs.

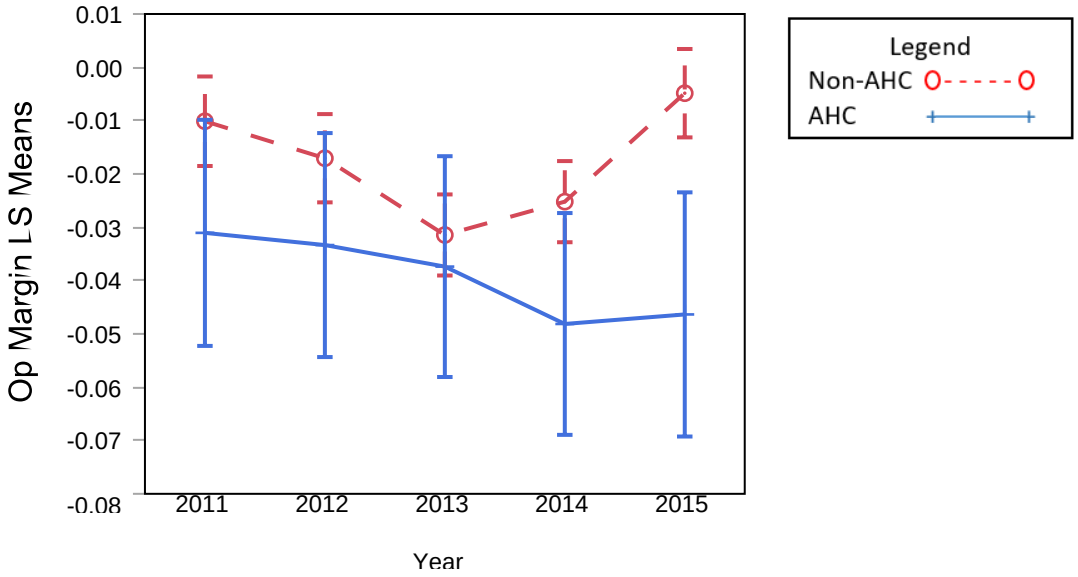

Figure 10. Least squares means plot for operating margin and VBP from linear mixed model.

The trend over the years shows a steady decline for both types from 2011 through 2013, followed by an improvement in 2014 and 2015 for non-AHCs, and only a slight improvement for AHCs from 2014 to 2015. The results indicate that VBP on its own does not have a significantly different result than VBP and HRRP combined when compared to operating margin from 2011 through 2015.

VBP by total margin. Similar to operating margin, the trend continues with total margin. Table 14 outlines the fixed effects parameter estimates with total margin and VBP. AHC was again significant in the fixed effects with the other variables of HHI and ownership status, and a marginal significant for health system affiliation, when compared to Table 12. Medicaid status along with all years except 2013 were insignificant, as was the case with the combined rate analysis (Table 12). Year by AHC for years 2012 and 2014 were also insignificant which repeated the findings from the combined rate analysis. The most interesting result was with VBP becoming significant when isolated from HRRP. AHC by VBP was not significant at .8.

Table 14

Fixed Effects Parameter Estimates for Linear Mixed Model and Total Margin with VBP

Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	0.053411	0.004305	12.40	<.0001*
AHC[0]	-0.008412	0.003190	-2.64	0.0084*
Year[2012]	-0.001527	0.002438	-0.63	0.5311
Year[2013]	0.005182	0.002093	2.48	0.0133*
Year[2014]	0.000356	0.002346	0.15	0.8792
Year[2015]	-0.004080	0.003426	-1.19	0.2339
HSAffiliation[0]	-0.003015	0.001736	-1.74	0.0825
HHI	0.012945	0.006287	2.06	0.0396*
MedicaidStatus[0]	0.000204	0.001410	0.15	0.8846
OwnerStruc[Public]	-0.031152	0.003729	-8.35	<.0001*
OwnerStruc[FP]	0.033528	0.003029	11.07	<.0001*
VBP	3.214288	0.853030	3.77	0.0002*
AHC[0]*Year[2012]	-0.000676	0.002252	-0.30	0.7642
AHC[0]*Year[2013]	-0.006765	0.002041	-3.31	0.0009*
AHC[0]*Year[2014]	-0.000528	0.002277	-0.23	0.8166
AHC[0]*Year[2015]	0.010869	0.003317	3.28	0.0011*
AHC[0]*VBP	0.163224	0.852248	0.19	0.8481

These results still do not support hypothesis 2 but do show that VBP is more significant for the total margin analysis when examined independently from the combined rate. Figure 11, a plot of the least squares means, does show the difference between AHCs and non-AHCs with AHCs dropping below non-AHCs in 2015. This result is consistent with Figure 9 in hypothesis two.

