Access to Capital and Multihospital System Membership in the U.S. Hospital Industry

by

Nathaniel W. Carroll

A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
(Health Services Organization and Policy)
in The University of Michigan
2014

Doctoral Committee:

Professor Dean G. Smith, Co-Chair
Emeritus Professor John R.C. Wheeler, Co-Chair
Associate Professor Catherine Shakespeare
Assistant Professor Simone R. Singh

To my wife,
Thank you for your love and support.

Acknowledgements

I would like to express my appreciation to my dissertation committee for their time and guidance. My co-chairs Jack Wheeler and Dean Smith were instrumental in helping me take rough ideas and refine them into researchable questions. Throughout my graduate career they have provided me with valuable advice and guidance. Thanks are also due to my committee members Cathy Shakespeare and Simone Singh. Cathy offered many excellent suggestions and a fresh perspective that greatly improved my work. Simone has been a constant source of invaluable advice from the time I applied to the doctoral program through my defense. She has spent far more time than she had to helping me learn about research, teaching and the job market and for this I am especially grateful.

Thanks are also due to everyone that has provided me with opportunities to fund my graduate education. Fellowships from the Agency for Healthcare Research and Quality gave me the time I needed to expand my understanding of methods and financial theory. Jeff Kullgren and Edward Norton for provided me with research assistant opportunities that supported me financially while also giving me the opportunity to learn from their examples. I would also like to thank the Robert Wood Johnson Foundation for employing me as a research assistant and the Department of Health Services Organization and Policy for its role in helping fund my doctoral work.

This dissertation would not have been possible without the individuals and organizations that helped me gain access to the data I needed including John Griffith, Daniel Lee, Merle Ederhoff, the CMS Flex Monitoring Team and Rackham Graduate School.

I would also like to thank my friends and colleagues in the HSOP program. The members of my dissertation groups--especially Joel Segel, Sayeh Nikpay, Morgen Miller and Adam Wilk—have given me a great deal of truly valuable feedback. Working with this group to refine ideas has made me a more rigorous researcher and a better academic. Journal club members Joel Segel and Will Story provided me with camaraderie, fellowship, and a chance to enjoy some of Michigan's finest beverages.

None of this would have been possible without the love and support I received from family and friends. I would like to thank my in-laws, Dave and Barbara Beck for their support and for allowing me to take daughter to Michigan. I am also deeply indebted to Maha Hazou. Each day when I dropped off Cooper and Amelia Grace at her house I had the assurance that my children were being cared for by a smart and capable woman who loves them deeply. I have benefited greatly from Maha's advice and have enjoyed her company immensely.

I cannot adequately express the amount of gratitude I have for my family. For as long as I can remember my father has been an example of everything that a teacher, researcher, father and husband should be. I would be lucky to have half of his success in any of these roles. For my entire life my mother has sacrificed to support my education. She is a model of wisdom and organization, and I have learned so much from her example. During my time in Michigan I could always count on a text or email from my sister to make me smile. I wish she lived closer. Finally, my grandparents' calls and prayers were a constant encouragement to me throughout my graduate studies.

Most importantly, I would like to thank my wife and children. Melissa worked with diligence and grace to create a warm home while excelling at work. During the past five years she has helped me to work when I needed to and encouraged me to stop working when it was time for a break. I could not ask for a better partner. Thanks also to Cooper and Amelia Grace, for their love, for helping me to have more fun than I would alone, and for reminding me to focus on what is really important.

Table of Contents

List of Tables

List of Figures

Abstract

Many have predicted that the U.S. hospital industry will become increasingly consolidated in the coming years, as independent hospitals join large multihospital systems. Independent hospitals joining systems often expect system membership to result in benefits including improvements in the quality of care provided, the efficiency of hospital operations and the hospital's access to capital to fund investment. Prior research has examined the effects of hospital system membership on quality and efficiency but has failed to examine how system membership affects hospitals' access to capital. The three studies that make up this dissertation address this gap in the literature by exploring the effects of system membership on a hospital's internal capital (cash) management, its external capital (debt) management and its capital investment behavior. All three studies estimate the effects of system membership using a difference in differences study design and a sample of independent hospitals acquired by multihospital system between 1997 and 2008. Financial data come from hospitals' Medicare Cost Reports.

The first study examines the effects of system membership on not-for-profit hospitals' cash holdings. This study tests the possibility that system membership enables not-for-profit hospitals to reduce the size of these reserves and, in doing so, frees up internal cash to fund real investment. The results suggest that system membership does not cause large reductions in acquired hospital cash balances.

The second study explores the effects of system membership on not-for-profit hospitals' ability to access debt markets. The results show that low-leverage acquired hospitals increase debt holdings more than a set of control hospitals identified through propensity score matching. These results are consistent with the idea that some independent hospitals have challenges accessing debt capital and that system membership helps affected hospitals overcome these challenges.

The final paper looks at the capital investment behavior of acquired hospitals as a way of determining whether or not system membership improves acquired hospitals' access to capital. Ordinary least squares regression estimates suggest that acquired hospitals experience a temporary increase in capital investment in the years immediately following acquisition. However, this increase is largest for hospitals that have relatively newer physical plants in the pre-acquisition period.

Chapter 1

Introduction

One of the most prominent changes in the hospital industry in the past 30 years has been the increase in the proportion of hospitals operating as part of a multihospital system. Currently over 60% of hospitals are members of a multihospital system. (Health Forum, 2013) Merger and acquisition activity within the hospital industry has risen since 2009 and many believe the industry is preparing for further consolidation. (PWC, 2013; Wong-Hammond & Damon, 2013) Health services researchers have devoted significant effort to studying the effects of consolidation within the hospital industry. However, much of this effort has addressed consolidation in the form of single-market hospital mergers or hospital conversions from not-for-profit (NFP) to investor ownership rather than the effects of independent hospitals joining systems. (Cuellar & Gertler, 2003) Moreover, the research that has addressed the effects of system membership focuses on the effects of system membership on quality outcomes (Madison, 2004), hospital prices (Melnick & Keeler, 2007), or operational efficiency (Dranove, Durkac, & Shanley, 1996; Dranove & Lindrooth, 2003). While these are all important outcomes, system membership may also cause changes in the financial management of hospitals. In particular, many hospitals joining systems claim that they expect system membership to improve their access to capital. However, the effects of system membership on a hospital's ability to access financial capital have received little attention from researchers.

Now more than ever hospitals managers are focusing on access to capital and ways to improve financial management practice. In the past 20 years financial management has become a much larger part of hospital managers' responsibilities. Prior to 1983 hospital administrators bore little financial or operational risk because Medicare and many other payers reimbursed hospitals for the full cost of providing services and making capital investments. However, cost-based reimbursement for hospital services ended in 1983 and cost-based reimbursement for capital expenses was phased out between 1992 and 2002. As a result hospitals administrators became responsible for managing the risk associated with capital investments. Because of these changes, securing financing has become challenging for many hospitals. Some hospitals are not generating sufficient internal capital to fund important projects (HFMA and PricewaterhouseCoopers, 2004) and many hospitals face declining bond ratings and difficulty accessing debt markets. (American Hospital Association, 2013b; HFMA and PricewaterhouseCoopers, 2003) Not-for-profit hospitals have faced the greatest barriers to capital access because these hospitals do not have access to equity markets and equity from philanthropic donations is negligible for most hospitals. (Smith, Wheeler, Rivenson, & Reiter, 2000) Challenging debt market conditions and limited access to equity financing make access to capital a problem for many NFP hospitals.

While some hospitals face limited access to capital, the hospital industry as a whole has experienced relatively high demand for investment to replace aging facilities, expand specialty services and to pursue investments in health information technology. (American Hospital Association, 2013a; Bazzoli, Gerland, & May, 2006; HFMA and PricewaterhouseCoopers, 2004) Independent NFP hospitals that have struggled to gain access to capital have been advised by hospital managers, consultants and the trade press to consider joining multihospital systems.

(Ault, Childs, Wainright, & Young, 2011; Cali & Quinn, 2013; Carlson & Galloro, 2009; Dunn, 2013; Galloro & Tieman, 2002; Kaufman Hall and Associates, Inc., 2010) Unfortunately, little is known about whether multihospital system membership does improve access to capital and, if so, how this occurs.

Conceptual justifications for differences in the cost of capital

Despite widespread belief that system membership can improve access to capital, theoretical justifications for why a hospital's cost of capital should decline when it joins a system are rare. Still, financial theory and some prior work suggest a few reasons internal and external capital may be more available to system hospitals than to independent hospitals. For NFP hospitals, internal capital comes primarily from stores of cash and financial investments. These accounts are held not only to fund investment in physical assets, but also to fund transactions and as a precaution against unexpected cash shortfalls. (Rivenson, Reiter, Wheeler, & Smith, 2011) System membership may increase available internal capital by "freeing up" some cash held for precautionary or transaction purposes to be used for investment. This could occur if system membership allowed a hospital to lower the optimal level of cash on hand. Lower optimal levels of cash holdings would result if system membership allowed hospitals to take advantage of economies of scale in cash management or to reduce the volatility of cash flows. (Opler, Pinkowitz, Stulz, & Williamson, 1999)

System membership can also affect access to NFP hospitals' primary source of external capital—debt markets. Wedig et al (1998) observe that the cost of capital for NFP hospitals increases with leverage because NFP hospitals have difficulty raising equity capital and managers are averse to the risks associated with increased leverage. Wedig et al assert that the

increase in the cost of capital is likely to occur at lower leverage for independent hospitals than system-affiliated hospitals. The authors justify their claim, reasoning that because hospital systems can spread risk across all of the system's hospitals, those hospitals should be able to take on more debt that independent hospitals. System hospitals may also borrow larger amounts than independent hospitals and in doing so, reduce the proportional transactions costs of borrowing. System hospitals may also have more of the managerial expertise required to access debt markets than independent hospitals.

System membership may change an independent hospital's cost of capital by improving access to external debt markets, by freeing up internal cash reserves, or through other changes in financial management. System membership could affect the management of internal and external capital separately as described above. However, the effects of system membership on the two kinds of capital could also be related. For instance, improved access to debt markets may reduce a hospital's optimal level of cash holdings, freeing some cash for investment.

Effects of differing costs of capital

Regardless of the mechanism by which a change in the cost of capital occurs, the result should be an increase in the amount of capital expenditure a hospital undertakes. Accepting the modest assumption that the returns on a hospital's capital investment opportunities are declining as total investment increases, a reduction in a hospital's cost of capital should cause the hospital to pursue additional capital investment since more projects will offer returns sufficient to compensate for the reduced cost of borrowed capital. It is important to note, however, that system membership is likely to affect other factors related to capital expenditures, either by

creating new investment opportunities or by changing the expected cash flows associated with existing opportunities. Changes in capital investment associated with system membership could be driven by a changing cost of capital or by these changes in factors affecting investment demand.

Empirical evidence on system membership and the cost of capital

There is relatively little research that examines differences in access to capital between system-affiliated and independent hospitals directly. Two exceptions include Calem and Rizzo (1995) and Sloan et al (1988). The first paper finds evidence that capital investment is more sensitive to cash flow for independent hospitals than for system hospitals, suggesting that system hospitals are better able to raise external financing than independent hospitals. However, differences in investment-cash flow sensitivity could also be the result of cash management policies that differ between independent and system-affiliated hospitals. Results from the Sloan et al (1988) paper suggest that independent and system-affiliated hospitals do not differ in their ability to attract external capital. They compare interest rates on debt issued by independent hospitals and hospital systems and find only minor differences in the cost of debt to each type of NFP hospital. However, these results are limited in that they are not conditional on factors affecting creditworthiness and they are based on hospitals that successfully issued debt. The results may not be representative if independent hospitals are more likely to be denied credit or to be offered interest rates that are so high they forgo a debt issue. Both studies are of limited generalizability because they rely on data from before the end of cost-based reimbursement for capital.

In addition to research that directly examines the effect of system membership on the cost of capital, several studies examine debt management, cash management and capital investing practices. If differences in these financial management practices helped system hospitals to enjoy improved access to capital, I would expect to see system hospitals holding less cash and greater amounts of debt than independent hospitals, while investing more in capital expenditures than independent hospitals. Previous research suggests that systems as a whole hold less cash than independent hospitals and that system-affiliated hospitals hold less cash than independent hospitals (McCue, Thompson, & Dodd-McCue, 2000; Rivenson et al., 2011). Debt levels among system hospitals are larger than those among independent hospitals, even after controlling for many factors that affect a hospital's leverage. (Gentry, 2002; Wedig et al., 1998) However, prior research has not found an association between system-affiliation and higher capital spending levels. (Kim & McCue, 2008; Reiter, 2004) Thus there is some evidence that financial management of internal and external capital differs between system-affiliated and independent hospitals, but there is no evidence that these differences enable system hospitals to enjoy higher levels of capital expenditures. It is important to note that these studies use cross sectional observations and the differences they detect could be effects of system membership or they could arise because hospital systems selectively acquire independent hospitals able to maintain lower cash balances and higher leverage. Moreover, the studies of debt and capital investment are not primarily concerned with detecting differences in system and independent hospitals' financial management and only include system membership as a constant control variable. If the effects of system membership are complex or only occur for a subgroup of hospitals, the effect might not be captured using the models employed in these papers.

Scope of dissertation

This dissertation will determine whether there are changes in the financial management practices of acquired hospitals that are consistent with the idea system membership can improve an independent hospital's access to capital. The dissertation will consist of three papers that examine changes in cash management, debt management and capital investment behavior. These papers will answer the following questions:

1. When an independent NFP hospital joins a multihospital system are there changes in the hospital's cash holdings?
2. Does leverage change for NFP hospitals that join systems. In particular, do highly-levered hospitals increase their debt holdings?
3. Does the level of capital investment increase when an independent hospital joins a multihospital system. If so, when do these changes occur relative to the time of acquisition?

Chapter II will examine hospitals' cash management practices. Cash holdings are particularly important for NFP hospitals' capital access because they fund capital expenditures directly and indirectly, as collateral used to insure future access to debt markets. Independent NFP hospitals also hold large cash reserves. If the factors that cause independent hospitals to hold large cash reserves change with system membership, optimal cash balances for acquired hospitals could decline. Managers would be freed to use excess cash holdings to fund capital investment. This paper will examine whether independent an hospital's cash holdings decline

after the hospital joins a system, and whether these changes are consistent with a decline in optimal cash holdings that frees cash reserves for use funding capital investments.

Chapter III will examine management of a key source of external capital for NFP hospitals--debt. Some prior work suggests that systems have better access to debt markets than independent hospitals. This could be because hospital systems better understand how to interact with debt markets than independent hospitals or because the fixed transactions costs of borrowing make borrowing relatively cheaper for systems than for smaller, independent hospitals. If system membership has these beneficial effects, acquired hospitals that are under-levered should be able to increase their debt holdings while over-levered hospitals can maintain debt holdings. This paper will examine changes in leverage for both low-levered and highly-levered independent hospitals that join systems.

Chapter IV will examine how the level of capital investment changes for independent hospitals that join multihospital systems. Prior research and the trade press suggest that independent hospitals can join multihospital systems to improve their access to capital. If the availability or cost of capital declines we would expect hospitals to increase their levels of capital investment. This paper will examine whether independent hospitals that join systems increase their capital expenditures.

Sample

Each paper uses a similar sample of acquired hospitals to examine the effects of system membership. Unfortunately, there is not a comprehensive dataset of hospital transactions available and identifying independent hospitals that joined systems is challenging. To overcome this challenge a two-step procedure was used to identify independent hospitals that joined

systems. First, data from the American Hospital Association (AHA) annual survey for the years 1996-2009 were analyzed to identify changes in a hospital's system status. Cases were identified in which a hospital was not classified as the member of a hospital system, then, in the next year, the hospital was classified as a system member. This yielded a list of 519 potential transactions in which an independent hospital appeared to join a system. However, in researching some of these transactions it became apparent that a system membership change did not occur as indicated by the AHA data. To resolve this, three other sources of information on hospital transactions were consulted. The first source is the annual list of hospital mergers and acquisitions published by *Modern Healthcare.* The second source of information on hospital consolidation are the Hospital Acquisition Reports published by Irving Levin and Associates. If neither the *Modern Healthcare* lists nor the Hospital Acquisition reports contained a record of the transaction, the hospital's webpage and online news sources were used to search for evidence a transaction had taken place. If none of these attempts yielded confirmation that the transaction occurred the hospital was eliminated from the sample. Hospitals without confirmed transactions were eliminated from the sample for several reasons. First, some hospitals with unconfirmed transactions clearly listed a system affiliation on their webpages but did not offer information about the date on which they joined a system. In these cases it was impossible to assign a system status to each hospital year since only the current system status was known. In other cases, the hospital websites did not contain information about a system affiliation. However, some hospitals with confirmed system affiliation do not prominently display their affiliation on their websites so the lack of information about system-affiliation is not adequate justification for classifying these hospitals as independent. Hospitals that joined a multihospital system and then left the system a few years later were excluded from the sample as well. These hospitals were

excluded because they may have experienced challenges integrating into the system or they may not have been affiliated with the system for long enough to experience improvements in access to capital. The papers in this dissertation seek to determine whether system membership can improve capital access for acquired hospitals. As a result, the sample includes hospitals most likely to have realized these improvements. This is why hospitals that move in and out of systems during the study period are not included in the sample. Future research will be needed to estimate how frequently acquired hospitals do experience improvements in access to capital. Ultimately this method identified 219 hospitals whose acquisitions could be confirmed. The actual samples used in each paper are smaller because they are limited to subpopulations of acquired hospitals for which an effect is most likely.