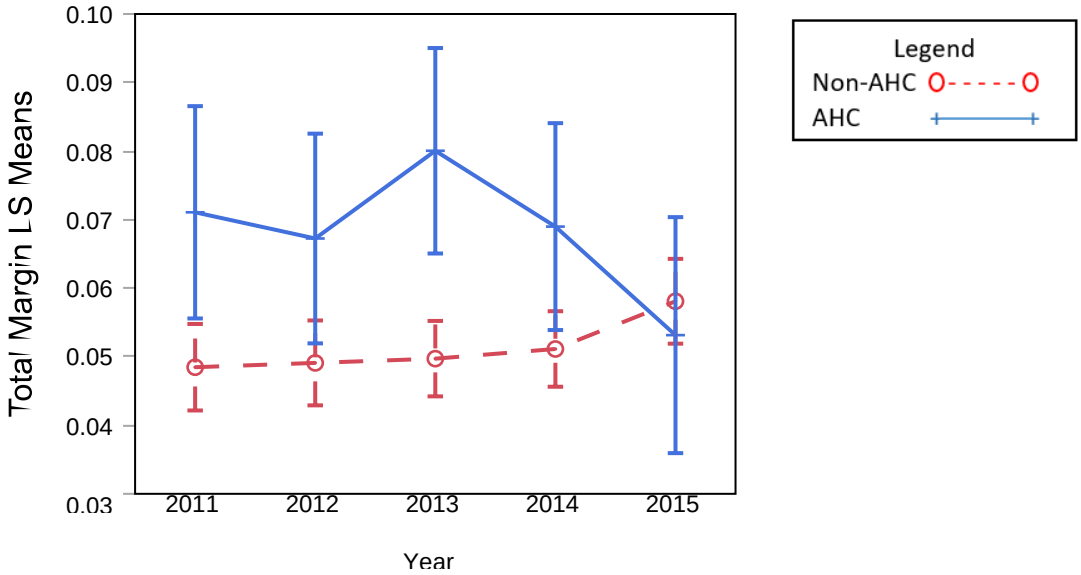

Figure 11. Least squares means plot for total margin and VBP from linear mixed model.

HRRP by operating margin. The supplemental analysis continues the review with an analysis of HRRP with the same variables as combined rate in hypothesis two. Table 15 provides the fixed effects of the parameter estimates for HRRP on operating margin. The only difference in the HRRP supplementary analysis compared to the VBP analysis was the insignificance of HRRP as compared to VBP. In the first supplemental analysis, VBP was significant with a p-value of <.01, as was the combined rate, whereas HRRP had an insignificant p-value of .5. This indicates that VBP is more significant in predicting hospital operating margin than was HRRP from 2011 through 2015. However, as with VPB and combined rate, HRRP by AHC continues to be insignificant, not supporting hypothesis two. Figure 12 provides the least squares means plot for AHC by operating margin.

Table 15

Fixed Effects Parameter Estimates for Linear Mixed Model and Operating Margin with HRRP

Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	-0.048454	0.006493	-7.46	<.0001*
AHC[0]	0.011581	0.004964	2.33	0.0197*
Year[2012]	0.001917	0.003063	0.63	0.5314
Year[2013]	-0.005127	0.002510	-2.04	0.0412*
Year[2014]	-0.007632	0.002680	-2.85	0.0044*
Year[2015]	0.004246	0.004235	1.00	0.3161
HSAffiliation[0]	-0.010700	0.002310	-4.63	<.0001*
HHI	0.042210	0.009167	4.60	<.0001*
MedicaidStatus[0]	6.339e-6	0.001637	0.00	0.9969
OwnerStruc[Public]	-0.084253	0.005212	-16.16	<.0001*
OwnerStruc[FP]	0.074128	0.004279	17.32	<.0001*
HRRP	0.457204	0.691172	0.66	0.5083
AHC[0]*Year[2012]	-0.003532	0.002891	-1.22	0.2219
AHC[0]*Year[2013]	-0.007035	0.002464	-2.85	0.0043*
AHC[0]*Year[2014]	0.001790	0.002607	0.69	0.4922
AHC[0]*Year[2015]	0.010006	0.004128	2.42	0.0154*
AHC[0]*HRRP	0.2625336	0.6901722	0.38	0.7037

Figure 12 is consistent with the previous plots for VBP and combined rate on operating margin and indicate that HRRP on its own does not provide any other conclusions than what were provided in the initial analysis.

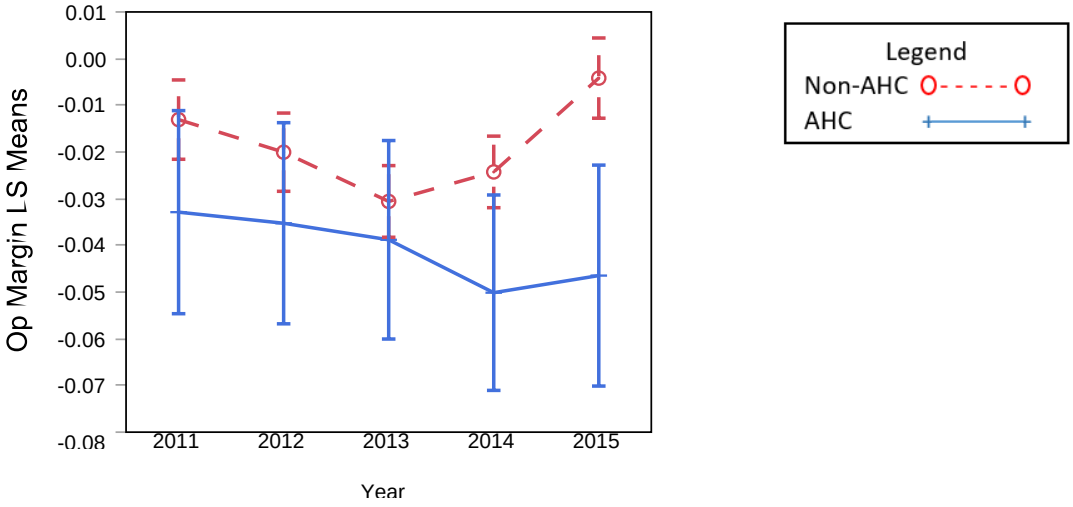

Figure 12. Least squares means plot for operating margin and HRRP from linear mixed model.

HRRP by total margin. Table 16 provides the fixed effects parameter estimates for HRRP on total margin.

Table 16

Fixed Effects Parameter Estimates for Linear Mixed Model and Total Margin with HRRP

Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	0.052142	0.004487	11.62	<.0001*
AHC[0]	-0.006144	0.003410	-1.80	0.0718
Year[2012]	-0.001725	0.002672	-0.65	0.5185
Year[2013]	0.004971	0.002250	2.21	0.0272*
Year[2014]	0.000598	0.002353	0.25	0.7993
Year[2015]	-0.003794	0.003603	-1.05	0.2924
HSAffiliation[0]	-0.003165	0.001745	-1.81	0.0698
HHI	0.013427	0.006331	2.12	0.0340*
MedicaidStatus[0]	0.001213	0.001406	0.86	0.3882
OwnerStruc[Public]	-0.032367	0.003747	-8.64	<.0001*
OwnerStruc[FP]	0.034512	0.003045	11.33	<.0001*
HRRP	-0.156420	0.597815	-0.26	0.7936
AHC[0]*Year[2012]	-0.003137	0.002528	-1.24	0.2148
AHC[0]*Year[2013]	-0.004940	0.002212	-2.23	0.0256*
AHC[0]*Year[2014]	0.000810	0.002291	0.35	0.7235
AHC[0]*Year[2015]	0.012653	0.003514	3.60	0.0003*
AHC[0]*HRRP	1.124576	0.596936	1.88	0.0596

The result indicates that VBP is more significant than HRRP when evaluating the programs impact on hospital total margin. Interestingly, AHC is also insignificant, a departure from the VBP findings and hypothesis two results indicating that the analysis of HRRP and AHCs are further not correlated to total margin performance compared to VBP and their combined effect. However, AHC by HRRP indicates a marginal significance and may indicate that HRRP affects AHCs marginally differently than non-AHCs. Figure 13 plots the least squares means and again shows no significant departure from hypothesis two.

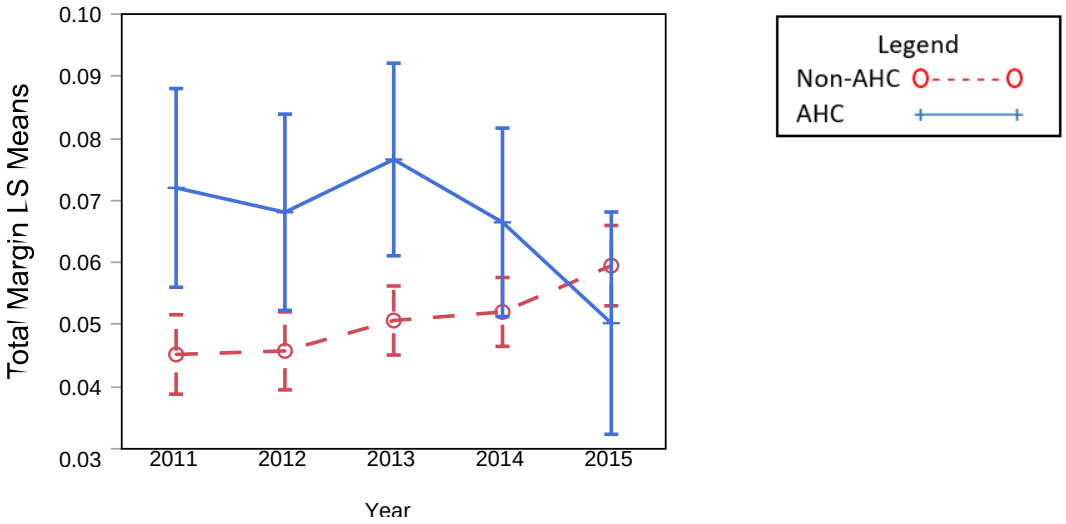

Figure 13. Least squares means plot for total margin and HRRP from linear mixed model.