System vs. independent hospital motivations for acquisition

This dissertation focuses primarily on the motivation for independent hospitals to join multihospital systems. In particular, each of the papers take steps to identify the sub-sample of acquired hospitals most likely to experience increases to access to capital. However, it is important to acknowledge that acquiring systems have their own motivations for acquiring independent hospitals. It is possible that some hospital systems acquire hospitals with the goal of helping to improve those hospitals' access to capital, enabling the acquired hospital to make investments it could not otherwise make, and then sharing in the profits those investments create. However, more often systems are pursuing other motives through acquisition. In some cases the acquiring system could be motivated by the desire to increase its market power. In others the system may want to expand its geographic reach, to acquire a competitor or to acquire a hospital the system believes is poorly run which offers opportunities to improve efficiency and cash flow.

Ideally, research on the relationship between hospitals and access to capital would develop measures to identify hospital systems most likely to improve acquired hospitals' access to capital. This dissertation makes an effort to include only hospital systems most likely to improve access to capital in acquired hospitals by eliminating hospital systems consisting of only one or two hospitals from the sample. Hospitals acquired by these small systems are the least likely to see improvements in access to capital. The AHA definition of system membership includes hospitals that are owned, leased or contract managed by a central organization Hospitals that entered systems only through contract management agreements are eliminated from the sample of acquired hospitals since contract management is not a form of system membership likely to lead to changes in access to capital. Hospitals that enter systems through lease agreements would be unlikely to experience changes in access to capital if the term of the lease was short. Most of the lease terms reported were longer than 20 years so hospitals that joined systems through lease agreements were included in the sample of acquired hospitals. However, restricting the sample of acquired hospitals based on system size and the form of system membership are only two of many possible system characteristics that could affect a system's willingness and ability to improve an acquired hospital's access to capital. Future research in this area could use more sophisticated strategies for identifying systems likely to improve access to capital among the hospitals they acquire.

Despite the dissertation's focus on characteristics of acquired hospitals (rather than acquiring systems) likely to lead to improvements in access to capital, the three papers that comprise this dissertation provide a fuller understanding of how system membership affects acquired hospitals' management of internal and external capital, as well as hospitals' capital investment decisions. In doing so, these papers provide a better understanding of whether or not

system membership can improve an independent hospital's access to capital. The results will be of interest to hospital boards, hospital managers, and policy makers, all of whom need a clear understanding of the financing benefits associated with system membership.

References

American Hospital Association. (2013a). *Fundamental transformation of the hospital field.*

American Hospital Association. (2013b). *Trendwatch chartbook 2013: Trends affecting hospitals and health systems.* (No. 4).

Ault, K., Childs, B., Wainright, C., & Young, M. (2011). Relevant factors to consider prior to an investor-owned acquisition of a nonprofit healthcare entity. *Journal of Healthcare Management, 56*(4), 269-80; discussion 280-1.

Bazzoli, G. J., Gerland, A., & May, J. (2006). Construction activity in U.S. hospitals. *Health Affairs (Project Hope), 25*(3), 783-791.

Calem, P. S., & Rizzo, J. A. (1995). Financing constraints and investment: New evidence from hospital industry data. *Journal of Money, Credit and Banking, 27*(4), 1002-1014.

Cali, B., & Quinn, C. (2013). A new tool for system building. *Healthcare Financial Management,* , 72.

Carlson, J., & Galloro, V. (2009). M&A: An upside to a down market. *Modern Healthcare, 39*(3), 22-31.

Cuellar, A. E., & Gertler, P. J. (2003). Trends in hospital consolidation: The formation of local systems. *Health Affairs, 22*(6), 77-87.

Dranove, D., Durkac, A., & Shanley, M. (1996). Perspective: Are multihospital systems more efficient? *Health Affairs, 15*(1), 100-104.

Dranove, D., & Lindrooth, R. (2003). Hospital consolidation and costs: Another look at the evidence. *Journal of Health Economics, 22*(6), 983-997.

Dunn, L. (2013). To merge or not to merge: Benefits, challenges and the future for stand-alone hospitals Retrieved, 2013, Retrieved from http://www.beckershospitalreview.com/hospital-transactions-and-valuation/to-merge-or-not-to-merge-benefits-challenges-and-the-future-for-stand-alone-hospitals.html

Galloro, V., & Tieman, J. (2002). Hitting the brakes. *Modern Healthcare, 32*(2), 22.

Gentry, W. M. (2002). Debt, investment and endowment accumulation: The case of not-for-profit hospitals. *Journal of Health Economics, 21*(5), 845-872.

Health Forum, L. (2013). Fast facts on US hospitals. Retrieved, 2013, Retrieved from http://www.aha.org/research/rc/stat-studies/fast-facts.shtml

HFMA and PricewaterhouseCoopers. (2003). *Financing the future report 1: How are hospitals financing the future? Access to capital in health care today.*

HFMA and PricewaterhouseCoopers. (2004). *Financing the future report 3: how are hospitals financing the future? the future of capital spending.*

Kaufman Hall and Associates, Inc. (2010). *A guide to financing strategies for hospitals with special consideration for smaller hospitals.* American Hospital Association.

Kim, T. H., & McCue, M. J. (2008). Association of market, operational, and financial factors with nonprofit hospitals' capital investment. *Inquiry, 45*(2), 215-231.

Madison, K. (2004). Multihospital system membership and patient treatments, expenditures, and outcomes. *Health Services Research, 39*(4p1), 749-770.

McCue, M. J., Thompson, J. M., & Dodd-McCue, D. (2000). Association of market, mission, operational, and financial factors with hospital's level of cash and security investments. *Inquiry - Blue Cross and Blue Shield Association, 37*(4), 411-22.

Melnick, G., & Keeler, E. (2007). The effects of multi-hospital systems on hospital prices. *Journal of Health Economics, 26*(2), 400-413.

Opler, T., Pinkowitz, L., Stulz, R., & Williamson, R. (1999). The determinants and implications of corporate cash holdings. *Journal of Financial Economics, 52*(1), 3-46.

PWC. (2013). *US healthcare M&A insights annual report.*

Reiter, K. L. (2004). *Investment, financing, and liquidity constraints in not-for-profit hospitals.* (Unpublished PhD). University of Michigan,

Rivenson, H., Reiter, K., Wheeler, J., & Smith, D. (2011). Cash holdings of not-for-profit hospitals. *Journal of Health Care Finance, 38*(2), 24-37.

Sloan, F. A., Valvona, J., Hassan, M., & Morrisey, M. A. (1988). Cost of capital to the hospital sector. *Journal of Health Economics, 7*(1), 25-45.

Smith, D. G., Wheeler, J. R., Rivenson, H. L., & Reiter, K. L. (2000). Sources of project financing in health care systems. *Journal of Health Care Finance, 26*(4), 53-58.

Wedig, G., Hassan, M., Van Horn, R., & Morrisey, M. (1998). Hospital affiliation and capital structure: How will capital markets guide health care restructuring? *Journal of Public Budgeting, Accounting Financial Management, 10*(3), 413.

Wong-Hammond, L., & Damon, L. (2013, March 2013). To remain Independent—or not? strategies for assessing future positions. *HFM,* Retrieved from http://www.hfma.org/Content.aspx?id=15901

Chapter 2

Cash Reserves and System Membership: Does System Membership Improve Not-For-Profit Hospitals' Access to Internal Capital by Reducing Optimal Cash Balances?

Introduction

Hospitals are currently facing regulatory and market forces that make capital expenditures critical. These include new investments in information technology systems needed to improve clinical quality, to take advantage of payer incentives to use this technology and increasingly to avoid financial penalties for failing to use this technology. (American Hospital Association, 2013) Capital investment has also been linked to the quality of clinical care hospitals provide (Levitt, 1994) and a hospital's ability to compete with other hospitals in its market (Byrd & McCue, 2003). However, as capital needs have increased many independent hospitals have found raising capital difficult. (American Hospital Association, 2013; Carlson & Galloro, 2009) In particular, many independent not-for-profit (NFP) hospitals claim they have difficulty finding funding for capital investment. These hospitals maintain large stocks of financial assets that could easily be liquidated to fund capital investment needs (Gentry, 2002; Song & Reiter, 2010), but this course of action is seldom if ever recommended to hospital executives. Instead, hospitals seeking access to capital are frequently advised by consultants and industry experts to join multihospital systems as a way to improve access to capital. (Ault, Childs, Wainright, & Young, 2011; Janiga & Muller, 2013) However, little is known about how

system membership affects a hospital's ability to access capital markets and which characteristics of system membership are responsible for improving an acquired hospital's access to capital. This paper will examine the possibility that system membership improves access to capital by allowing independent hospital to hold fewer financial assets in reserve and to use a portion of their existing reserves for capital investment.

Finance theory suggests that independent NFP hospitals have a unique set of organizational and financial market characteristics that lead them to hold large investments in financial assets rather than using these funds as a source of capital. These financial assets include cash holdings as well as short-term investments in financial securities. (Throughout the rest of the paper both of these categories of financial securities will collectively be referred to as "cash" because of their liquid nature.[1]) It is possible that system membership alters these characteristics in ways that allow hospitals to reduce their cash balances. As a result, acquisition by a system may allow some hospitals with large cash holdings to use some of their cash to fund real investment. "Freeing up" cash and other financial assets in this way is one way that system membership could improve access to capital for acquired hospitals. The amount of capital available from "freed up" internal cash reserves is potentially large because NFP hospitals hold large stores of financial assets. From 1997-2006 NFP hospitals held an average of 21% of their assets in cash or financial investments while investor-owned hospitals held only 4% of their assets as cash or financial investments. (Song & Reiter, 2010) Even NFP hospitals with negative profits held 15% of their assets as cash or securities. Moreover, analysis of Medicare Cost Report data suggests NFP hospitals affiliated with multihospital systems hold smaller stores of cash and financial investments than independent NFP hospitals. Not-for-profit hospitals have

[1] Rivenson et al (2000) examine different ways to conceptualize NFP hospitals' liquid asset holdings and finds that hospitals holding large cash balances also tend to hold large stores of other liquid financial assets.

sizeable investments in financial assets. If system membership reduces the optimal level of financial assets NFP hospitals should hold, acquired hospitals' financial investments should be a ready source of internal capital to fund real investment opportunities.

Understanding the financing benefits of system membership and how these benefits are achieved is important. If system membership allows a hospital to shift its asset structure and reduce its holdings of cash (an asset that produces a relatively low return) to make investments in real assets (that produce a higher return), this would greatly increase the efficiency of the hospital's financial management. However, the costs of system membership can be large for independent hospitals. These costs include a loss of autonomy and community control, transactions costs associated with the system acquisition (Herman, 2014; Mitrakos, 2012) and possible increases in the prices of hospital services to the community. (Melnick & Keeler, 2007) Moreover, there is reason to believe system membership may not affect acquired hospitals' access to capital at all. Systems are likely motivated to acquire hospitals for reasons other than their desire improve the acquired hospital's access to capital. Acquiring systems may be motivated by the idea that an acquisition is "a good deal" because the cost of acquiring a hospital is lower than the revenues the hospital will produce, or by the desire to realize economies of scale (though there is little evidence these benefits are realized (Burns & Pauly, 2002; Dranove, Durkac, & Shanley, 1996; Dranove & Lindrooth, 2003; Sloan, Conover, & Ostermann, 2003). Many of these objectives can be achieved even without a change in optimal cash holdings that frees up cash reserves for investment in real assets. Moreover, system acquisition is not likely to reduce cash holdings for all acquired hospitals. Despite the relatively large cash holdings most independent NPF hospitals maintain, some acquired hospitals join systems precisely because they are facing financial distress and have minimal cash holdings. Hospitals acquired because

they face financial distress may actually experience increases in their cash holdings after acquisition by a system.

This paper adds to our understanding of how system membership affects an acquired hospital's ability to access capital by examining whether system membership frees up financial assets that can be used to fund real investment. In the sections that follow, this paper will review financial theory that explains how firms determine their optimal level of cash and financial asset holdings. This framework suggests several reasons NFP hospitals maintain large cash balances and several characteristics of multihospital systems that may cause optimal cash balances of NFP system hospitals to be smaller than their independent counterparts. Finally, the hypothesis that acquired hospitals with high cash holdings may experience reductions in their cash balances after joining systems is examined empirically using a panel of independent NFP hospitals acquired by NFP hospital systems.

How firms set optimal cash balances

If capital markets were perfect, financing would be available for all investment opportunities that promised returns great enough to compensate for a project's risk. Firms could easily raise this financing at rates that appropriately reflected a project's risk. Cash balances would be small because cash would only be used to meet working capital needs. However, for some firms informational and agency concerns create differences in the cost of internal and external financing. (Fazzari, Hubbard, Petersen, Blinder, & Poterba, 1988) Not-for-profit firms have a limited ability to raise external capital since they are unable to sell shares of equity and must rely solely on donated capital and debt issues. As a result of these market imperfections, firms must hold cash balances not only for transactional purposes but as a precaution in case

external financing is unavailable or excessively costly (only available at rates significantly above a project's risk-adjusted expected return). But how much cash should a firm hold? A 1999 article by Opler et al provides the theoretical and empirical basis for much of the existing research on optimal cash balances. Opler suggests that firms face costs associated with holding cash as well as costs of experiencing a cash shortfall. Costs of holding cash include profits from forgone investments and agency costs resulting from large cash balances that insulate managers from the oversight. Firms also face costs of holding too little cash. These costs include being forced to either pass up investment opportunities or to issue costly debt to take advantage of investment opportunities. If the cash shortfall is sufficiently severe, a firm may be forced to sell off assets at a discount to raise the funds necessary to prevent bankruptcy. A firm's optimal cash balance equates the expected marginal costs of holding too much and too little cash. Opler et al refer to this theory of cash management as the "tradeoff theory" of cash management. Using a sample of investor-owned firms, Opler et al finds that firms maintain target cash balances over time and that these firms tend to increase cash balances when actual cash balances fall below target balances. These results are consistent with the idea that firms have an optimal cash balance. The costs that create these optimal balances---costs of holding cash and the cost of a cash shortfall---are discussed in more detail below.

Costs of holding cash

The primary cost of holding cash is the difference between the return it generates when held as a liquid assets and the return that it would generate if put to its most profitable use. This is known as the liquidity premium, because in most cases the return on cash holdings is below the returns associated with other possible uses for cash. (Merton H. Miller & Orr, 1966; Opler, Pinkowitz, Stulz, & Williamson, 1999) To see this, consider how an investor-owned firm

operating to maximize shareholder value can use cash. There are three possible uses of cash. First, the firm may hold cash for transactional purposes the form of safe, liquid, low-return securities. If excess cash is available, the firm will invest it in real assets expected to produce a return greater than the firm's cost of capital. If none of the available projects are expected to produce returns at or above the cost of capital, the firm should return cash to shareholders. Holding cash is costly because the return on cash holdings is below the return investors expect on their equity and, equivalently, below the required returns on real investments.

In addition to costs created by the liquidity premium, cash balances can also lead to agency costs. Agency costs arise because managers have incentives to pursue their own objectives to the detriment of firm owners. (Jensen & Meckling, 1976) These objectives can include shirking work duties, increasing executive compensation, consuming perquisites, or investing in projects with a low expected return simply to expand the size of the organization ("empire building"). (Marianne Bertrand & Sendhil Mullainathan, 2003)(Blanchard, 1994)(Jensen, 1986)(Harford, 1999) Large cash holdings can make it easier for managers to pursue these objectives. Investment in low-return projects is simpler because managers are not subjected to monitoring by external capital markets. (Opler et al., 1999) Inefficient operation, perquisite consumption and unwarranted increases in executive compensation are more likely because excess cash protects inefficient firms from the financial distress that they might face without cash reserves. The existence of these agency costs reduces a firm's optimal cash balance. However, unless a firm has good governance mechanisms in place to monitor and control managers' actions equity holders will not realize the extent of the agency costs imposed by large cash balances, nor will equity holders take actions to reduce these costs. As a result the firm will tend to accumulate cash reserves in excess of its optimal balance. (Opler et al., 1999)

Expected costs of cash shortfalls

If capital markets were perfect there would be no cost to a cash shortfall. When investment opportunities arose firms could borrow from banks or bondholders willing to provide financing at an appropriate risk-adjusted rate and without incurring transactions costs of issuance. However, agency costs and asymmetric information problems make internal financing cheaper than external financing for some firms (Fazzari et al., 1988) while for other firms these problems create credit rationing that makes external financing completely unavailable (Stiglitz & Weiss, 1981). Firms with low cash holdings and prevalent investment opportunities face costs of cash shortfalls. These costs are largest when the firm has no access to debt markets and must forgo projects that cannot be funded with cash holdings. In this case the cost of a cash shortfall is the profit forgone when a hospital must pass up a profitable investment opportunity. A similar, though less severe cost of maintaining a small cash balance is realized by firms for whom external debt financing is more costly than internal financing. In this case the cost of a cash shortfall is the premium a firm must pay to issue the debt required to fund the firm's investment opportunity.

When cash shortfalls are sufficiently large, a firm may face bankruptcy and associated costs of financial distress. These include asset sales to raise cash needed to satisfy obligations and other costs driven by the uncertainty surrounding a firm's future including strained relationships with suppliers and customers. These indirect costs of financial distress are large. Estimates of these costs range from 11% (Altman, 1984) to 23% (Andrade & Kaplan, 1998) of the firm's pre-distress value.