Chapter Summary

The study analyzed the difference between AHCs and non-AHCs in their operating and total margins, and investigated the impact that HRRP and VBP had on these two hospital types from 2011 through 2015. Contingency theory provided a framework and suggested that differences in performance would be present across these hospital types, and that HRRP/VBP penalties would have a differentially greater impact on profitability of AHCs than non-AHCs. The central theme of the study, obtained through contingency theory, was that as contingencies changed AHCs would have a more difficult time adjusting their organizational structure to respond to these government programs.

The chapter investigated these propositions through the measurement of fit, specifically the dependent variables of operating and total margin. It focused on the contingencies of AHC and non-AHC and the introduction of HRRP and VBP, while following previous research and controlling for other variables. The chapter presented the data, how that data was organized, and how the final data set was filtered to

produce the dataset used. Summary statistics were presented and outliers were reviewed for patterns and significance.

A linear mixed model in JMP was used to evaluate the two hypotheses, along with supplemental analysis. The results showed that AHCs and non-AHCs had significantly different profit margins over time, and that the combined penalties of VBP and HRRP had a significant impact on operating and total margins. Overall though, the findings suggested that HRRP/VBP penalties had a similar effect on operating margins of both AHCs and non-AHCs. Through supplemental analyses, it was also found that VBP had a larger impact on total and operating margin compared to HRRP. The overall results of these analyses provides partial support for hypothesis one of the study, but no support for hypothesis two.

Chapter 6: Conclusions

This chapter opens with a discussion of the study's findings. Then, the results are discussed in context of the two hypotheses. The implications of the study are outlined, with focus on the managerial and policy impacts. This is followed by a review and commentary of contingency theory in relation to the study. The study limitations are discussed, along with the suggestions for future research. The chapter concludes with a review of the materials presented.

Summary and Overview

AHCs differ from non-AHCs in many fundamental ways, primarily stemming from AHCs' tripartite mission focusing on education, research, and practice. As outlined in Chapter 2, these differences led to different organizational structures that are dependent on government payers, high patient populations enrolled in Medicare and Medicaid, and high costs related to education and research, when compared to non-AHCs. AHCs' unique organizational structures potentially leaves them vulnerable to changes in payment structures and government programs.

The purpose of the study was to investigate how these organizational structures interacted with two government programs, HRRP and VBP, potentially causing differences in operating and total margins of AHCs when compared to non-AHCs, from 2011 through 2015. This was investigated through two research questions, the first primarily examining differences, over time, of AHCs versus non-AHCs, at a descriptive level, and the second examining if and how HRRP and VBP affected operating and total margin for these two hospital groups, when controlling for other environmental and hospital characteristics. These research questions were evaluated based on a

contingency theory framework. The framework proposes a link between contingencies (HRRP, VBP, and AHC status), leading to a change in fit, as measured by operating and total margins.

Contingency theory was selected for the underlying theory, as it provides a framework to explain how changes in environmental factors can lead to reduced performance. The theory hypothesizes that over time, an organization's contingencies will change. As they change, organizations must adjust their structures to best meet these new contingencies to prevent a loss of market fit, leading to a decline in their performance. While the study's results, summarized in Chapter 5, show differences between AHCs with some varying effects from the variables in the study, the research hypotheses for both questions are not fully supported. The remainder of this chapter will focus on putting into context the implications of study findings for AHCs and non-AHCs and their profitability.

Discussion of the Study Findings

Hypothesis 1. AHCs will have a statistically different operating and total margins compared to non-AHCs before (period 1) the implementation of HRRP and VBP and after (period 2).

Hypothesis one focused on the overall question: is there a difference between the profitability of AHCs, compared to non-AHCs, and how did they perform from period one to period two. Hypothesis one was an important question, as research to date had not investigated if there was actually a financial difference between AHCs, and only alluded that circumstances should lead to a difference in financial performance. Upon evaluation of hypothesis one first looking at operating margin, the results showed that

that there was a difference between AHCs and non-AHCs with non-AHCs having a higher operating margin, and that both AHCs and non-AHCs had higher operating margins in period one when compared to period two. However, the interaction of AHC by period was not significant. This finding did not support hypothesis one that there was a significant difference between the two periods dependent on AHC status. The result of the analysis for the first part of hypothesis one was only partially supported in that AHCs had lower operating margins, compared to non-AHCs, and both hospital types being negatively affected from period 1 to period 2.