Independent NFP hospital cash balances

Not-for-profit hospitals have optimal cash balances and maintain target cash balances in the same way as investor-owned firms. (Rivenson, Reiter, Wheeler, & Smith, 2011) However, the unique features of independent, NFP hospitals affect the size of these optimal cash balances by affecting both the cost of a cash shortfall and the cost of holding cash. Specifically, independent NFP hospitals have financial and operating characteristics that make their expected cost of cash shortfalls high relative to investor-owned and system-affiliated NFP hospitals, resulting in a higher optimal level of cash holdings for independent NFP hospitals. Independent NFP hospitals may also have lower costs of holding cash, which would lead these hospitals to hold more cash. This would be the case if independent NFP hospitals are better able to engage in arbitrage by issuing tax-exempt debt or if poor governance reduces these hospitals' perceived cost of holding a large cash balance. Either of these factors would make independent NFP hospitals' costs of holding cash relatively low, though whether or not independent and system-affiliated hospitals actually differ in the quality of their governance or their ability to engage in tax arbitrage is less clear.

High costs of a cash shortfall

Financial market imperfections lead to differences in the cost of internal and external financing. As a result a cash shortfall creates costs related to the inability to finance profitable investment opportunities or the premium required to raise external financing. Not-for-profit hospitals are especially likely to face costly external financing. The most important factor increasing NFP hospitals' cost of external financing is these hospitals' limited access to equity capital. Since NFP hospitals cannot issue new shares of equity, funding investment opportunities often requires new debt financing and a shift in capital structure that is difficult to reverse. This shift is costly if a hospital enjoyed an optimal capital structure before taking on additional debt,

and even more costly if the hospital was over-levered. The use of cash can also increase the premium on external financing if it results in a downgrade to the hospital's bond rating. Many hospitals report that they target cash holdings at a level that will allow them to maintain a specific bond rating (Rivenson et al., 2000)

There is evidence that independent, NFP hospitals experience both costs of forgone investment and costs of raising "expensive" external financing. Not-for-profit hospitals rely on liquid assets to fund investment and are forced to limit investment when cash flows are not sufficient to fund all desired projects. (Calem & Rizzo, 1995; Reiter, Smith, & Wheeler, 2008) () However, system-affiliated NFP hospitals are less likely to rely on internal cash to finance investment than independent NFP hospitals (Calem & Rizzo, 1995) which suggests that system hospitals may face smaller costs of forgone investment and external financing than independent NFP hospitals. Moreover, the premium system-affiliated hospitals must pay for external financing is probably smaller than the premium required of independent NPF hospitals because bond rating agencies seem to favor hospital systems over independent hospitals. (Dunn, 2013; Moody's Investor Service, 2012; Standard and Poor's, 8/13/2012; Standard and Poor's, 2013) As a result the costs of raising external financing and the cost of foregone investment are likely to be greater for independent NFP hospitals than for system-affiliated NFP hospitals.

In the case of a severe cash shortfall, a firm may have to sell off assets to raise cash required to meet its obligations and avoid bankruptcy. Independent hospitals forced to sell off assets will like have to endure greater discounts on asset sales than system-affiliated hospitals. Hospital systems that need to raise cash can sell off a complete member hospital. The market for hospital acquisitions is active (see Irving Levin Hospital Market M&A Reports for examples). On the other hand, independent hospitals cannot sell off entire facilities. Most of their assets are

held in the form of buildings with specialized uses or technology that is both specialized and likely to become outdated quickly. Selling these sorts of assets is likely to require deep pricing discounts. The greater discounts required for asset sales required to avoid bankruptcy are another reason the costs of a cash shortfall are high for independent NFP hospitals.

Not only are the costs of a cash shortfall high for independent NFP hospitals, these hospitals are also more likely to experience a shortfall because their cash flows vary more than the cash flows of hospital systems. Miller and Orr (1966) show that a firm's optimal cash balance is decreasing with the size and volume of its cash transactions because these factors reduce random variation in a firm's cash flows. Hospital systems, by definition, are larger than individual hospitals and can take advantage of economies of scale in cash management. In addition to reducing cash flow variation by exploiting economies of scale, systems also have more diverse sources of cash flow than individual hospitals. Systems may contract with a larger number of payers spread over a larger geographic area than independent hospitals. To the extent that cash flows from these payers are not perfectly correlated overall variation in cash flow is reduced. Less volatile cash flows reduce the likelihood of a cash shortfall and hence the size of precautionary cash balances. Overall, the likelihood of a cash shortfall is higher for independent hospitals than for system affiliated hospitals. Should such a shortfall occur, it will also be more costly for an independent NFP hospital relative to similar system-affiliated hospitals. This high expected cost of a cash shortfall is one incentive for NFP hospitals to maintain large cash holdings.

Low costs of holding cash

Relative to system-affiliated and investor-owned hospitals, independent NFP hospitals have high costs of a cash shortfall and incentives to hold large stores of cash. Independent NFP hospitals may also hold more cash than hospitals with other organizational forms for two

reasons. First, governance among independent NFP hospitals may be worse than governance of investor-owned or system-affiliated NFP hospitals. As a result independent NFP hospital boards may underestimate the agency costs of high cash balances and allow managers to accumulate excess cash. Second, NFP hospitals' ability to engage in indirect arbitrage using tax-exempt debt makes the cost of holding cash much lower for NFP hospitals than for investor-owned hospitals. Unfortunately, the factors that determine how much arbitrage is available to a hospital are complex and it is unclear whether system-affiliated or independent NFP hospitals are better able to engage in this arbitrage. The remainder of this section describes how agency costs and the liquidity premium differ for investor-owned and both system-affiliated and independent NFP hospitals.

Agency costs, including perquisite consumption and inefficient investment, are one of the costs firms face when holding cash. Good governance can reduce these costs and can help to limit the amount of excess cash a firm holds. Unfortunately, many of the mechanisms associated with good governance in investor-owned firms are unavailable to NFP hospitals. These include management compensation arrangements that tie executive pay to firm value (usually measured by stock price), the presence of large blocks of shareholders to monitor firm actions, or the threat that poor-performing managers can be removed through a hostile takeover. (Shleifer & Vishny, 1997) Governance of NFP hospitals comes primarily in the form of a governing board composed of community representatives acting as volunteers. These representatives may lack the experience to closely monitor managers. Moreover, board service is voluntary and members are not compensated for their service and so many may like the time required to closely monitor managers. As a result, NFP hospital managers may be able to maintain excessive cash balances

and enjoy perquisite consumption or "empire building" investment. Independent NFP hospital board members may underestimate these costs.

Prior research on the relationship between cash holdings and agency costs suggests that large levels of cash holdings can create agency costs not only in investor-owned firms, but in NFP organizations and municipal government organizations as well. (Municipal government organizations also lack many of the governance mechanisms used by investor-owned firms) may benefit from high cash holdings. In a sample of municipal governments, Gore (2009) finds high cash holdings are associated with larger administrative expenses, higher city manager salaries and greater managerial entrenchment. Among NFP organizations (over 40% of which were hospitals) higher cash balances are associated with greater executive compensation and lower expenditures on program goals, even after controlling for important covariates like organizational size. (Core, Guay, & Verdi, 2006)

Not-for-profit hospitals with large cash balances certainly seem likely to incur agency costs. However, it is possible that system membership improves hospital governance, helping board members to recognize the high agency costs of holding cash and resulting in reductions in cash balances. System level managers have the experience and resources necessary to monitor the managers of affiliated hospitals. Community board members may lack this experience and these resources. Depending on the system's organization, system-level managers may also have the authority to replace under-performing hospital managers in the same way activist shareholders can replace managers in an investor-owned firm. Even though there are reasons to suspect that system membership improves governance of independent NFP hospitals in ways that would reduce these hospitals' cash balances, research that actually compares the effectiveness of governance structures in independent and system-affiliated NFP hospitals is scarce. It is possible

that agency problems at the system-level are no less severe than problems at the hospital level. The differences in governance for system and independent hospitals, and whether these differences do in fact have an effect on hospitals' cash holdings are opportunities for future research.

Another reason NFP hospitals have high cash holdings (relative to investor-owned hospitals) is that NFP hospitals have the opportunity to engage in an indirect arbitrage by holding cash rather than using it to fund investment. Not-for-profit hospitals are able to engage in this arbitrage by issuing tax-exempt debt at below-market rates while investing cash holdings in financial assets with returns greater than the interest rate on the tax-exempt debt. This arbitrage opportunity gives both system-affiliated and independent NFP hospitals a low liquidity premium and hence a low cost of holding cash. The availability of indirect arbitrage opportunities is an important reason NFP hospital hold larger cash balances than their investor-owned counterparts. (Wheeler, Smith, Rivenson, & Reiter, 2000)

It is clear that indirect arbitrage opportunities are available to NFP hospitals, but it is less clear whether system membership increases or decreases these opportunities. Wedig et al (1996) develop a theoretical model describing the conditions necessary for indirect arbitrage to take place. The extent to which this arbitrage is available depends on several factors including: a) the availability of projects qualifying for tax-exempt debt; b) the availability of profitable investment opportunities that do not qualify for tax-exempt debt; c) the degree of the hospital's leverage; d) the size of the hospital's cash holdings. System membership could create new investment opportunities that qualify for tax-exempt financing. This would increase the independent hospital's opportunities for indirect arbitrage, decrease the cost of holding cash and increase the

hospital's cash holdings.[2] Alternatively, system membership could create new investment opportunities that did not qualify for tax-exempt financing. In this case, cash reserves would be used to fund these projects and the hospital's cash holdings would fall. Clearly the determinants of a NFP hospital's liquidity premium are complex and the effects of system membership on this premium, and hence a hospital's cash balances, is an opportunity for future theoretical and empirical research.

Does acquisition by a system reduce hospitals' cash balances?

The previous sections have described a number of theoretical reasons that system-affiliated NFP hospitals should have lower optimal cash balances than independent NFP hospitals. However, the discussion in the previous sections has neglected an important, practical point. Even if independent NFP hospitals have relatively high optimal cash balances, they may have trouble actually accumulating these balances. This is especially true in a sample of hospitals acquired by systems because some of these acquired hospitals may be joining systems precisely because they were unable to generate adequate cash to support their operations, much less fund investment and precautionary reserves. The remainder of this paper is devoted to answering two questions. First, in the sample of acquired NFP hospitals, how many have excess cash holdings that system membership could "free up" to be used in investment. Second, for the sample of acquired NFP hospitals with excess cash holdings, does system membership actually result in reductions in these cash holdings as theory suggests.

[2] This is true for hospitals with relatively low leverage. Higher leverage decreases the opportunity for arbitrage by increasing the interest rate for all debt types, even tax-exempt debt, and reducing the spread between the cost of debt and the expected return on financial assets.

Data and sample

Study data come from two sources, the American Hospital Association (AHA) hospital database records from 1996-2009 and Medicare Cost Report (MCR) records from 1996-2009. The AHA data come from files maintained and updated yearly by the AHA. Medicare Cost Report (MCR) data are collected by the Centers for Medicare and Medicaid Services (CMS) and contain information on costs and other characteristics for all US hospitals that accept Medicare patients. Data used in this study come from Schedule G of the cost report. Medicare Cost Report data are audited and widely used in academic research (for example, (Dranove & Lindrooth, 2003; Kim & McCue, 2008)(Bazzoli, Chan, Shortell, & D'Aunno, 2000)). However, these data have also been criticized as inaccurately describing hospitals' financial conditions and the costs hospitals incur in providing care. (Kane & Magnus, 2001; Magnus & Smith, 2000) Unfortunately, most sources of hospital financial data have limitations, and a nationally representative dataset containing audited financial information at the hospital level is not available ((Medicare Payment Advisory Commission, 2004)).

The sample is also restricted to NFP hospitals, since this study focuses on how system membership changes NFP hospitals' ability to use internal cash reserves for capital investment. We have excluded from the sample hospitals with unusual organizational characteristics including hospitals owned by the state, local and federal governments, hospitals located in US territories outside the 50 US states, hospitals not classified by the AHA as providing general acute care services and hospitals that did not appear in both the AHA and MCR data. These hospitals have characteristics that may cause their cash management procedures to differ from other hospitals. Hospitals with multiple system status changes and hospitals with system status changes that could not be confirmed are excluded also. The derivation of the sample is described

further in Table 2.1. Several hospitals were excluded because they had missing data or data values that were unrealistically large or small. We list the rules used to define unrealistic data in Table 2.2.

Hospitals are required to file partial-year cost reports in cases where the hospital's ownership changes or the hospital adopts a new beginning date for its fiscal year. As a result, the Medicare Cost Report data occasionally contain multiple reports for the same hospital in the same year. When this was the case for acquired hospitals we kept the earlier observation if the duplicate occurred in the pre-acquisition period and the later observation if the duplicate occurred in the post-acquisition period. When independent hospitals without a change in system status had duplicate observations we retained the later of the duplicate observations.

Measures

Cash holdings

Cash holdings are measured using the "days cash on hand" metric common in practice and previous research on hospital cash holdings. Days cash on hand is computed as a hospital's total cash holdings divided by the hospital's average daily operating expenses. This measure is comparable for hospitals of different sizes and offers an intuitive interpretation (the number of days a hospital could continue operating without taking in any additional cash). Both the cash holdings and operating expense amounts used to compute the 'days cash on hand' measure are taken from the Medicare Cost Report's Schedule G. Cash holdings here include actual cash balances as well as notes receivable, temporary investments and other financial investments. All financial investments, rather than just short-term investments, are included in the cash measure because long-term investments could potentially be liquidated to fund capital investment.

Excess cash

This study examines whether acquired hospitals have excess cash holdings and whether system membership reduces these cash holdings. However, determining what constitutes "excess cash holdings" for a particular hospital is challenging. This study uses three measures of excess cash holdings since there is not a universally agreed upon measure of excess cash. The first two measures define excess cash based on the distribution of cash holdings for independent, NFP hospitals. These measures define hospitals with excess cash holdings as hospitals that have cash holdings greater than the 75^{th} or the 50^{th} percentile of all permanent independent hospitals. This measure assumes that hospitals with cash holdings above the 75^{th} or 50^{th} percentile are the hospitals most likely to reduce their cash balances after joining systems. Year to year changes in financial markets and hospital industry conditions could affect all hospitals' cash holdings and so the 50^{th} and 75^{th} percentile definitions of excess cash are for each year of the sample rather than from the pooled data.

Using percentile cutoffs to define excess cash holdings is straightforward but imperfect because percentile measures do not take into consideration characteristics that affect a hospital's optimal level of cash holdings. The third measure of excess cash addresses this problem. For this measure, predicted cash holdings are modeled as a function of variables that should affect a hospital's optimal cash holdings. These variables include proxies for hospital size (total assets) since larger hospitals can be expected to hold more cash. A leverage variable is included as well (long-term debt to total assets) since hospitals with better debt market access are expected to hold less precautionary cash. Proxies for profitable investment opportunities (return on assets and local market characteristics) are also included since hospitals with a better set of investment opportunities can be expected to hold larger cash reserves because the cost of a cash shortfall is

greater for these hospitals. Similar measures have been used as proxies for investment opportunities in other research (Reiter et al., 2008) since the typical measure of investment opportunities, Tobin's Q, cannot be computed for firms without publicly traded equity. Finally, proxies for cash flow are included (net patient revenues) since hospitals that typically generate more cash can hold smaller cash balances. Net patient revenues are an admittedly imperfect measure of cash flow. Unfortunately, actual cash flow data are not available for a national sample of hospitals and using net income as a proxy is also imperfect since NFP hospitals have been shown to manage earnings figures towards zero. (Leone & Van Horn, 2005) Cash holdings are predicted using lagged values of these financial variables. Ideally, the model predicting cash holdings would also include a measure of cash flow volatility. However, this variable is unavailable both because of limited cash flow data and because requiring a lagged measure of volatility would have limited an already small sample even further.

Parameters for the model used to predict cash holdings are estimated using data on system hospitals; then, these parameters are used to predict cash holdings for permanent independent and acquired hospitals. These predictions can be interpreted as the amount of cash an independent hospital with a given set of characteristics would be expected to hold if it was part of a hospital system. Permanent independent and acquired hospitals with cash holdings above the predicted amount are deemed to have excess cash holdings. Parameters for the model of cash holdings are calculated for each year of data rather than from pooled data since these parameters may change from year to year as hospital industry characteristics change. A similar method for identifying excess cash holdings was used by Opler et al (1999) and Core (2006).

System membership

Data on system status is taken from the AHA hospital database. In keeping with previous research in this area, the *sysid* variable generated from AHA internal files is used rather than the *mhsmemb* variable determined by a hospital's response to the AHA annual survey (Dranove & Lindrooth, 2003). Two categories of system membership are included in the sample—hospitals that are independent throughout the study period and hospitals that are independent then join a hospital system. In addition, data for permanent system hospitals are used to estimate one of the measures of excess cash holdings. The AHA definition of a hospital system includes single hospital systems. A freestanding hospital can be considered a member of a system if the hospital is closely affiliated with three or more other healthcare organization (AHA Guide, 2005). Many of the potential benefits of system membership may not be realized for these single hospital systems. Therefore, the system membership variable is adjusted to exclude hospitals in systems containing only one or two hospitals. These hospitals are excluded from the analysis since they are not classified as system hospitals but cannot be classified as independent hospitals either. This definition is similar to the one used by the bond rating agency Standard and Poor's (Standard and Poor's, 2013). Whether the effects of system membership differ for one to two hospital systems versus larger systems is an opportunity for future research.