Hypothesis one was then investigated on total margin. The results did not support the second part of hypothesis one, as there was no difference in period, AHC, or the interaction effect. This result was not expected, as there was at least an expectation that there would be a difference in AHC and non-AHC for total margin, even if there was not a difference from period 1 and period 2. The significance of the values for period, .058, under a p-value of .1, indicating there was a marginal effect, which led to the question of whether the use of year-by-year indicators rather than a simple period indicator was more appropriate for examining changing margins over time. The inference was that a period indicator was masking a significant interaction that was happening in the individual years. To investigate this idea, hypothesis one was re-evaluated by expanding the two periods into individual year indicators.

By performing tests by years on operating and total margins again, the findings for hypothesis one changed. For both margins, the interaction of year by AHC became significant for specific years, meaning that the AHC designation is significant but it depends on the year, and the year is significant depending on the AHC designation. On

operating margin, there was not statistically significant change for AHCs from 2011 to 2015 and much of the variation was driven by non-AHCs on the five-year period. For total margin AHCs experienced a statistically significant change in 2013 and then a decline from 2013 to 2015. Non-AHCs experienced a statistically significant gain from 2011 to 2015. Interestingly, for operating margin, 2013 referenced against 2011 resulted in non-AHCs having a more significant decline than AHCs but this trend was reversed in 2015 with non-AHCs regaining their 2011 operating margin levels. Again, these results only partially supported hypothesis one for the select years.

The result was represented visually in Figures 6 and 7. In Figure 6, AHCs no change in their operating margins, where non-AHCs experienced a decline, followed by a rebound in 2015 to their original 2011 operating levels. The interesting change from period to year becomes more evident on total margin, as represented in Figure 7. Figure 7 shows AHCs outperforming non-AHCs in 2011 and 2012, followed by a large increase in 2013, then a steep decrease in 2014 and 2015. The pattern of increases and decreases were different from what was observed for operating margin, suggesting there were non-operating revenue or expense streams causing this fluctuation that only impacted AHCs. The finding is an interesting result, with the cause not being evident with the available data.

By changing from period to year, the results from both tests only partially support hypothesis one. AHCs were only significantly different for operating margin and it was only a significant difference in 2013 and 2015 when AHC status was interacted with year primarily related to non-AHC performance in those years. For total margin, only AHC status by 2013 and 2015 were significant but with 2013 showing a higher margin

for AHCs. As noted, these results do not fully support hypothesis one and only partially support the expectations that were drawn from contingency theory. There may be other organizational or environmental factors that caused AHCs to have a different financial path compared to non-AHCs.

The results from hypothesis one contribute to the literature by providing a detailed analyses of the difference between AHCs and non-AHCs on performance, measured by operating and total margins at a descriptive level. The partial support of hypothesis one calls into question statements made by those who have suggested financial performance differences would be evident due to AHCs high costs and obligations (AAMC, 2018c; Grover, Slavin, & Willson, 2014; Koenig et al., 2003; Thier, 2001). Hypothesis two results further explored these relationships by incorporating additional variables in the analysis.

Hypothesis 2. AHCs will experience a larger negative impact on their operating and total margins after the implementation of HRRP and VBP when compared to non-AHCs.

Hypothesis two focused on expanding hypothesis one, through the inclusion of additional independent variables of combined rate (the net effect of HRRP penalties and VBP bonuses or penalties) AHC status, and year, along with various control variables that have been identified by previous research as strong predictors of hospital profitability. As opposed to hypothesis one, hypothesis two used year as a variable from the beginning, and not period. Hypothesis two was also based on contingency theory and expands on its use from hypothesis one through the inclusion of combined rate and AHC status, which are the primary contingencies of interest in this study, in an analysis

of operating and total margins. Hypothesis two focused on the interactions between year by AHC status and combined rate by AHC status.

The first part of hypothesis two measured the variables against operating margin. The most relevant result was AHC by year, showing that AHC status was only significant when evaluated for 2013 and 2015, a similar result from hypothesis one. This result along with the combined rate by AHC being insignificant did not support hypothesis two. Even though the interactions were not significant, the result for combined rate on its own does partially support previous research that had shown HRRP and VBP being significant factors affecting operating performance (Gu et al., 2014; Rice, 2015) with the variable combined rate being significant at a p= .0055. When plotting the least squared means for operating margin and year in Figure 8, it does show that there is a separate trend for AHCs and non-AHCs in the out years for 2014 and 2015. The figure and results from the first part of hypothesis two indicate that there may be organizational and environmental factors affecting these two hospital types but not the primary contingencies that this research question focused on.

In the next step, combined rate by total margin, showed a similar outcome to operating margin and combined rate with the years 2013 and 2015 being significant, although combined rate was insignificant with a p-value of less than .1. The result is not unexpected since total margin includes more funding sources to offset variations in operating performance. In this case, the other funding sources are able to offset potential financial performance reductions due to HRRP and VBP penalties. AHC status was still significant but again it depended on the years and it was insignificant when paired with the combined rate. Figure 9 shows AHCs performance increasing for 2013

but then sharply declining over time while non-AHCs show a steady growth in total margin over time. However, with insignificant results for the interactions these results again do not support hypothesis two and indicate that there may be some factors affecting profitability other than the contingencies investigated.