This study uses a two-step procedure to identify independent hospitals that joined systems. First, data from the AHA annual survey for the years 1996-2009 are analyzed to identify changes in a hospital's system status. Cases are identified where a hospital was not classified as a member of a hospital system, then, in the next year, the hospital was classified as a system member. However, in researching some of these transactions it became apparent that a system membership change did not occur as indicated by the AHA data. To resolve these

discrepancies, two sources were consulted--the annual lists of hospital mergers and acquisitions published by Modern Healthcare and the Hospital Acquisition Reports published by Irving Levin and Associates. If neither the Modern Healthcare lists nor the Hospital Acquisition reports contained a record of an independent hospital's acquisition, the hospital's webpage and online news coverage were used to find evidence of the transaction. If none of these attempts yielded confirmation that the transaction occurred, the hospital was eliminated from the sample. Hospitals with unconfirmed transactions were eliminated from the data for several reasons. First, some hospitals with unconfirmed transactions clearly listed a system affiliation on their webpages but did not offer information about the date on which they joined a system. In these cases it was impossible to assign a system status to each hospital year since only the current system status was known. In other cases, the hospital websites did not contain information about a system affiliation. However, some hospitals with confirmed system affiliations do not prominently display their affiliation on their websites so the lack of information about system-affiliation is not adequate justification for classifying these hospitals as independent. The final sample contains information on 95 acquired NFP hospitals.

In addition to dropping hospitals that are members of one or two hospital systems, hospitals that the AHA data suggest have undergone multiple changes in system status and hospitals that become independent after having been affiliated with a system are also omitted from this study. This is done for two reasons. First, the system status data on these hospitals may not be accurate, especially in the case of hospitals with multiple system status changes. Second, the study questions relate to the common claim that multihospital system membership can improve an independent hospitals' access to capital. There are no similar claims to guide our expectations about how internal capital reserves could change for hospitals leaving systems or

hospitals with multiple system changes. This paper's results can speak to the effect of independent hospitals joining systems, though dropping cases of multiple changes in system membership will certainly limit the generalizability of these results.

Methods

This study addresses two questions---do independent hospitals purchased by multihospital systems maintain especially large cash holdings that could be a source of investment capital, and does system membership lead to reductions in these excess cash balances. The first question (do acquired hospitals have excess cash balances) is answered simply by looking at the percent of acquired hospitals that fall into each of the three definitions of an excess cash balance. This distribution is compared to the percent of permanent independent hospitals with an excess cash balance.[3]

The second study question (whether system membership results in reductions in cash balances for hospitals with excess cash holdings) is examined using a difference in differences study design. This method compares changes in cash holdings for acquired hospitals to changes in cash holdings for a control group of hospitals. In this case, the control group is made up of independent hospitals that do not join multihospital systems and also have excess cash holdings. For each acquired hospital, changes in cash holdings are measured as the difference in days cash on hand in the year before acquisition and days cash on hand in the first and second years after acquisition. These differences are compared to changes in cash holdings for the control group over the same period. For instance, for a hospital with excess cash holdings that was acquired in

[3] This measure is most interesting for the measure of excess cash holdings based on predicted cash holdings since, by definition, 25% of independent hospitals with have "excess cash balances" above the 75th percentile of cash holdings and 50% of independent hospitals will have "excess cash balances" where excess cash is measured as having cash holdings larger than the 50th percentile.

the year 2000, changes in cash holdings from 1999 to 2001 and 1999 to 2002 are calculated. These changes in cash holdings are compared to the average change in cash holdings from both 1999 to 2001 and 1999 to 2002, for all independent hospitals with excess cash holdings. Regression to the mean is not a concern for this study since acquired hospitals with high levels of cash holdings are being compared to independent controls with similarly high cash holdings.

Results

Table 2.3 shows descriptive statistics for the study sample. Acquired hospitals held less cash on average than permanent independent hospitals. This is preliminary evidence that the desire to "free up" internal cash reserves for capital investment may not be a benefit most hospitals are anticipating when they join multihospital systems. Acquired hospitals' relatively smaller cash holdings do not appear to be explained by better access to debt markets than other independent hospitals (long-term debt to total asset ratios are similar) nor by better ability to generate positive cash flow (at least to the extent this can be captured by revenue and profitability measures---both of which are lower for acquired hospitals than independent hospitals). It is possible, however, that acquired hospitals are holding less cash because they have a less profitable set of investment opportunities. The sample of acquired hospitals does have a lower return on assets than the group of permanent independent hospitals.

Despite the fact that acquired hospitals have lower cash holdings than permanent independent hospitals during the pre-acquisition period, cash holdings nonetheless fall for acquired facilities from the pre- to the post-acquisition period (95 days cash on hand vs. 84 days cash on hand). Moreover, the post-acquisition average cash holdings are similar to the average cash holdings for all system hospitals.

Hospitals with excess cash holdings

Table 2.4 shows the number of hospitals from the acquired and permanent independent hospital samples with excess cash holdings. There is no evidence that a greater proportion of acquired hospitals held excess cash than permanent independent hospitals. By any of the three measures of excess cash holdings the percent of acquired hospitals with excess cash is relatively similar to the percent of permanent independent hospitals with excess cash.

Changing cash holdings

Table 2.5 shows difference in difference estimates of the changes in cash holdings associated with hospital system membership. Results from analyses using each of the three measures of excess cash are reported. The evidence to support the hypothesis that system membership allows acquired hospitals to reduce their cash holdings is weak. Both of the percentile-based measures of excess cash suggest that acquired hospitals with excess cash in the pre-acquisition year reduced their cash holdings by a greater amount than independent hospitals with similarly high cash holdings. Unfortunately, these differences were not statistically significant, with one exception. The two-year difference in difference estimate derived using the definition of excess cash as cash holdings above the 50^{th} percentile for all independent hospitals suggests system acquisition resulted in 11.7 day reduction in days cash on hand. This reduction has a p-value of 0.07, but there is no theoretical reason that this particular measure of the change in cash holdings should be significant while the others are not.

The results estimated using the definition of excess cash holdings based on predicted cash holdings actually suggest system membership is associated with an increase in cash holdings for acquired hospitals. This result is also statistically insignificant but it is surprising that the direction of the effect is the opposite of what was hypothesized. This may be a result of the

small sample size or may be because the model used to predict cash holdings omitted variables that determine hospitals' optimal cash holdings.

Discussion

Using any of the three measures of excess cash holdings it does not appear that acquired hospitals are more likely to hold excess cash than independent hospitals that were not acquired. This suggests that few independent hospital acquisitions are motivated by a desire to "free up" internally held cash reserves for capital investment. This could be because independent hospitals place greater value on their independence than the benefits system membership offers. In fact, the desire to maintain independence may be one reason some hospitals keep large stores of cash and investments. From a purchasing system's perspective, independent hospitals holding large cash balances may be difficult to acquire. For some independent hospitals a large cash balance may be the result of past and present financial success. These hospitals may not have much to gain by joining systems and may avoid acquisition all together or they may demand a high acquisition price or other costly concessions from potential purchasers. Even for independent hospitals with much to gain from system membership, high cash balances create problems for acquiring systems. High cash balances allow a hospital to continue operating without a system partner. Without an immediate threat to the independent hospital's ability to continue operations, high-cash independent hospitals may be unable to convince community members, employees and physicians that the benefits of system membership are worth the loss of independence. This lack of consensus would make it much harder for an acquiring system to purchase an independent hospitals.

For the small number of hospitals with high cash holdings that are acquired, these results do not support the hypothesis that system membership leads to large declines in cash holdings that could be used to fund real investment. In fact, the results do not suggest that acquired hospitals experience large enough reductions in days cash on hand to bring them in line with the mean cash holdings for all system hospitals. System hospitals held a mean of 87 days cash on hand, averaged over all years of the sample. Study results suggest that acquired hospitals with high-cash holdings experienced declines of -15.8 days in the first year after acquisition and -20 days in the second year. (These results were estimated using the 75th percentile of independent cash holdings as the cutoff for "high cash". The other two measures of "high cash" hospitals lead to smaller estimated reductions in days cash on hand.) The minimum level of cash holdings required to be classified as "high-cash" varied between 145 days (in 2002) and 185 days (in 1998). An acquired hospital with 145 days cash on hand (the lowest required to be classified as "high cash" in any year) that experiences a 20 day decline in cash holdings would still be maintaining 125 days cash on hand, notably more than the system-average of 84 days cash. Moreover, the change required to bring high-cash hospitals in line with system averages would have to be much bigger than the estimated changes. The standard error of the estimated change in days cash is 23.4. If the true effect of system membership is large enough to bring high-cash, acquired hospitals into line with system averages then this effect must be greater than the estimated effect by 1.5 standard errors.[4] The changes in cash holdings associated with the other two measures of cash holdings were both smaller in magnitude than the changes estimated using the 75th percentile as a cutoff to define "high cash" hospitals.

[4] To elaborate, the lowest level of cash holdings a hospital could maintain to be "high cash" is 144 days cash on hand. The estimated reduction in cash holdings associated with system membership is 20, with a standard error of 23.4. So 144 – (20 + (23.4 x 1.5)) is 88.9, only slightly above the system average for cash holdings (87 days).

Study results suggest that the reductions in cash holdings high-cash hospitals experience are unlikely to be large enough to bring these hospitals' cash holdings in-line with system hospital averages. This begs the question—why is the mean level of cash holdings for system-affiliated hospitals (87 days cash on hand) lower than the average level of cash holdings for independent hospitals (113 days cash on hand)? If hospital systems are not reducing acquired hospitals' cash holdings then why is the mean cash level among system-affiliated hospitals different than among independent hospitals? One explanation is that systems are more likely to acquire hospitals with low cash holdings. There is some evidence to support this idea in the descriptive statistics in Table 2.3. In the pre-acquisition period cash holdings averaged 95 days cash, lower than the 113 days cash the average independent hospital held. A second explanation is that systems are successful in reducing the cash holdings of the hospitals they acquire but the reductions take longer than two years to accomplish and so the results presented in this study do not capture all of the reduction.

Limitations

This study has a number of limitations. First, there are limitations related to the quality and availability of data from the MCR. These data have been criticized as inaccurate (Kane & Magnus, 2001; Magnus & Smith, 2000) but are also frequently used in academic research. Unfortunately, these data do not include variables measuring some of the important determinants of hospital cash holdings, like cash flow information or cash flow volatility. Omitting these variables from the models used to predict hospital cash holdings likely resulted in an imperfect prediction of hospital cash holdings and hence an imperfect measure of excess cash holdings. For these reasons the study includes two other measures of high cash holdings based on

percentile cutoffs. Unfortunately, these measures do not take into account characteristics of hospitals that may cause them to optimally hold a large cash balance.

The relatively short post-acquisition follow-up period (two years) is another limitation of the study. Rivenson et al (2000) found anecdotal evidence that in the late 1990s some acquired hospitals had difficulty centralizing cash management. This suggests that perhaps hospital systems require more than two years to make meaningful changes in the cash balances of acquired hospitals. Using a longer follow-up period could provide more information about how acquired hospital cash balances change over time. However, a longer follow-up period would also have reduced the already minimal sample size.

The assumption imposed by the difference-in-differences study design creates limitations on the study as well. This method assumes that acquired hospitals would have had similar changes in cash management as all independent hospitals, had the acquired hospitals remained independent. This may not be true. As a means of testing this, characteristics affecting cash holdings were compared between pre-acquisition hospital periods and independent hospitals. These results are provided in Table 3. There were differences among the two groups but none suggested the group of acquired hospitals were holding greater cash reserves than would be expected or that the acquired hospitals should be expected to reduce expenses more than the group of permanent independent hospitals. Moreover, the assumption that independent hospitals that were not acquired is a useful control group is probably more realistic than the assumptions required for a cross-sectional comparison of independent and system-affiliated hospitals.

Conclusion

This study contributes to the literature on system membership and hospitals' access to capital by using finance theory to identify a new mechanism through which system membership could improve acquired hospitals' access to capital. Since hospital systems have lower costs of cash shortfalls and hence lower optimal cash balances than independent hospitals, system acquisition should enable independent hospitals to use some of their cash reserves for capital investment. However, empirical tests suggest that relatively few acquired hospitals hold excess cash balances before acquisition. This is an interesting difference between investor-owned firms and NFP hospitals. Investor-owned firms holding large cash balances often become targets for acquisition but this study suggests hospitals with excess cash are no more likely to be acquired than those without. Study results fail to support the hypothesis that acquired hospitals holding excess cash reduce their cash balances. This may be because system membership has no effect on acquired hospitals' cash balances, or because changes in cash balances take longer to occur than the two year follow-up period used in this study. Future research could incorporate additional years of data and a larger sample of acquired hospitals to generate more precise estimates of the changes in acquired hospitals' cash balances. Another interesting question worthy of further research is whether systems prefer to acquire hospitals with low cash holdings and if so, why these hospitals are preferred.

Table 2.1: Sample selection

	Acquired hospitals	Permanent independent hospitals
US General acute care hospitals*	576	1,865
Couldn't be matched to MCR	519	1,684
Dropping unconfirmed acquisitions	219	1,684
Keeping only NFP owned facilities	156	981
After deleting missing/unrealistic data	131	956

**Excludes military and federal hospitals as well as hospitals with multiple system status changes and all hospitals that are not NFP owned*

Table 2.2: Rules defining outliers

		Acquired hospitals		Permanent Independent	
Variable	**Rule**	**Hospitals affected**	**Hospital years affected**	**Hospitals affected**	**Hospital years affected**
Days cash on hand*	>75th percentile + (4 x IQR)	0	0	29	79
Return on assets	>75th percentile + (4 x IQR)	6	6	102	155
Operating expenses per bed	> 0	0	0	0	0
Net patient revenue per bed	>75th percentile + (4 x IQR)	1	3	21	59
Total assets	> 0	1	1	1	1
Long term debt to total assets	>75th percentile + (4 x IQR)	0	0	8	13
----	No missing values for above variables**	53	65	897	919

Note: All variables except for days cash on hand are lagged
*Days cash on hand includes cash, temporary investments, notes receivable and financial investments
**These include some observations missing because lagged values are not available in the first year of the data set

Table 2.3: Descriptive statistics

	Pre-Acquisition		Post-Acquisition		Independent Hospitals		System Hospitals	
	mean	**sd**	**mean**	**sd**	**mean**	**sd**	**mean**	**sd**
Days cash on hand	95	83	84	96	113	105	87	107
Return on assets (%)	1.67	7.76	2.02	9.56	2.67	7.09	3.94	9.3
Operating expenses (per bed)	447,932	206,185	665,101	330,004	489,890	315,923	549,032	302,991
Net patient revenue (per bed)	434,569	192,408	666,561	355,397	479,396	309,778	550,498	307,768
Total assets (thousand $)	123,000	258,000	136,000	164,000	108,000	172,000	153,000	248,000
Long term debt to total assets	0.32	0.19	0.37	0.28	0.29	0.2	0.31	0.28
N		95		95		956		1,044

Note: All variables except for days cash on hand are lagged.
N reported is number of hospitals in each group rather than the number of hospital-year observations. Some hospitals are not observed in all years

Table 2.4: NFP hospital observations by sample year and measure of excess cash holdings

Measure of excess cash holdings	Year											
	1998	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**Total**	**Percent**
Acquired												
All acquired hospitals	14	18	8	19	5	4	8	4	3	9	95	---
>75th percentile	4	3	1	5	0	0	2	0	1	1	17	18%
> 50th percentile	7	10	7	10	5	3	6	2	5	6	61	64%
Greater than predicted	8	5	0	1	0	0	2	2	1	6	25	26%
Independent												
All independent hospitals	596	848	831	824	809	806	790	789	796	789	7,878	---
>75th percentile	149	212	208	206	202	202	197	197	199	197	1,969	25%
> 50th percentile	298	424	416	412	405	403	395	395	398	395	3,941	50%
Greater than predicted	169	189	37	79	219	100	261	211	217	666	2,148	27%

The top panel shows the total number sample hospitals acquired in each year of the study. This panel also shows, by year, the number of acquired hospitals that held excess cash as determined using three different measures of excess cash holdings. The measures of excess cash holdings are 1) Cash holdings in excess of the 75th percentile of all independent hospitals 2) cash holdings in excess of the 50th percentile of all independent hospitals and 3) Cash holdings in excess of the cash holdings predicted by a multivariate model of hospital cash holdings.
Note: The 7,878 observations for independent hospitals are hospital-years, not individual hospital observations. This is because an independent hospital can serve as a control observation for multiple acquired hospitals.

Table 2.5: Difference in difference estimates of changes in cash holdings

	Pre-acquisition to 1 year after			Pre-acquisition to 2 years after		
Cash holdings > 75th percentile						
	Acquired	**Independent**	**DiD**	**Acquired**	**Independent**	**DiD**
Change in cash holdings	-62.0 (27.8)	-46.1 (4.2)	-15.8 (25.9)	-78.0 (24.7)	-58.0 (4.3)	-20.0 (23.4)
Number of acquired hospitals	17		---	17		---
Cash holdings > 50th percentile						
	Acquired	**Independent**	**DiD**	**Acquired**	**Independent**	**DiD**
Change in cash holdings	10.0 (6.1)	13.8 (0.3)	-3.8 (6.2)	6.4 (6.1)	18.1 (0.3)	-11.7* (6.2)
Number of acquired hospitals	61		---	61		---
Excess cash holdings						
	Acquired	**Independent**	**DiD**	**Acquired**	**Independent**	**DiD**
Change in cash holdings	-17.1 (20.7)	-25.4 (2.7)	8.3 (21.2)	-24.0 (17.4)	-30.8 (3.8)	6.7 (17.9)
Number of acquired hospitals	25		---	25		---

* p-value <0.1

Standard errors are shown in parentheses. The first panel shows results estimated when excess cash holdings are defined as cash holdings above the 75th percentile for permanent independent hospitals. The second panel uses a definition of excess cash as cash holdings above the 50th percentile of cash holdings. The final panel are results estimated when excess cash is defined as cash holdings above what is predicted using a multivariate model.