The other variables, with the exception of Medicaid expansion status and health system affiliation, were all significant. It is interesting that health system affiliation was insignificant, when it was significant with operating margin. This may be related to a hospital's ability to generate other funding. Under the total margin calculation, items such as contributions and donations, income from investments, and income from other services (such as food or rental of space) are captured, as opposed to operating margin. These additional revenues could rise to such a level that it offsets some of the financial benefits that are obtained through hospital affiliation. Hospital affiliation would primarily benefit patient revenues (through more favorably negotiated insurance contracts) and expenses (through reduced prices for goods and services), so the significance of the finding only for operating margin may not be uncharacteristic.

Hypothesis two's results support previous research that found HRRP and VBP had significant associations with hospital operating margin, but these studies typically also found that these programs had a significant correlation with total margin as well (Bazzoli, Thompson, & Waters, 2018; Gilman et al., 2015; Kahn et al., 2015). This study's findings may differ from others study's due to the use of different years and variations of variables of interest with this study focusing on AHCs.

Additionally, while other research has shown the importance of Medicaid expansion, this study found that it was not significant in any of the results. This was an

interesting result as previous research (Chen et al., 2017) has shown that the Medicaid expansion resulting from the Affordable Care Act was a significant factor when comparing operating margins for hospitals in states that had expanded Medicaid compared to those that had not in the Mississippi Delta region. The result of the analysis in Chapter 5 led to an interesting conclusion that Medicaid expansion is either not influential on operating and total margins or the measurement of the variable 'Medicaid expansion' coded as a 0/1 dichotomous variable failed to capture the intricacies that are evident in each state's individual circumstances as they expanded Medicaid. This is an opportunity for future research to understand what factors led to this result and how it conflicted with other studies.

Supplemental analysis for VBP and HRRP. The supplemental analysis focused on the importance of VBP and HRRP, individually, on operating and total margin.

VBP was analyzed first with the same variables on operating margin as hypothesis two. The findings showed that the significance levels of study variables were consistent in the models that used VBP only when compared to the model with the combined HRRP/VBP rate. For total margin, VBP was found to be significant on its own with a p-value of .0002, a departure from combined rate which had a p-value of .06. This may be due to the implementation of VBP occurring fully in 2013 without the same staging process that HRRP used.

As a strong departure from VBP, HRRP was insignificant for both operating and total margins when examined on its own. However, the interaction of HRRP and AHC had a p-value of .059 for total margin, which was under .1, indicating marginal

significance. The result is interesting as all other analyses have showed declining significance in the combined rate from the operating margin analysis (p-value.0055) to the total margin analysis (p-value .0601) and no other result showed a significant interaction between AHC and either the combined rate or the VBP.

The results of the supplementary analysis show that VBP had more of an impact on profitability when contrasted to HRRP with HRRP only showing a marginal significance when taken into account with AHC for total margin. Overall, the results continued to not support hypothesis two.

Review of the results. Based on the results from this study's analyses, hypothesis one is only partially supported and hypotheses two is not supported. The study has shown that the combined rate of HRRP and VBP and AHC status, individually, are important for operating and total margins but the interaction of HRRP and VBP with AHC status and year are not consistently significant. The results do support previous research that has shown other factors, such as hospital ownership status and HHI, are significant in determining a hospital's profitability from 2011 through 2015, with the exception of the Medicaid expansion variable. The results suggest that other organizational and environmental factors may be leading to differences in AHC versus non-AHC financial performance.

Managerial and Policy Implications of the Study

The findings of this study have managerial and policy implications. Each of these implications will be discussed briefly.

For leaders of all hospitals subject to HRRP and VBP, the biggest implication is that HRRP and VBP do impact their profitability, mainly operating margin. The results of

the study demonstrate that hospitals that are able to minimize HRRP penalties and maximize VBP bonuses can benefit financially. Another implication of this research is that HRRP and VBP are not equal when it comes to their impacts on operating and total margins. From the design of the two programs and based upon this study's findings, it is generalizable that the average hospital would benefit from working with the VBP program, maximizing their financial gain in comparison to HRRP. If a hospital has limited resources to address both programs to improve rates and outcomes, hospital leadership could be better off focusing on VBP. Leadership may also find that VBP is a much more flexible program, allowing hospitals to select metrics and compare their performance against either peer hospitals or their previous historical performance. For the hospital leader, this can take the form of eliminating or reducing adverse events, adopting evidence-based care standards, and/or changing the patients' care experiences for the better. The options are much more plentiful compared to HRRP and can be implemented at varying levels, allowing hospital leaders to tailor strategies that fit their current situations. HRRP does not afford the same benefits, as this program is a comparable program but penalizes hospitals specifically based upon their readmission rates.