References

Altman, E. (1984). A further empirical-investigation of the bankruptcy cost question. *Journal of Finance, 39*(4), 1067-1089.

American Hospital Association. (2013). *Fundamental transformation of the hospital field.*

Andrade, G., & Kaplan, S. (1998). How costly is financial (not economic) distress? evidence from highly leveraged transactions that became distressed. *Journal of Finance, 53*(5), 1443-1493.

Ault, K., Childs, B., Wainright, C., & Young, M. (2011). Relevant factors to consider prior to an investor-owned acquisition of a nonprofit healthcare entity. *Journal of Healthcare Management, 56*(4), 269-80; discussion 280-1.

Bazzoli, G. J., Chan, B., Shortell, S. M., & D'Aunno, T. (2000). The financial performance of hospitals belonging to health networks and systems. *Inquiry : A Journal of Medical Care Organization, Provision and Financing, 37*(3), 234-252.

Blanchard, O. J. (1994). What do firms do with cash windfalls? *Journal of Financial Economics, 36*(3), 337; 337-360; 360.

Burns, L. R., & Pauly, M. V. (2002). Integrated delivery networks: A detour on the road to integrated health care? *Health Affairs, 21*(4), 128-43.

Byrd, C., & McCue, M. (2003). Can your hospital remain independent? *Healthcare Financial Management, 57*(9), 40-44.

Calem, P. S., & Rizzo, J. A. (1995). Financing constraints and investment: New evidence from hospital industry data. *Journal of Money, Credit and Banking, 27*(4, Part 1), 1002-1014.

Carlson, J., & Galloro, V. (2009). M&A: An upside to a down market. *Modern Healthcare, 39*(3), 22-31.

Core, J. E., Guay, W. R., & Verdi, R. S. (2006). Agency problems of excess endowment holdings in not-for-profit firms. *Journal of Accounting and Economics, 41*(3), 307-333.

Dranove, D., Durkac, A., & Shanley, M. (1996). Perspective: Are multihospital systems more efficient? *Health Affairs, 15*(1), 100-104.

Dranove, D., & Lindrooth, R. (2003). Hospital consolidation and costs: Another look at the evidence. *Journal of Health Economics, 22*(6), 983-997.

Dunn, L. (2013). To merge or not to merge: Benefits, challenges and the future for stand-alone hospitals Retrieved, 2013, Retrieved from http://www.beckershospitalreview.com/hospital-

transactions-and-valuation/to-merge-or-not-to-merge-benefits-challenges-and-the-future-for-stand-alone-hospitals.html

Fazzari, S. M., Hubbard, R. G., Petersen, B. C., Blinder, A. S., & Poterba, J. M. (1988). Financing constraints and corporate investment. *Brookings Papers on Economic Activity, 1988*(1), 141-206.

Gentry, W. M. (2002). Debt, investment and endowment accumulation: The case of not-for-profit hospitals. *Journal of Health Economics, 21*(5), 845-872.

Gore, A. (2009). Why do cities hoard cash? determinants and implications of municipal cash holdings. *The Accounting Review, 84*(1), 183-207.

Harford, J. J. (1999). Corporate cash reserves and acquisitions. *The Journal of Finance (New York), 54*(6), 1969-1997.

Herman, B. (2014). How much do hospitals pay to find a partner? A case study. Retrieved, 2014, Retrieved from http://www.beckershospitalreview.com/hospital-transactions-and-valuation/how-much-do-hospitals-pay-to-find-a-partner-a-case-study.html

Janiga, N., & Muller, M. (2013). 7 common reasons for hospital transactions | news & analysis Retrieved, 2013, Retrieved from http://www.beckershospitalreview.com/news-analysis/7-common-reasons-for-hospital-transactions.html

Jensen, M. C. (1986). Agency costs of free cash flow, corporate finance, and takeovers. *The American Economic Review, 76*(2, Papers and Proceedings of the Ninety-Eighth Annual Meeting of the American Economic Association), 323-329.

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics, 3*(4), 305-360.

Kane, N. M., & Magnus, S. A. (2001). The medicare cost report and the limits of hospital accountability: Improving financial accounting data. *Journal of Health Politics, Policy and Law, 26*(1), 81-105.

Kim, T. H., & McCue, M. J. (2008). Association of market, operational, and financial factors with nonprofit hospitals' capital investment. *Inquiry : A Journal of Medical Care Organization, Provision and Financing, 45*(2), 215-231.

Leone, A. J., & Van Horn, R. L. (2005). How do nonprofit hospitals manage earnings? *Journal of Health Economics, 24*(4), 815-837. doi:10.1016/j.jhealeco.2005.01.006

Levitt, S. (1994). Quality of care and investment in property, plant, and equipment in hospitals. *Health Services Research, 28*(6), 713-727.

Magnus, S. A., & Smith, D. G. (2000). Better medicare cost report data are needed to help hospitals benchmark costs and performance. *Health Care Management Review, 25*(4), 65-76.

Marianne Bertrand, & Sendhil Mullainathan. (2003). Enjoying the quiet life? corporate governance and managerial preferences. *Journal of Political Economy, 111*(5), 1043-1075.

Medicare Payment Advisory Commission. (2004). *Report to the congress: Sources of financial data on Medicare providers.* (Report to the Congress No. 2013).

Melnick, G., & Keeler, E. (2007). The effects of multi-hospital systems on hospital prices. *Journal of Health Economics, 26*(2), 400-413.

Merton H. Miller, & Orr, D. (1966). A model of the demand for money by firms. *The Quarterly Journal of Economics, 80*(3), 413-435.

Mitrakos, A. (2012). Provena, resurrection merger costs approach $20 million. Retrieved, 2014, Retrieved from http://www.chicagobusiness.com/article/20120621/NEWS03/120629958/provena-resurrection-merger-costs-approach-20-million#

Moody's Investor Service. (2012). *Moody's: Driven by M&A, upgraded non-profit healthcare debt exceeds downgraded debt in third quarter* (No. 2013).

Opler, T., Pinkowitz, L., Stulz, R., & Williamson, R. (1999). The determinants and implications of corporate cash holdings. *Journal of Financial Economics, 52*(1), 3-46.

Reiter, K. L., Smith, D. G., & Wheeler, J. R. C. (2008, Fall; 2013/2). Liquidity constraints on hospital investment when credit markets are tight.*35*, 24+.

Rivenson, H., Reiter, K., Wheeler, J., & Smith, D. (2011). Cash holdings of not-for-profit hospitals. *Journal of Health Care Finance, 38*(2), 24-37.

Rivenson, H., Wheeler, J., Smith, D., & Reiter, K. (2000). Cash management in health care systems. *Journal of Health Care Finance, 26*(4), 59-69.

Shleifer, A., & Vishny, R. W. (1997). A survey of corporate governance. *The Journal of Finance, 52*(2), 737-783.

Sloan, F. A., Conover, C. J., & Ostermann, J. (2003). Rates of return from hospital conversions. *Health Care Manage.Review, 28*(2), 107.

Song, P. H., & Reiter, K. L. (2010). Trends in asset structure between not-for-profit and investor-owned hospitals. *Medical Care Research and Review, 67*(6), 694-706.

Standard and Poor's. (2013). *U.S. not-for-profit health care system ratios: Stability in 2011 gives providers a firm foundation to face industry changes.*.Standard and Poor's.

Standard and Poor's. (8/13/2012). *U.S. not-for-profit stand-alone hospital ratios: Providers confront A difficult road after A stable ride in 2011*.

Stiglitz, J. E., & Weiss, A. (1981). Credit rationing in markets with imperfect information. *The American Economic Review, 71*(3), 393-410.

Wedig, G. J., Hassan, M., & Morrisey, M. A. (1996). Tax-exempt debt and the capital structure of nonprofit organizations: An application to hospitals. *The Journal of Finance, 51*(4), 1247.

Wheeler, J. R., Smith, D. G., Rivenson, H. L., & Reiter, K. L. (2000). Capital structure strategy in health care systems. *Journal of Health Care Finance, 26*(4), 42-52.

Chapter 3

The Cost of Capital, Leverage and System Membership: Does System Membership Help Hospitals Achieve Optimal Leverage?

Introduction

Hospitals are currently facing regulatory and market forces that make capital expenditures critical. These include new investments in information technology systems needed to improve clinical quality, to take advantage of payer incentives to use this technology and increasingly to avoid financial penalties for failing to use this technology. (American Hospital Association, 2013) Capital investment has also been linked to the quality of clinical care hospitals provide (Levitt, 1994) and a hospital's ability to compete with other hospitals in its market (Byrd & McCue, 2003). However, as capital needs have increased many hospitals have found raising capital difficult. (American Hospital Association, 2013; Carlson & Galloro, 2009) In particular, many not-for-profit (NFP) hospitals have found gaining access to capital challenging. Hospitals struggling to raise capital have been advised to consider system membership as a means of improving their access to capital funds. Many hospitals expect that joining a system will improve their access to capital, even if this benefit is not the hospital's primary motivation for joining a system. (Ault, Childs, Wainright, & Young, 2011; Janiga & Muller, 2013) Unfortunately, there is little evidence that system membership does improve access to capital and even less theoretical or empirical work explaining how system membership could do so.

Capital access could improve if system membership provides better access to debt markets or if hospital systems act as a source of capital for highly-levered independent hospitals that lack access to equity capital. System membership could enable hospitals to take on more debt by providing acquired hospitals with financial expertise required to issue debt, by creating new investment opportunities that allow the hospital to issue additional tax-exempt debt, or by reducing transactions costs as a proportion of borrowed funds. It is also possible that systems serve as a source of equity financing for independent hospitals, allowing them to reduce debt levels or purchase assets without increasing their debt holdings.

Our limited understanding of the financing benefits of system membership is a problem because the costs of system membership can be large for independent hospitals. These costs include a loss of autonomy and community control, transactions costs associated with the system acquisition (Herman, 2014; Mitrakos, 2012) and possible increases in the prices of hospital services to the community. (Melnick & Keeler, 2007) Moreover, there are reasons to believe system membership may not affect hospitals' access to debt capital. Systems are motivated to acquire hospitals for reasons other than their desire to help the acquired hospitals obtain debt financing. Acquiring systems may be motivated by the idea that an acquisition is "a good deal" because the cost of acquiring a hospital is lower than the revenues the hospital will produce, or by the desire to realize economies of scale (though there is little evidence these benefits are realized (Burns & Pauly, 2002; Dranove, Durkac, & Shanley, 1996; Dranove & Lindrooth, 2003; Sloan, Conover, & Ostermann, 2003). Meeting these objectives would not require the acquiring system to make any capital expenditures or issue any new debt, aside from any debt issuance required to make the initial purchase. Better understanding whether and how system membership affects hospital access to capital will help board members of independent hospitals

consider the financing benefits associated with system membership and to weigh these benefits against the costs of joining a multihospital system.

This paper adds to our understanding of the benefits of multihospital system membership for a hospital's ability to access investment capital. Debt is a particularly important source of capital for NFP hospitals since they have limited sources of equity capital. Several prior studies have found that system-affiliated hospitals have higher debt holdings than independent hospitals. (Gentry, 2002; G. Wedig, Hassan, Van Horn, & Morrisey, 1998) However, some of these studies use data that predates important changes in hospital reimbursement practices. Most are based on cross sectional comparisons. Observed differences in system and independent hospitals could be the result of hospital systems selectively acquiring certain kinds of hospitals rather than financing benefits inherent to system membership. If system membership does improve NFP hospitals' ability to access debt, how exactly this occurs is unknown. We also do not know how access to debt changes for hospitals with different degrees of pre-acquisition leverage. For instance, do hospitals with relatively low pre-acquisition leverage enjoy larger increases in leverage than hospitals with moderate to high levels of pre-acquisition leverage? This paper will address these gaps in the literature. It begins by briefly discussing established theories that describe the capital structure decisions of for-profit firms, and relating these theories to NFP hospitals. Next, the paper will develop predictions about how system membership affects the debt holdings of NFP hospitals with low, moderate and high levels of pre-acquisition leverage. Finally, these predictions are tested using a panel of acquired NFP hospitals matched to independent control hospitals.

Tradeoff theory of for-profit capital structure

The seminal 1958 work by Modigliani and Miller shows that under a set of perfect capital market assumptions a firm's cost of capital is not influenced by the firm's choice of debt or equity financing. (Modigliani & Miller, 1958) Modigliani and Miller's assumptions include limitless access to debt and equity capital for firms, the ability to borrow and lend without transactions costs, the absence of bankruptcy costs and the absence of subsidies to use a certain kind of financing. Modigliani and Miller also assume firms are investor owned and they do not attempt to describe how the cost of capital for a NFP firm changes with its financing choices. Under these assumptions, adding relatively less expensive debt to a firm's capital structure will cause increases in the financial risk of the firm and hence increases in equity holders' required returns. The increase in required returns on equity will perfectly offset any reductions that might have occurred as a result of the increase in leverage, leaving the firm's overall cost of capital unchanged. In practice, however, Modigliani and Miller's assumptions do not hold and the existence of corporate taxes, subsidies for debt financing (i.e. the tax deductibility of interest expense) and bankruptcy costs imply that a firm can make capital structure choices to minimize its cost of capital. These conclusions are the basis of the "tradeoff theory" of capital structure. The tradeoff theory suggests that since interest payments on debt are tax deductible, firms can reduce their cost of capital by incorporating more debt into their capital structures. However, at some point increases in leverage increase the firm's risk of bankruptcy. This risk induces costs of financial distress, including strained relationships with suppliers and consumers and losses from being forced to sell assets at below market values. After some optimal leverage point, the present value of these costs of financial distress will outweigh the benefit of the interest tax

shields that debt creates. That optimal leverage point minimizes the firm's cost of capital and so firms should work to maintain this optimal mix of debt and equity.

Tradeoff theory of not-for-profit capital structure

Not-for-profit hospitals do not pay taxes and cannot enjoy benefits of tax deductible interest. However, NFP hospitals do face their own set of market imperfections including unique tax benefits and barriers to raising capital. These characteristics cause NFP hospitals' cost of capital to vary for different combinations of debt and equity financing in the same way that the tradeoff theory describes. For NFP firms, the benefits of issuing debt come not through tax deductibility of interest, but through the ability to issue tax-exempt debt and the non-monetary nature of the required return on equity. Much like in the investor-owned case, the cost of additional leverage is an increase in the expected cost of financial distress. The result is that, like investor-owned firms, NFP firms have an optimal leverage ratio at which the cost of capital is minimized. Each of the market imperfections that creates this optimal leverage ratio is discussed in greater detail below.

Tax-exempt debt

For NFP organizations the benefits of additional leverage come not through the tax deductibility of interest but through another subsidy to use debt---the ability to issue tax-exempt debt. This debt is tax-exempt in the sense that the debt-holder is not required to pay income taxes on the interest payments received. As a result the debt holder is willing to accept a lower interest rate and the NFP firm is able to borrow at lower rates. Not-for-profit firms that finance their operations primarily with equity have an opportunity to decrease their cost of capital by adding more debt into their capital structures. For NFPs, tax-exempt debt is cheap relative to

equity financing because hospitals can engage in arbitrage by borrowing at below-market rates and investing the equity they hold in securities with returns above the risk free rate. This kind of arbitrage has been shown to be both theoretically possible (G. J. Wedig, Hassan, & Morrisey, 1996) and practically important in hospitals' capital structure decisions (Gentry, 2002; Wheeler, Smith, Rivenson, & Reiter, 2000). However, the amount of tax exempt debt NFP firms can issue is limited. A NFP firm's tax-exempt debt issues cannot exceed the value of the mission-supporting capital projects in which the NFP invests. As a result, the benefits of tax-exempt debt are limited by this project financing constraint.[5]

Donors' expected return on equity

Not-for-profit firms may benefit from increased leverage not only through their ability to issue tax exempt debt but also because the required returns on donated equity for these firms may not increase with leverage in the same way an investor-owned firm's required return on equity does. The nature of the returns expected by donors differs from the returns expected by suppliers of equity to for-profit organizations. For-profit equity investors expect a return that will compensate them for the market-risk of the security they purchase. This required return can be estimated using information about covariance between the returns on the firm's stock and returns on the market as a whole. For NFP firms, the nature and cost of the returns donors expect from their contributions to hospitals are poorly defined and have been the subject of academic debate. (Pauly, 1986; Silvers & Kauer, 1986) While it is safe to assume everyone investing in publicly

[5] It is important to note that regulations have been written to limit the extent of tax arbitrage. However, enforcing these regulations can be difficult. The regulations prohibit hospitals from directly investing borrowed funds into financial markets for the purpose of arbitrage. However, the regulations do not prevent hospitals from borrowing to fund projects that they might otherwise have funded with cash from their endowments, while investing endowment assets into financial markets. (Gentry, 2002)

traded equity is pursuing the same monetary return, it is quite possible that the nature of the return expected by charitable donors is specific to the individual donor. Some donors may expect their donations to be used in adding capacity to a hospital while others may expect their donations to be used in expanding charity care provision. Still others may donate to fulfill a vague sense of obligation to support a healthcare organization within their community, with little expectation about how that donation will be used.