An interesting implication of this study is that Medicaid expansion was not a significant factor affecting a hospital's margin. In many states that have yet to expand Medicaid, this may be a point of debate with state governments. Even if a state expands Medicaid, it does not necessarily translate to higher financial margins for hospitals. These findings may be the product of a loss of other supplemental operating funding as Medicaid is expanded. State governments may be reducing supplemental funding to

hospitals with the expectation hospitals will receive insurance payments that otherwise would not have existed prior to Medicaid expansion. With the effect of Medicaid expansion on profitability being unclear, governments should be cautious to remove other funding sources without understanding how Medicaid expansion affects AHCs and other high Medicaid population hospitals. Hospital management and policy makers should take all of these factors into account when addressing AHC funding.

The most important policy implication that this study addressed is that AHCs are different when it comes to operating and total margins. While this varies by year and is not related to HRRP and VBP, the results suggest that there are other factors that may be leading to AHCs being uniquely impacted when it comes to operating and total margins. Many view AHCs as a vulnerable group of hospitals, different from non-AHCs, and future policies should take this into consideration, perhaps providing more time for them to adjust to changing practices and policies.

Comments on Contingency Theory

Contingency theory was developed to explain why organizations are structured in certain ways, and how those organizations' structures will change to meet shifting contingencies and maintain a high level of fit in their environment. In this study, contingency theory was employed to explain how HRRP and VBP could affect fit of hospitals, as measured by total and operating margins, from 2011 through 2015, and explain why some hospitals would perform better over that time than others. The main contingencies of AHC status and combined HRRP and VBP rate were used, along with covariates of competitiveness, health system affiliation, Medicaid expansion, and ownership structure. While the study did not support the ways that HRRP and VBP were

hypothesized to impact AHCs over time, there were instances of year by AHC being significant and the study did show that AHCs were different from non-AHCs independently from other control variables.

Based on this study's use of contingency theory, it was hypothesized that as a hospital's environment changes, and its contingencies change, this would lead to a differential effect for AHCs when compared to non-AHCs. The results shown in Figures 8 and 9, plotting least squared means, were the most supportive of contingency theory showing that the performance of the two hospital groups did diverge from 2013 through 2015. However, the study failed to demonstrate that the two specific contingencies under study (i.e., AHC status and the HRRP and VBP programs) might be the cause of this divergence.

One lesson that was learned from the use of contingency theory in this study is that it is important to incorporate data on organizational structures that may lead to improved fit and measures of prior performance. This study did incorporate the prior performance measures, which was noted by Donaldson (1995) as being a key issue in that many prior studies failed to incorporate this into their analysis. By including prior performance, this study was able to control for multiple determinants of performance that may not have been directly observed otherwise.

However, since this study focused primarily on the difference in financial performance over time it did not have, and thus, did not include, variables that would lead to the explanation of how, or what, changed within the structures of the organizations. This limitation of excluding key variables is another criticism of Donaldson (2001). A recommendation to cope with this common issue is to

development of a composite measure of fit in contingency theory studies. Although this study attempted to assess fit for each contingent pairing individually, a composite measure of fit is more likely to explain differences in organizational performance (Drazin & Van de Ven, 1985). As mentioned earlier, the addition of composite measure might be more appropriate for future research to better understand how organizations responded to changes in contingencies.

Study Limitations

Missing data was the largest limitation in the study. As outlined in Chapter 4, reductions in the overall study sample were required due to missing structural data, along with missing financial data. This is a limitation that other studies have encountered, and will continue to encounter, unless the submission and review of data are addressed at CMS and American Hospital Association. This study is confident in its use and analysis of the available data, even with the missing data, as other research has used these data and they are recognized across this type of research as acceptable data sources. A disproportionate amount of missing data in 2015 is a concern, but was expected, as data are still being collected and approved in CMS. Future research should include more complete 2015, data and additional years, to understand if the trends, overall, are in fact trends, or products of missing data.

Another potential limitation of this study is measurement error in the reporting of study variables. This should have a minimum impact on the study data since there were a significant number of variables, and one of the key variables under study was based on a simple classification structure of group membership (i.e., hospital AHC status) with

minimum potential impact of incorrect data being reported. Additionally, the results, with the exception of Medicaid expansion, are in line with what other studies have found.

A limitation that was addressed in the additional analysis of hypothesis one was the use of a simple indicator for period 1 versus period 2 for the HRRP/VBP analysis. This limitation generated misleading results that did not tell the whole story when comparing AHCs to non-AHCs over the two periods. The additional analysis using year indicators provided more insight into the performance of AHCs over the study period, and resolved this limitation, along with analysis used for assessing hypothesis two.

Suggestions for Future Research

The most important suggestion for future research is to better understand what organizational changes lead to differential hospital financial performance over time. The assumption was made, based on contingency theory, that if the margins improved, organizational structures must have changed, as the primary contingencies of interest (i.e., AHC status) did not change. There is a large opportunity, and the potential for qualitative and quantitative analysis to understand why some hospitals improved, while others did not. As mentioned above, composite measures of fit have been used in other research to examine changes in an organization. The incorporation of a composite measure could help to further understand what caused the two different financial paths of these hospitals. A composite measure could be developed to include other characteristics that might have changed, such as leadership, quality improvement initiatives, or other institutional and environmental changes.