The non-monetary nature of donors' required returns has two interesting implications for a NFP hospital's cost of capital. First, hospitals with relatively little debt are likely to find that debt is much cheaper than donated equity financing. This may be true either because the fundraising costs required to solicit large amounts of donated capital are substantial or because the returns a hospital must promise to philanthropists to induce large donations are particularly costly. (D. G. Smith, Clement, & Wheeler, 1995) Second, the expected return on equity donated to a hospital probably does not increase with leverage in the same way the expected return on equity does for an investor-owned firm. If NFP hospital donors do not increase their required rates of return as leverage increases, NFP hospitals with relatively low leverage will have the opportunity to lower their overall cost of capital by issuing additional debt.[6]

Required return on internally generated equity

[6] Unfortunately little research has been done to examine how hospital donor expectations change as hospital leverage increases. This is not surprising given the difficulty in defining what exactly donors expect and the related challenge of measuring the extent to which that expectation is met. Magnus does find a positive association between leverage and the amount of charity care a hospital provides and while the study does not directly address the how the required return on equity changes with leverage, this finding is consistent with the idea that the required return increases with leverage. (Magnus, Smith, & Wheeler, 2004) However, it is not clear whether this association occurs because donors demand greater returns as leverage increases or because charity care is a use of retained earnings and hospitals that provide more charity care have less internally generated equity available to finance investment and have a greater reliance on debt financing.

A relatively small portion of most investor-owned firms' equity comes directly from the proceeds of selling equity securities. In the same way, a relatively small portion of most NFP hospitals' equity comes from charitable donations. (Pauly, 1986) For the investor-owned firm there is no distinction between the required return on internally generated equity and the required return on equity provided by external investors. In either case the required return on equity is the opportunity cost of invested funds to equity holders. In the case of equity provided by new security issues the required return is the return of an alternative investment with a similar risk. The same is true in the case of retained earnings since investor-owned firms can distribute these earnings to equity holders in the form of dividends, and investors are able to invest this monetary return however they like. For NFP hospitals, however, there is a difference between donated and internally-generated equity. As discussed previously, the required return on donated equity is the cost of whatever action is required to induce a donor to give. However, unlike the investor-owned case, the opportunity cost of internally generated equity is different than the opportunity cost of externally provided equity. This is because NFP hospitals, unlike investor-owned firms, are legally prohibited from paying out the equity they generate internally as dividends. Rather, NFP hospitals have three options for using internally generated equity. A NFP hospital can either spend internally-generated equity on projects expected to produce a financial return, spend internally-generated equity on projects expected to produce a social return of value to the community[7] or retain internally-generated equity to insure the hospital's ability to remain solvent and continue providing services into the future. As a result, the cost of internally-generated capital for the NFP firm will be the value of the most valuable forgone use of those equity funds.

[7] One may wonder why NFP hospitals provide services of value to the community rather than particular services valued by equity donors. The reason is that the community as a whole provides NFP hospitals a substantial equity contribution in the form of corporate income tax and property tax exemptions. In fact, this is rarely an important distinction because the outputs valued by donors and the community are often the same.

In practice, this means that NFP hospital boards are frequently weighing the value of projects that produce a social or financial return against the value created by retaining equity funds to insure the NFP hospital's future viability.

While the value of real investment (for either a social or financial return) is unrelated to leverage, the value created by retaining internally generated equity is likely to increase with leverage. At relatively low leverage the likelihood that creditors will force a hospital into bankruptcy is low and the value created by retaining funds to insure the hospital's continued operation is also low. As leverage increases, board members are likely to place a higher value on holding additional equity as precautionary savings resulting in a rising cost of internal equity. Therefore, unlike the required return on donated equity which is likely to change little with leverage, the required return on internally-generated equity can be expected to increase with leverage. Wedig et al provide theoretical and empirical support for the idea that NFP hospital managers are risk averse and that this risk aversion causes the cost of capital to increase with leverage. (G. J. Wedig, 1994)

Expected costs of financial distress

As is the case for investor-owned firms, the expected costs of financial distress increase with NFP firm leverage. These include direct costs of bankruptcy litigation as well as indirect costs like strained relationships with suppliers, loss of market share and the forced sale of assets at a discount. These indirect costs can be significant. Research on investor-owned firms estimates that the magnitude of these indirect costs of financial distress range from 11% (Altman, 1984) to 23% (Andrade & Kaplan, 1998) of firm value. The expected value of these costs increases with leverage, since the probability of bankruptcy increases with leverage as well.

After the optimal leverage point, additional leverage will lead to increases in the expected cost of financial distress that exceed the benefits of additional debt.

Existence of an optimal level of debt

All of these capital market imperfections---the limited availability of tax-exempt debt, the poorly-defined required return on donated equity, boards' desire to retain internally-generated equity to insure future solvency and the presence of bankruptcy costs---suggest that NFP firms have an optimal leverage point at which their cost of capital is minimized. At relatively low leverage adding debt reduces the NFP's cost of capital by allowing it to enjoy the benefits of tax-exempt debt and avoiding the high costs of attracting additional donated equity. At some point the NFP hospital achieves a minimum cost of capital. As leverage increases, however, the costs of both debt and equity rise because the probability of bankruptcy and the costs of financial distress increase. Because the opportunity cost of a NFP's internally generated equity is the value of those funds held to maintain solvency rather than the opportunity cost to individual equity providers (as is the case for investor-owned firms) the cost of equity increases as well.

The existence of market imperfections, including bankruptcy costs, create an optimal level of debt. However, bankruptcy costs affect optimal leverage in two ways. The first is through the financial risk, discussed previously. Financial risk is the increase in the probability of bankruptcy that comes as a result of higher leverage. The second way bankruptcy costs can affect optimal leverage is through business risk. Unlike financial risk, business risk is unrelated to the degree of leverage a firm holds. Business risk is related to the variation in the cash flows a firm's operations generate. Business risk is dictated by the operations a firm undertakes as well as its position within product and factor markets and it is constant regardless of firm leverage.

However, firms with greater business risk have a higher probability of bankruptcy, higher expected costs of bankruptcy and hence a lower optimal leverage.

Not-for-profit firms, like for-profit ones, can minimize their costs of capital by choosing a specific combination of debt and equity. The existence of a minimum cost of capital suggests that hospitals should strive to maintain target leverage ratios that will allow them to enjoy this minimum cost of capital. There is empirical evidence that hospitals do in fact adopt target leverage ratios and manage their debt burdens towards these targets, (G. J. Wedig et al., 1996; Wheeler et al., 2000) though barriers to achieving the optimal cost of capital also exist.

Barriers to optimal NFP hospital leverage

Market imperfections imply that NFP firms have an optimal level of debt that minimizes their cost of capital. If these imperfections apply to all hospitals equally we would expect to see a relatively narrow range of NFP hospital leverage. Not-for-profit hospitals operate within the same general industry and most face similar business risks including exposure to national policy changes and changes in Medicare reimbursement rates and so the costs and benefits of additional leverage are similar for all NFP hospitals. In reality, however, the distribution of NFP hospital leverage is wide. In 2001 the top quartile of hospitals by leverage financed more than 45% of total assets with long-term debt. In the same year the bottom quartile of hospitals financed less than 18% of their assets using long-term debt. (Solucient, 2003)

This wide range of debt holdings is best explained not by differences in the optimal leverage ratios among NFP hospitals but by the existence of barriers to achieving the optimal leverage ratio. Many hospitals may be resigned to holding less debt than they would like because they lack the managerial expertise to access public debt markets, because the amounts

they need to borrow are not large enough to justify the fixed transactions costs of issuing public debt or because they lack addition investment opportunities needed to afford access to tax exempt debt. Other hospitals may hold more debt than is optimal because they have limited access to equity capital and face a choice between passing up profitable investment opportunities and maintaining a debt level that minimizes the cost of capital. The forces that prevent hospitals from either decreasing or increasing debt holdings towards the optimal leverage point are discussed in more detail below.

Barriers to increasing leverage

There are not obvious reasons that independent NFP hospitals should choose to pass up the benefits of tax-exempt debt financing and maintain a relatively low degree of leverage. Nevertheless, in 1996 only 30.6% of NFP hospitals reported using any tax-exempt debt at all. Those hospitals that did hold tax-exempt debt were larger than hospitals without tax exempt debt (holding a mean of $93 million in total assets compared to $17 million) and held more total debt than hospitals without tax exempt debt (mean of $31 million vs. $0.9 million). Since tax-exempt debt is typically issued through bond markets, these figures suggest that issuing bond debt through public markets in general and issuing tax exempt debt in particular involves substantial fixed transactions costs that make borrowing relatively small amounts costly. (Gentry, 2002) For small hospitals looking to borrow relatively modest amounts of debt these fixed costs of issuing public debt may make the effective interest rate on additional debt prohibitively high. The presence of these transaction costs is one notable barrier hospitals may face while trying to increase debt holdings[8], but these hospitals may face other barriers as well. The generally smaller hospitals that carry little debt may also lack the managerial expertise required to issue

[8] Technically, transactions costs and the increases they cause in the price of debt are not barriers to optimal leverage, but rather factors that increase the cost of capital.

and manage large debt portfolios. These facilities may prefer to employ managers with broad expertise to managers with narrow but well-developed expertise in obtaining financing. Small, under-levered facilities may also lack the investment opportunities required to take advantage of tax-exempt debt financing. When the project financing constraint binds and tax-exempt debt is not available, the benefits associated with higher leverage are much smaller.

Barriers to reducing leverage

Not-for-profit hospitals with more debt than is optimal may also find it difficult to reduce their leverage. These hospitals' limited access to equity capital is a major barrier to any attempt to reduce debt holdings. For instance, highly-levered hospitals may be able to reduce their cost of capital by incorporating additional equity into their capital structures. Unfortunately, NFP hospitals have limited access to equity capital and so reductions in leverage may not be possible. Unlike investor-owned firms, NFPs cannot raise equity capital by selling shares in the firm. Instead, NFPs are limited to raising equity through retained earnings and charitable donations. For many hospitals, recent declines in reimbursement have reduced the availability of retained earnings and donations are a small and unreliable source of equity capital (D. G. Smith, Wheeler, Rivenson, & Reiter, 2000; D. G. Smith & Clement, 2013). As a result, hospitals with profitable investment opportunities often face the choice between forgoing these opportunities increasing their leverage ratio and accepting the increased cost of capital that comes along with it.

The cost of capital and system membership

Market imperfections shape a hospital's cost of capital curve and create an optimal leverage point that minimizes the cost of capital, but other characteristics of NFP firms can prevent a hospital from attaining that optimal degree of leverage. These imperfections are likely

to affect independent and system-affiliated NFP hospitals differentially. In fact, when hospital industry publications and consultants suggest independent hospitals join multihospital systems to improve their access to capital, the implication is that system membership can reduce an acquired hospital's cost of capital. (Greene, 2014) Though industry publications rarely suggest why access to capital improves, finance theory offers a few possible explanations. Capital access could improve if system membership minimizes market imperfections so that a hospital faces a lower cost of capital at its current leverage or if system membership reduces the barriers a hospital faces in moving to its optimal leverage ratios. For under-levered hospitals, system membership can reduce the cost of debt by reducing high proportional transactions costs. System membership can also help under-levered hospitals add debt to their capital structures by overcoming barriers to debt access like a lack of financial expertise and a binding project financing constraint. For over-levered hospitals, system membership may help shift the cost of capital curve down by reducing bankruptcy risk and agency costs. Alternatively, systems may help highly-levered acquired hospitals move towards their optimal leverage point by providing equity financing or reducing debt levels.

Benefits of system membership for under-levered hospitals

Not-for-profit hospitals may be forced to maintain sub-optimal leverage ratios because transaction costs, a lack of financial management expertise or a binding project financing constraint prevents them from issuing additional debt. However, membership in a multihospital system can overcome these barriers to increasing leverage. By pooling the borrowing needs of multiple hospitals, hospital systems may borrow amounts large enough to minimize the fixed costs of bond issuance. The scale of multihospital system operations also enables systems to

employ managers with a narrow focus on issuing and managing debt. This financial expertise enables hospital systems to maintain higher leverage than independent hospitals could alone.

Hospital system membership has also developed ways to avoid being bound by the project financing constraint. Wedig, Hassan and Morrisey (1996) find that freestanding hospitals subject to the project financing constraint only take on additional tax-exempt debt after additional investment projects become available to relax the constraint. Surprisingly, system-affiliated hospitals subject to the constraint continue to issue tax exempt debt but do not make large capital investments. Wedig et al note this as an area of future research but suggest that some system-affiliated hospitals are using capital investments in other system hospitals to satisfy the project financing constraint.

Benefits of system membership for over-levered hospitals

For highly-levered hospitals, increases in leverage are associated with large increases in the cost of capital. These increases are driven by a high expected cost of bankruptcy. System membership can reduce these costs and flatten the steep cost of capital curve for high-leverage hospitals. In addition to changing the shape of an acquired hospital's cost of capital curve, systems may also serve as a source of equity allowing hospitals to reduce their leverage ratios and move closer to optimal leverage.

As described previously, increases in the expected costs of financial distress cause the cost of capital to increase with leverage for hospitals with relatively high debt burdens. Wedig et al (1998) suggest that hospitals operating in systems face smaller fluctuations in their cash flows and hence a lower risk of bankruptcy than similarly levered independent hospitals. This is because hospital systems receive cash flows from multiple hospitals and as long as individual hospitals' cash flows are not perfectly correlated, cash flow volatility will be lower for a hospital

system than for an independent hospital. Consequently, the probability of bankruptcy caused by an unforeseen shortfall in cash flow is smaller for hospital systems than for an independent hospital. As a result, at a given level of debt, additional debt should be associated with smaller increases in risk for system hospitals than for independent hospitals. There is some indirect evidence to suggest that greater diversity of system cash flows than independent cash flows affects system hospitals' leverage decisions. Wedig et al (G. Wedig et al., 1998) finds a weaker relationship between hospital leverage and local market conditions for system hospitals than for independent hospitals which suggests cash flows from hospitals within a system may be used to make debt payments on behalf of other system hospitals when necessary.

In addition to reducing a hospital's cost of capital at a given leverage ratio, system membership can also help acquired hospitals reduce their leverage ratios, moving them down the cost of capital curve towards an optimal leverage ratio. This could occur if the acquiring system purchases assets on behalf of the acquired hospital without increasing the acquired hospital's debt burden. Alternatively, an acquiring system could pay off the debt held by an acquired hospital. This would be especially beneficial if the system is able to issue debt at lower rates than the acquired hospital. It is reasonable to assume hospital systems have greater stores of equity than most acquired independent hospitals. Prior research has found an association between consolidated ownership and profitability (Clement, McCue, Luke, Bramble, & et al, 1997) suggesting that hospital systems may be better able to generate equity financing from retained earnings than independent hospitals. The availability of retained earnings is especially important for NFP hospitals since retained earnings are their primary source of equity capital.

Hypotheses

Theory suggests system membership reduces barriers independent hospitals face in realizing their optimal leverage ratio. System membership can change the shape of a hospital's cost of capital curve by reducing agency costs and the probability of bankruptcy. These factors will affect leverage of acquired hospitals differently depending on whether the acquired hospital is under-levered, over-levered or optimally levered in the period before acquisition. Hospitals with relatively low leverage in the pre-acquisition period are the most likely to be under-levered and facing barriers to additional debt issuance that system membership can help overcome. This reasoning leads to the following hypothesis:

H1: *Acquired hospitals with relatively low leverage in the pre-acquisition period should experience increases in leverage after joining multihospital systems.*

Highly-levered hospitals, on the other hand, are the most likely to be over-levered. But the change in leverage that should occur when these hospitals join a system is less clear than in the low-leverage case. High-leverage hospitals joining systems may gain access to new sources of equity that enable them to decrease their leverage ratios. However, if the cost of capital curve flattens enough (because of changes in the expected costs of financial distress), the acquired hospital could realize a lower cost of capital at its pre-acquisition leverage point, even without reducing its leverage. If the reduction in the hospital's cost of capital is sufficiently large, and if the hospital has investment opportunities available, a highly-levered hospital may actually choose to issue additional debt to fund its investment opportunities. The direction of the predicted change in leverage for high-leverage hospitals depends on the relative magnitude of the

increases in access to equity and the reductions in financial distress costs. Many of the independent hospital acquisitions reported by Irving Levin and Associates included stipulations that the acquiring system pay off some of the acquired hospital's debt (Irving Levin Associates, 2006; Irving Levin Associates, 2010) so in practice system equity seems to have an important effect while the importance of changes in financial distress costs is less sure. These factors lead to the following hypothesis:

H2: *Acquired hospitals with relatively high leverage in the pre-acquisition period should experience decreases in leverage after joining multihospital systems.*

It is important to develop hypotheses that are conditional on hospital leverage in the pre-acquisition period since these hypotheses predict opposing effects for under- and over-levered hospitals. It is also important because moderately-levered hospitals are the most likely to be maintaining optimal leverage and hence the least likely to experience changes in leverage associated with system membership.

Data

Study data come from two sources, the American Hospital Association (AHA) hospital database records from 1996-2009 and Medicare Cost Report (MCR) records from 1996-2009. The AHA data come from files maintained and updated yearly by the AHA. Medicare Cost Report data are collected by CMS and contain information on costs incurred by all US hospitals that accept Medicare patients as well as other hospital characteristics. Data used in this study come from Schedule G of the cost report. Medicare Cost Report data are audited and widely

used in academic research (for example, (Dranove & Lindrooth, 2003; Kim & McCue, 2008)(Bazzoli, Chan, Shortell, & D'Aunno, 2000)). However, these data have also been criticized as inaccurately describing hospitals' financial conditions and the costs hospitals incur in providing care. (Kane & Magnus, 2001; S. A. Magnus & Smith, 2000) Unfortunately, most sources of hospital financial data have limitations and a nationally representative dataset containing audited financial information at the hospital level is not available ((Medicare Payment Advisory Commission, 2004)).