Outside of contingency theory, this study failed to identify the key variables that lead to variations between AHC and non-AHC operating and total margins. A data book

produced by MedPAC (2018) showed similar findings between teaching and non-teaching hospitals with major teaching hospitals showing a downward trend after 2013 through 2016 compared to non-teaching hospitals on total all-payer margin. The data book did not provide an explanation for these differences in performance. Any suggestion as to the cause of these differences would be speculative in nature at this point, other than high-level causes such as the Affordable Care Act and/or improvement in the overall economy. A key activity for future research would be to break down financial margins into their component parts to better understand the trends over time. Financial margins combine revenue and expense performance, but as an aggregated measure, do not allow one to understand how these two components are changing relative to one another. The difference in performance for AHCs might lie with expense performance (AHCs being less able to control costs relative to non-AHCs) or revenue performance (non-AHCs being more able to generate revenues relative to AHCs). Exploring trends in revenues and expenses for AHCs and non-AHCs would be the next logical step in trying to determine why these hospital organizations had differential financial paths over the period of study.

Future research should also determine what happened to total margin in 2013 for AHCs (Figure 9). AHCs saw a significant spike but there did not seem to be a contributing factor that explained that spike. There are opportunities to investigate the AHCs that experienced this type of financial improvement to further research the cause for the change and the cause for the steep decline in 2014 and 2015.

Finally, the results of the study found contradicting results when applying Medicaid expansion as a variable. Other research, namely Chen et al. (2017), has

found Medicaid expansion to have a significant effect on hospital profitability, but under each analysis and supplementary analyses in the study, Medicaid expansion continued to be insignificant. Future research could expand on this concept, especially looking at the extent of Medicaid enrollment increases in different states to better understand the influence of Medicaid expansion on hospital operating and total margins.

Conclusions

The study was designed to investigate the difference between AHC and non-AHC profitability, as measured by operating and total margins, from 2011 through 2015, during the implementation of HRRP and VBP. The study proposed two main hypotheses: 1) that there would be a difference between AHCs and non-AHCs from period 1 (pre-HRRP and VBP) and period 2 (post-HRRP and VBP), and 2) that there would be a differential effect on financial margins between AHC and non-AHCs from 2011 through 2015, related directly to the combined rate of HRRP and VBP, while controlling for other variables. The results of the study only partially supported hypothesis one when the period indicator was replaced by yearly indicators, showing that there was a difference in profitability only in 2013 and 2015 between AHCs and non-AHCs. The second hypothesis was not supported when evaluating hospitals on AHC status and the combined rate. For both operating and total margins, AHCs were not impacted differentially from non-AHCs on combined rate and only differed in 2013 and 2015 on both operating and total margins. These results suggest that there is something else affecting AHC profitability other than differential effects from HRRP and VBP penalties. The supplemental analysis showed that VBP had significant impacts on

operating and total margins, while HRRP was only marginally significant when factored with AHC for total margin.

The results have both managerial and policy implications. The managerial implications are important for hospital leadership, showing that HRRP and VBP are important factors when understanding their operating and total margins. Other managerial implications were that Medicaid expansion did not appear to be correlated with higher margins. Prior to state governments reducing subsidies for hospitals that serve low income or indigent populations, they should review the effect Medicaid expansion has had on hospital profitability.

The study did have some limitations that are prevalent in this type of research, such as missing data and outliers. The study spent considerable time reviewing the missing and outlier data characteristics, and concluded that the final sample was representative of the total group of hospitals of interest to the study. The large sample size allows for the generalizability of the study for this study's results to urban US based hospitals that were subject to HRRP and VBP. A limitation that should be reviewed and re-analyzed in the future relates to the incomplete nature of the 2015 financial data for this study, and the various levels of missing data. These are a product of the timing of the study, and with time, the missing data should be remedied. Future research could reexamine the 2015 missing data and also investigate what occurred in 2013 to cause such a large spike for AHCs related to total margin. The insignificance of Medicaid expansion in this study should be reviewed as well since the findings from the study are counter to what other research has found, and thus, worth further exploration. Finally, future research can focus on the hospital characteristics related to structure to better

understand what changed and how that influenced operating and total margins, over time. This type of research would lend itself well to qualitative study and working with select hospitals to understand changes over time.

Overall, this study addressed the question of whether VBP and HRRP affected AHCs differently from non-AHCs over the period of 2011 through 2015. While the results did not support the hypotheses, the study's findings did suggest that there is something organizationally or in the environment that might be affecting AHCs differently from non-AHCs. The results suggest that future research should be conducted to better understand how internal and external factors might be affecting AHCs differently from non-AHCs so that AHCs may continue to be financially viable and serve in their unique position in U.S. healthcare.

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