The sample is also restricted to NFP hospitals, since this study focuses on how system membership changes NFP hospitals' ability to access debt capital. We have also excluded a number of hospitals with unusual organizational characteristics that may affect the way they manage debt. These excluded hospitals consist of hospitals owned by the state, local and federal governments, hospitals located in US territories outside the 50 US states, hospitals not classified by the AHA as providing general acute care services and hospitals that did not appear in both the AHA and MCR data. Hospitals with multiple system status changes and hospitals with system status changes that could not be confirmed are excluded also. The derivation of the sample is described further in Table 3.1. Several hospitals were excluded because they had missing data or data values that were unrealistically large or small. We list the rules used to define unrealistic data in Table 3.2.

Hospitals are required to file partial-year cost reports in cases where ownership changes or the organization adopts a new beginning date for its fiscal year. As a result, the Medicare Cost Report data occasionally contain multiple reports for the same hospital in the same year. When this was the case for acquired hospitals we kept the earlier observation if the duplicate occurred in the pre-acquisition period and the later observation if the duplicate occurred in the

post-acquisition period. When independent hospitals without a change in system status had duplicate observations we retained the later of the duplicate observations.

Measures

Leverage

This study uses two measures of leverage, both of which are frequently used in financial research and in practice. The first is the ratio of long term debt to total assets. This ratio captures the percentage of all of an organization's assets that are financed by long-term debt (not including short term liabilities. Long-term debt holdings include mortgages, loans and bond notes but exclude the current portion of these liabilities. The second leverage measure is the ratio of long-term debt to net fixed assets. The two measures are similar but can capture slightly different dimensions of leverage because NFP hospitals often hold large stores of cash (Rivenson, Wheeler, Smith, & Reiter, 2000; Rivenson, Reiter, Wheeler, & Smith, 2011) which can have a large effect on a hospital's long-term debt to total asset ratio but no effect on a hospital's long-term debt to net fixed asset ratio. Consider a hospital that has substantial equity stored as cash holdings and that finances most of its capital purchases using debt. This hospital may have a moderate leverage when leverage is measured using the long-term debt to total asset ratio but high leverage when leverage is measured using the long-term debt to net fixed asset ratio. The long-term debt to total asset ratio is a better measure of a hospital's capacity to take on additional debt since it includes cash holdings in the denominator, whereas long-term debt to net fixed assets is a better measure of a hospital's propensity to use debt in making capital purchases. As a result the long-term debt to net fixed asset ratio should be more sensitive to leverage changes in low-leverage hospitals that have trouble using debt financing.

Empirical tests of the hypotheses developed earlier also require classifying hospitals as "high" or "low" leverage. Unfortunately there are not natural definitions of "high" and "low" leverage. For this study "high leverage" is defined as leverage above the 75th percentile of independent hospital leverage. Similarly, "low leverage" hospitals are below the 25th percentile of independent hospital leverage. Acquired hospitals' degree of leverage was determined by their debt holdings in the year before acquisition. Table 3.3 shows average leverage for independent hospitals in study years.

System status

Data on system status is taken from the AHA hospital database. In keeping with previous research in this area, the *sysid* variable generated from AHA internal files is used rather than the *mhsmemb* variable, which is based on a hospital's response to the AHA annual survey (Dranove & Lindrooth, 2003). Two categories of system membership are included in the sample—hospitals that are independent throughout the study period and hospitals that are independent then join a hospital system. The AHA definition of a hospital system includes single hospital systems. A freestanding hospital can be considered a member of a system if the hospital is closely affiliated with three or more other healthcare organization (AHA Guide, 2005). Many of the potential benefits of system membership may not be realized for these single hospital systems. Therefore, the system membership variable is adjusted to exclude hospitals in systems containing only one or two hospitals. These hospitals are excluded from the analysis since they are not classified as system hospitals but cannot be classified as independent hospitals either. This definition is similar to the one used by the bond rating agency Standard and Poor's (Standard and Poor's 2013). Whether the effects of system membership differ for one to two hospital systems versus larger systems is an opportunity for future research.

A two-step procedure was used to identify independent hospitals that joined systems. First, data from the AHA annual survey for the years 1996-2009 were analyzed to identify changes in a hospital's system status. Cases were identified where a hospital was not classified as a member of a hospital system, then, in the next year, the hospital was classified as a system member. This yielded a list of 519 transactions in which an independent hospital joined a system. However, in researching some of these transactions it became apparent that a system membership change did not occur as indicated by the AHA data. To resolve these discrepancies, two sources were consulted--the annual lists of hospital mergers and acquisitions published by Modern Healthcare and the Hospital Acquisition Reports published by Irving Levin and Associates. If neither the Modern Healthcare lists nor the Hospital Acquisition reports contained a record of an independent hospital's acquisition, the hospital's webpage and online news coverage were used to find evidence of the transaction. If none of these attempts yielded confirmation that the transaction occurred, the hospital was eliminated from the sample. Unconfirmed acquisitions were eliminated from the sample for several reasons. First, some hospitals with unconfirmed transactions clearly listed a system affiliation on their webpages but did not offer information about the date on which they joined a system. In these cases it was impossible to assign a system status to each hospital year since only the current system status was known. In other cases, the hospital websites did not contain information about a system affiliation. However, some hospitals with confirmed system affiliation do not prominently display their affiliation on their websites so the lack of information about system-affiliation is not adequate justification for classifying these hospitals as independent. The final sample contains information on 109 acquired NFP hospitals and 972 NFP hospitals that remained independent

throughout the sample period Table 3.4 summarizes the number of confirmed acquisitions that took place in each year included in the data.

In addition to dropping hospitals that are members of one or two hospital systems, two other sets of hospitals are dropped from the sample-- hospitals that the AHA data suggest have undergone multiple changes in system status and hospitals that become independent after having been affiliated with a system. This is done for two reasons. First, the system status data on these hospitals may not be accurate, especially in the case of hospitals with multiple system status changes. Second, this study's hypotheses are based on the common claim that joining a system affects a hospital's access to capital. There are no similar claims to guide our expectations about leverage among hospitals leaving systems or hospitals with multiple system changes. This study's results can speak to the effects of independent hospitals joining systems, though dropping cases of multiple changes in system membership will certainly limit the generalizability of these results.

Methods

This study uses a difference-in-difference estimator to quantify the effects of system membership on hospital leverage. This estimator compares leverage changes in acquired hospitals before and after acquisition to changes in leverage for a control group of hospitals identified using propensity score matching. This method makes a strong case for the causal effect of system membership. The hypotheses state that under-levered hospitals should increase their leverage after joining systems while over-levered hospitals should decrease their leverage. Using a simple pre-post comparison, simple regression to the mean could produce results that supported these hypotheses, even if system membership had no effect on hospital leverage.

However, the difference in difference estimator compares changes in leverage for acquired hospitals to changes in leverage for independent hospitals with similar characteristics. This method will provide a good estimate of the effect of system membership on hospital leverage unless changes in leverage for the acquired hospitals would have been systematically different than changes in leverage for the matched controls, even if the acquired hospitals had remained independent. These estimates would be biased if hospital systems selectively acquired hospital that were likely to experience large changes in leverage even without being acquired, but there is no obvious reason to suspect systems selectively acquire hospitals likely to experience large changes in leverage.

To minimize the chance that study estimates are affected by selection bias, control hospitals are identified using propensity score matching. This method uses a propensity score (in this case the probability of a hospital joining a multihospital system) to match acquired hospitals to independent control hospitals with similar values of observed covariates. Propensity score matching requires that acquired and control hospitals be matched on variables that affect both a hospital's likelihood of joining a system and a hospital's leverage. (Caliendo & Copeinig, 2005) The propensity score is modeled using measures of a hospital's leverage, its cash holdings, its bed size, its return on assets, whether it is located in a metropolitan area, a small urban area or a rural area, and a number of market variables including the percent of a county's residents without insurance, median county income and the number of other hospitals in the county. Propensity score matching balances the distribution of these covariates so that they are similar in the acquired hospital group and the control group.

Table 3.5 shows descriptive statistics for three groups of hospitals -- acquired hospitals, the sample of independent matched control hospitals and the entire sample of permanently

independent hospitals. In the pre-acquisition period acquired hospitals have slightly higher leverage than permanent independent hospitals and fewer days cash on hand. They are also more likely to come from metropolitan areas and less likely to come from rural areas than permanent independent hospitals. Acquired hospitals in the sample are larger than permanent independent hospitals (with a mean bed size of 214 compared to 164 for independent hospitals), and have a lower return on assets (0.47% vs. 2.7%). Despite differences between the acquired hospitals and the population of independent hospitals, the matching method selects a group of control hospitals that is similar to acquired hospitals. Table 3.5 shows control hospitals are still slightly smaller than acquired hospitals and the mean return on assets among control hospitals is slightly larger than among acquired hospitals but these differences are small and the acquired and control groups closely resemble each other in all other observable respects.

One of the challenges to implementing the difference in difference method was identifying a post-acquisition period for control hospitals, since acquired hospitals joined systems in different years of the study. To deal with this, acquired hospitals were matched to controls in the pre-acquisition year. Changes in leverage are observed one and two years after acquisition. For example, a hospital acquired in 2000 would be matched to three other hospitals with characteristics similar to its own in 1999 (the year before acquisition). Next, changes in leverage from both 1999 to 2001 and 1999 to 2002 would be used to calculate leverage difference in differences one and two years after acquisition. By measuring leverage changes in the two years after acquisition we have allowed enough time for systems to make leverage changes in acquired hospitals. A longer post-acquisition follow-up period would also limit our already small sample size.

Results

Results suggest that, on average, acquired hospitals experience increases in leverage after joining systems. However, most of this increase is concentrated among hospitals with relatively low pre-acquisition leverage which tend to have large increases in leverage. Table 3.6 shows estimated changes in leverage for both measures of leverage, long-term debt to total assets and the long-term debt to net fixed assets. "Low leverage" hospitals (those that had leverage below the 25th percentile of all independent hospitals in the pre-acquisition period) experience substantively large and statistically significant increases in leverage compared to matched control hospitals. The long-term debt to total assets ratio increased by almost 15 percentage points while the long-term debt to total assets ratio increased by 24 percentage points. In all sample years this is a large enough increase to move a "low leverage" acquired hospital to a level of leverage equal to the median system-affiliated hospital. These increases were caused by increases in leverage among acquired hospitals rather than declines in leverage among control hospitals. On average, control hospital leverage was relatively stable. The increases in leverage occurred in the first year after acquisition and were sustained through the second post acquisition year. Moreover, these results do not appear to be driven by a few outlier observations. Of the 19 low leverage hospitals, almost 75% (14 hospitals) experienced post acquisition increases in leverage (relative to the leverage changes of their control hospitals). In contrast to the large increases in leverage seen for low-leverage acquired hospitals, there is no evidence that highly-levered hospitals experienced changes in leverage. Estimates of the changes in leverage for these hospitals range from a decrease of 4.5 percentage points to an increase of 1.6 percentage points, much smaller the that large changes in leverage seen in the low-leverage subgroup. Part

of the reason for the small magnitude of the average changes is that there were almost as many hospitals that decreased their leverage (21 hospitals) as increased it (17 hospitals).

Discussion

These results shed new light on one of the often cited benefits of system membership, its effect on access to debt capital. The observed increases in leverage for low-leverage hospitals are consistent with the idea that system membership helps low leverage independent hospitals overcome barriers to issuing debt while the null results for high leverage hospitals seem to suggest system membership does not offer these hospitals access to new sources of equity that can be used to reduce leverage. However, these conclusions come with important caveats.

Before concluding that system membership improves access to debt for low-leverage hospitals it would be helpful to know more about specific mechanisms that caused these changes to occur. The paper's hypotheses suggest under-levered hospitals increase their leverage after acquisition because system membership gives the acquired hospital access to financial expertise, because it reduces transactions costs of issuing debt and because it may relax the project financing constraint. However, there are other possible explanations for the observed changes in leverage. It is possible that the increases in leverage are simply allocations of the total system's leverage and that these allocations have no effect financially or operationally on the acquired hospital. Alternatively, these increases in leverage could occur if systems require acquired hospitals to bear the burden of the system debt issued to fund the acquisition. (However, if this were the case we would expect to see leverage increases among the sample of highly-levered acquired hospitals as well.) Even if increases in leverage are the result of improved access to debt, questions remain about what this debt is used to fund. Possibilities include capital

investment, the purchase of financial securities for arbitrage, community benefit or some other pursuit. Unfortunately, data on hospital finances is sparse and often lacks the detail required to answer these questions. In the future qualitative research may be a useful tool for pursuing answers to these important questions.

It is also difficult to conclude with certainty, despite the null results for high-leverage hospitals, that system membership does not affect debt management for these facilities. As discussed earlier in the paper it is possible that some acquired hospitals may respond to system membership by reducing their leverage (because system membership brings with it access to additional equity) while other hospitals respond to system membership by increasing leverage (because the reductions in bankruptcy risk reduce the hospital's cost of capital at its existing leverage and reduce the marginal cost of additional debt as well). Thus system membership could affect debt access in ways that produced two opposing results. If system membership causes some hospitals to increase leverage and others to decrease it, the net result would match this paper's results. Unfortunately there is no apparent way to distinguishing between which high-leverage hospitals we would expect to increase leverage and which we would expect to decrease leverage. Another barrier to concluding system membership has little effect on highly-levered hospitals, is that the paper's definition of highly levered (having leverage greater than the 75^{th} percentile of all independent hospitals) may be too generous. It is possible that this measure classifies some hospitals as highly levered when in reality the hospitals are not yet experiencing high costs of financial distress or they lack other characteristics which would serve as incentives to reduce leverage.

Whether a hospital is optimally-levered, over-levered or under-levered is a difficult construct to measure. Percentile cutoffs are not ideal since they do not consider factors that

could affect hospitals' optimal leverage. Percentile cutoffs measures may also be affected by temporary, transitory changes in leverage that do not reflect true barriers to increasing or decreasing a hospital's debt holdings. One way to improve the classification of hospitals as low or high leverage would be to better understand how each hospital in the sample came to its present leverage. For instance, some highly-levered hospitals may have maintained high leverage over many years whereas others may have experienced consistent yearly increases in leverage. Hospitals that have become highly-levered through consistent past increases in leverage seem more likely to be suffering from a lack of equity financing while hospitals that quickly added leverage then maintained relatively high debt holdings are likely to be highly levered because their optimal leverage is higher. Better understanding the trajectory of a facility's leverage could help develop better measures to understand whether the hospital is optimally levered and what imperfections, if any, affect it.

Conclusion

Little is known about the financial benefits of system membership even though a good understanding of these benefits is important to independent hospital board members as they weigh the costs and benefits of consolidation strategies. Public regulators must also understand the financial benefits of system membership as they decide whether to allow or discourage hospital consolidation. This paper uses recent data and a research design with high internal validity to examine the effects of system membership on hospitals' access to debt. The results suggest that debt holdings do increase for hospitals with relatively low leverage in the pre-acquisition period. This is consistent with the notion that system membership helps improve access to debt capital for hospitals facing challenges to issuing debt. However, to fully

understand the extent of the financing benefits system membership provides, more information is needed about the mechanisms that lead to changes in leverage and about the ways this additional debt is used by acquired hospitals.

Table 3.1: Sample selection

	Acquired hospitals	Permanent independent hospitals
US General acute care hospitals*	576	1,865
Couldn't be matched to MCR	519	1,684
Dropping unconfirmed acquisitions	219	1,684
Keeping only NFP owned facilities	156	982
After deleting missing/unrealistic data	155	972
After deleting multiple observations	155	972
Excluding acquired hospitals without 2 years of post-acquisition data	109	972

**Excludes military and federal hospitals as well as hospitals with multiple system status changes and all hospitals that are not NFP owned*

Table 3.2: Rules defining outliers

		Acquired hospitals		Permanent Independent	
Variable	**Rule**	**Hospitals affected**	**Hospital years affected**	**Hospitals affected**	**Hospital years affected**
LTD / total assets	<75th percentile + (4 x IQR)	3	4	26	80
LTD / net fixed assets	<75th percentile + (4 x IQR)	5	7	48	82
Days cash on hand	<75th percentile + (4 x IQR)	0	0	20	59
Return on assets	<75th percentile + (4 x IQR) and >25th percentile - (4 x IQR)	8	8	160	244
---	Acquired hospital observed before and after acquisition	1	1	0	0

Table 3.3: Independent NFP hospital leverage by year

	Long-term debt to total assets			Long-term debt to net fixed assets		
Percentile	**25th**	**50th**	**75th**	**25th**	**50th**	**75th**
1996	0.136	0.254	0.379	0.316	0.581	0.911
1997	0.119	0.244	0.371	0.278	0.583	0.882
1998	0.133	0.252	0.374	0.316	0.600	0.913
1999	0.122	0.251	0.373	0.292	0.595	0.896
2000	0.139	0.256	0.379	0.328	0.594	0.899
2001	0.150	0.259	0.383	0.352	0.595	0.900
2002	0.153	0.282	0.400	0.351	0.624	0.932
2003	0.169	0.289	0.412	0.384	0.689	1.000
2004	0.176	0.293	0.413	0.404	0.683	0.988
2005	0.167	0.295	0.401	0.389	0.674	0.984

Table 3.4: NFP hospital acquisitions by year

1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
15	23	17	7	21	3	4	9	4	6

Note: Figures only include acquisitions that maintained the hospitals NFP status

Table 3.5: Pre-acquisition hospital characteristics

	Acquired		Control		All Independent Hospitals	
	mean	**sd**	**mean**	**sd**	**mean**	**sd**
LTD to Total assets	0.33	0.19	0.33	0.2	0.29	0.19
Days cash on hand	94	83	92	91	115	107
Median county income ($)	42,464	10,399	41,953	10,907	43,444	11,787
Percent uninsured (county)	13.0	3.9	13.0	4.6	13.8	4.9
Metropolitan area	0.72	0.45	0.73	0.44	0.51	0.5
Small urban area	0.24	0.42	0.22	0.41	0.3	0.46
Rural area	0.05	0.21	0.05	0.21	0.19	0.39
Hospital size (beds)	214	176	203	162	164	148
Number of hospitals (county)	5.7	7.4	5.3	10	5.3	12.5
Return on assets (%)	0.47	6.7	0.74	7.4	2.7	6.5
N		109		327		11,030

Note: Statistics describe pre-acqusiition characteristics of acquired hospitals and the corresponding hospital-years for matched controls. Controls based on propensity score matching using LTD to total assets as a measure of leverage. Results obtained for controls matched using LTD to net fixed assets are not substantively different.

Table 3.6: Difference in difference estimates of changes in leverage

	Pre-acquisition to 1 year after			Pre-acquisition to 2 years after		
All acquired hospitals						
	Acquired	**Control**	**DiD**	**Acquired**	**Control**	**DiD**
LTD to Total assets	0.045	0.0013	0.044**	0.039	0.0002	0.039
	(0.020)	(0.0066)	(0.021)	(0.022)	(0.0073)	(0.024)
LTD to Net fixed assets	0.096	0.010	0.086	0.097	-0.010	0.104
	(0.047)	(0.022)	(0.053)	(0.056)	(0.022)	(0.057)
N	109	327	---	109	327	---
Low leverage						
	Acquired	**Control**	**DiD**	**Acquired**	**Control**	**DiD**
LTD to Total assets	0.153	0.0048	0.149**	0.152	0.006	0.146**
	(0.055)	(0.0098)	(0.054)	(0.054)	(0.018)	(0.061)
LTD to Net fixed assets	0.30	0.013	0.29**	0.30	0.016	0.29**
	(0.10)	(0.046)	(0.11)	(0.11)	(0.053)	(0.11)
N (based on LTDTA)	20	60	---	20	60	---
N (based on LTDNFA)	19	57	---	19	57	---
High leverage						
	Acquired	**Control**	**DiD**	**Acquired**	**Control**	**DiD**
LTD to Total assets	-0.006	-0.011	0.005	0.010	-0.005	0.016
	(0.029)	(0.013)	(0.03)	(0.400)	(0.014)	(0.043)
LTD to Net fixed assets	-0.012	-0.003	-0.010	-0.056	-0.011	-0.045
	(0.079)	(0.041)	(0.093)	(0.095)	(0.037)	(0.091)
N (based on LTDTA)	42	126	---	42	126	---
N (based on LTDNFA)	38	76	---	38	76	---

Note: Low leverage includes acquired hospitals with leverage below the 25th percentile of all independent hospitals. High leverage includes acquired hospitals with leverage above the 75th percentile of all acquired hospitals. Percentiles are based on distribution of independent hospital leverage, not acquired hospital leverage. The number of observations in the low and high leverage subgroups varies slightly based on which measure of leverage is used to define "low" or "high" leverage. Standard errors are shown in parentheses. Significance is based on t-tests of difference in differences. Differences for acquired and control hospitals do not add up to the total difference in differences because of rounding error.

** Significant at 5% level

*Significant at 10% level

References

Altman, E. (1984). A further empirical-investigation of the bankruptcy cost question. *Journal of Finance, 39*(4), 1067-1089.

American Hospital Association. (2013). *Fundamental transformation of the hospital field.*

Andrade, G., & Kaplan, S. (1998). How costly is financial (not economic) distress? evidence from highly leveraged transactions that became distressed. *Journal of Finance, 53*(5), 1443-1493.

Ault, K., Childs, B., Wainright, C., & Young, M. (2011). Relevant factors to consider prior to an investor-owned acquisition of a nonprofit healthcare entity. *Journal of Healthcare Management, 56*(4), 269-80; discussion 280-1.

Bazzoli, G. J., Chan, B., Shortell, S. M., & D'Aunno, T. (2000). The financial performance of hospitals belonging to health networks and systems. *Inquiry : A Journal of Medical Care Organization, Provision and Financing, 37*(3), 234-252.

Burns, L. R., & Pauly, M. V. (2002). Integrated delivery networks: A detour on the road to integrated health care? *Health Affairs, 21*(4), 128-43.

Byrd, C., & McCue, M. (2003). Can your hospital remain independent? *Healthcare Financial Management, 57*(9), 40-44.

Caliendo, M., & Copeinig, S. (2005). *Some practical guidance for the implementation of propensity score matching.* (Discussion Paper No. 1588). Bonn, Germany: IZA.

Carlson, J., & Galloro, V. (2009). M&A: An upside to a down market. *Modern Healthcare, 39*(3), 22-31.

Clement, J. P., McCue, M. J., Luke, R. D., Bramble, J. D., & et al. (1997). Strategic hospital alliances: Impact on financial performance. *Health Affairs, 16*(6), 193-203.

Dranove, D., Durkac, A., & Shanley, M. (1996). Perspective: Are multihospital systems more efficient? *Health Affairs, 15*(1), 100-104.

Dranove, D., & Lindrooth, R. (2003). Hospital consolidation and costs: Another look at the evidence. *Journal of Health Economics, 22*(6), 983-997.

Gentry, W. M. (2002). Debt, investment and endowment accumulation: The case of not-for-profit hospitals. *Journal of Health Economics, 21*(5), 845-872.

Greene, J. (2014, 3/22/14). Beaumont-oakwood-botsford alliance could give merged system access to capital. *Crain's Detroit Business,*

Herman, B. (2014). How much do hospitals pay to find a partner? A case study. Retrieved, 2014, Retrieved from http://www.beckershospitalreview.com/hospital-transactions-and-valuation/how-much-do-hospitals-pay-to-find-a-partner-a-case-study.html

Irving Levin Associates, I. (2006). *The hospital M&A market: Five year review and outlook.* (No. 1). Norwalk, CT: Irving Levin Associates, Inc.

Irving Levin Associates, I. (2010). *The hospital M&A market: Five-year review and outlook.* (No. 2). Norwalk, CT: Irving Levin Associates, Inc.

Janiga, N., & Muller, M. (2013). 7 common reasons for hospital transactions | news & analysis Retrieved, 2013, Retrieved from http://www.beckershospitalreview.com/news-analysis/7-common-reasons-for-hospital-transactions.html

Kane, N. M., & Magnus, S. A. (2001). The medicare cost report and the limits of hospital accountability: Improving financial accounting data. *Journal of Health Politics, Policy and Law, 26*(1), 81-105.

Kim, T. H., & McCue, M. J. (2008). Association of market, operational, and financial factors with nonprofit hospitals' capital investment. *Inquiry : A Journal of Medical Care Organization, Provision and Financing, 45*(2), 215-231.

Levitt, S. (1994). Quality of care and investment in property, plant, and equipment in hospitals. *Health Services Research, 28*(6), 713-727.

Magnus, S. A., & Smith, D. G. (2000). Better medicare cost report data are needed to help hospitals benchmark costs and performance. *Health Care Management Review, 25*(4), 65-76.

Magnus, S. A., Smith, D. G., & Wheeler, J. R. C. (2004). The association of debt financing with not-for-profit hospitals' provision of uncompensated care. *Journal of Health Care Finance, 30*(4), 46-58.

Medicare Payment Advisory Commission. (2004). *Report to the congress: Sources of financial data on medicare providers.* (Report to the Congress No. 2013).

Melnick, G., & Keeler, E. (2007). The effects of multi-hospital systems on hospital prices. *Journal of Health Economics, 26*(2), 400-413.

Mitrakos, A. (2012). Provena, resurrection merger costs approach $20 million. Retrieved, 2014, Retrieved from http://www.chicagobusiness.com/article/20120621/NEWS03/120629958/provena-resurrection-merger-costs-approach-20-million#

Modigliani, F., & Miller, M. (1958). The cost of capital, corporation finance and the theory of investment. *American Economic Review, 48*(3), 261.

Pauly, M. V. (1986). Returns on equity for not-for-profit hospitals. *Health Services Research, 21*(1), 1-28.

Rivenson, H., Reiter, K., Wheeler, J., & Smith, D. (2011). Cash holdings of not-for-profit hospitals. *Journal of Health Care Finance, 38*(2), 24-37.

Rivenson, H., Wheeler, J., Smith, D., & Reiter, K. (2000). Cash management in health care systems. *Journal of Health Care Finance, 26*(4), 59-69.

Silvers, J., & Kauer, R. (1986). Returns on equity for not-for-profit hospitals: Some comments. *Health Services Research, 21*(1), 21.

Sloan, F. A., Conover, C. J., & Ostermann, J. (2003). Rates of return from hospital conversions. *Health Care Manage.Review, 28*(2), 107.

Smith, D. G., Wheeler, J. R., Rivenson, H. L., & Reiter, K. L. (2000). Sources of project financing in health care systems. *Journal of Health Care Finance, 26*(4), 53-58.

Smith, D. G., & Clement, J. P. (2013). Hospital philanthropy. *Journal of Health Care Finance, 39*(3), 53-58.

Smith, D. G., Clement, J. P., & Wheeler, J. R. (1995). Philanthropy and hospital financing. *Health Services Research, 30*(5), 615-635.

Solucient. (2003). *The comparative performance of US hospitals: The sourcebook.* (). Evanston, IL: Solucient.

Wedig, G. J. (1994). Risk, leverage, donations and dividends-in-kind: A theory of nonprofit financial behavior. *International Review of Economics & Finance, 3*(3), 257-278.

Wedig, G. J., Hassan, M., & Morrisey, M. A. (1996). Tax-exempt debt and the capital structure of nonprofit organizations: An application to hospitals. *The Journal of Finance, 51*(4), 1247.

Wedig, G., Hassan, M., Van Horn, R., & Morrisey, M. (1998). Hospital affiliation and capital structure: How will capital markets guide health care restructuring? *Journal of Public Budgeting, Accounting Financial Management, 10*(3), 413.

Wheeler, J. R., Smith, D. G., Rivenson, H. L., & Reiter, K. L. (2000). Capital structure strategy in health care systems. *Journal of Health Care Finance, 26*(4), 42-52.

Chapter 4

Capital Investment by Independent and System Affiliated Hospitals

Introduction

The last 30 years have seen great consolidation within the hospital industry, driven in part by the growth or multihospital systems.[9] In 1979 only 30.8% of hospitals operated as part of a multihospital system but by 2001, 53.6% of hospitals were members of a system ((G. J. Bazzoli, 2003)). This shift has great potential to change financial management practice for hospitals operating within systems, however, despite the prevalent role hospital systems play in the hospital industry we know very little about how hospital financial management changes for hospitals that join systems. In fact, most of the literature on consolidation within the hospital industry overlooks the effects of system membership, focusing instead on single market hospital mergers or ownership conversions (Cuellar & Gertler, 2003). Research that does examine the implications of system membership for hospital management rarely focuses on financial management but instead examines how system membership affects hospital efficiency (Carey, 2003; Dranove, Durkac, & Shanley, 1996) prices (Dranove & Lindrooth, 2003; Melnick & Keeler, 2007) clinical quality (Madison, 2004) or differences in the structural features of system organizations (G. J. Bazzoli et al., 1999; G. J. Bazzoli, Shortell, Dubbs, Chan, & Kralovec, 1999; Dubbs, Bazzoli, Shortell, & Kralovec, 2004). Relatively little has been written about how

[9] Hospital consolidation strategies include joining multihospital systems as well as full-asset mergers in which two hospitals join together to operate as a single hospital under a single license and under control of a single board. This paper focuses on the effects of membership in a multihospital system, not the effects of a full asset merger.

system membership affects the way hospitals make capital expenditures. This is surprising since capital expenditure decisions are a critical part of hospital management and consultants and the trade press often claim system membership enables greater capital investment among hospitals.

Capital expenditures, access to capital and system membership

Capital expenditures are purchases of goods that will benefit the purchasing firm for multiple years in the future. In the hospital industry, examples of capital expenditures include the construction of new facilities, the expansion or renovation of existing facilities, and the purchase of new equipment or information technology. Capital expenditure decisions are critical to a hospital's ability to care for patients (Levitt, 1994) and compete successfully with other hospitals in the same market (Byrd & McCue, 2003). Capital expenditures are often very costly and the cash flows they produce are realized over many years after a capital purchase is made. As a result firms often rely on external sources of funds (or "capital") to provide financing for their capital investments. For hospitals, these sources of funds can include banks, bondholders who purchase hospital-issued debt, donors offering charitable donations to hospitals or, in the case of investor-owned hospitals, equity holders who purchase stock. A firm's ability to obtain funds from these sources is known as the firm's "access to capital".

Within the hospital industry there is a belief that system membership can help improve access to capital and hence a hospital's ability to make capital expenditures. This belief is demonstrated in several different ways. First, managers of hospitals that join systems frequently mention access to capital or the desire to find funding for capital expenditures as motivations for joining a system. For instance, Ludington Michigan's Memorial Medical Center recently signed a letter of intent to join the multihospital system Spectrum Health. A press release detailing their motivations stated "…benefits include expanded healthcare services, better access to capital,

improved access to medical specialists…" ((News - memorial medical center - memorial medical center)). Trade articles about system acquisitions also frequently mention access to capital as a motivation (for example (Cali & Quinn, 2013) (Ault, Childs, Wainright, & Young, 2011; Janiga & Muller, 2013) Another indication that the hospital industry believes system membership can improve access to capital is that professional advisors advocate system membership as a means of finding financing for capital expenditures. The 2010 report *A Guide to Financing Strategies for Hospitals,* commissioned by the American Hospital Association (AHA) suggests "hospitals can and should consider partnering with other organizations…that can bring capital to the table to fund specific initiatives or the organization's ongoing operations" (Kaufman Hall and Associates, Inc., 2010). Similarly, industry experts frequently suggest that system membership can improve access to capital for some hospitals. For instance, after the credit crises of 2009 one investment banker predicted "The continuing tight credit markets exacerbate the problem that tips many struggling not-for-profits into a sale--lack of access to capital" (Carlson & Galloro, 2009). The perception that system membership can improve access to capital was prevalent earlier in the decade as well. In 2002 one lawyer specializing in hospital mergers and acquisitions commented on the factors that drove independent hospital acquisitions that year saying, "The chains have the capital to upgrade those [capital starved rural hospital] facilities to keep patients from going to bigger facilities in bigger cities" (V. Galloro & Tieman, 2002). Moreover, the bond markets seem to look favorably on system membership when evaluating hospitals' creditworthiness. A 2012 report from the credit rating agency Moody's attributes many of the agency's upgrades of not-for-profit hospital debt to "an increase in merger and acquisition activity in the sector and not a fundamental change in its underlying credit conditions" (Moody's Investor Service, 2012). One of the clearest ways we know the hospital

industry associates system membership with the ability to fund capital investments is that hospitals joining systems will occasionally negotiate capital commitments from acquiring systems as a part of the sale agreement. This study has identified 203 deals through which formerly independent hospitals joined hospital systems. At least 25 of these deals were reported to include some form of capital commitment.[10](Moody's Investor Service, 2012)

System membership may not guarantee access to capital

It may seem as if joining a system must surely improve a hospital's ability to make capital investments, since this assumption is frequently mentioned in the hospital trade press, by hospital managers, and by experts in hospital finance, and since some firms negotiate commitments as a part of sales agreements. However, there are also reasons to believe system membership may not improve hospitals' ability to access capital. First, even when an acquisition deal does include a capital commitment, the acquiring organization does not always provide the agreed upon capital. This can occur even in cases where there is a well-funded organization with responsibility for monitoring compliance with the commitment. For instance, in 2009 the Hospital Corporation of America was sued for not fulfilling a $450 million capital commitment it made in conjunction with the purchase of 12 hospitals in Kansas City Missouri in 2003(Creswell, 2013). Similarly, in 2011 Vanguard Health Systems purchased the Detroit Medical Center (DMC) hospitals in a deal that included an $850 million capital commitment. Vanguard has several years to fulfill this commitment but its capital expenditures currently lag behind the schedule included in the purchase agreement. The foundation responsible for enforcing compliance with the agreement has expressed concern that Vanguard may divert some capital towards the construction of new outpatient clinics rather than improvements to existing hospitals

[10] Complete information on each deal was not available. The methods section of this paper describes in more detail how deals were identified and how information about each deal was gathered.

(DMC hospitals continue to receive capital infusion, but questions linger). Finally, discussions with several hospital financial managers in Southeastern Michigan have revealed that capital commitments from acquiring hospital systems are not always considered reliable. If hospitals that have explicitly negotiated capital commitments as a part of their sales agreement do not always see increased capital expenditures, it raises questions about whether hospitals that did not negotiate such commitments will receive capital from hospital systems they join.

There are also theoretical reasons to believe system membership may not allow independent hospitals to increase capital expenditures. If capital markets are efficient they should supply capital to projects that are expected to produce a return adequate to compensate for the project's risk. The fact that many hospital industry observers have claimed system membership improves access to capital necessarily implies the existence of some market friction that systems can overcome but independent hospitals cannot. These frictions could certainly exist. (Examples include not-for-profit hospitals' difficulty adjusting their capital structures or asymmetrical information problems that make any external financing costly). However, sources claiming that system membership improves access to capital rarely provide an explanation as to how this occurs, and that is cause to question their claim. Moreover, there is little peer-reviewed research examining the relationship between system membership and capital expenditures.

It is important to acknowledge that there are a number of possible explanations for independent hospitals to join systems aside from a desire to gain funding for capital expenditures. These include the desire to create market power, the desire to improve efficiency (though prior research is critical of systems' ability to do so (Burns & Pauly, 2002; Dranove et al., 1996; Dranove & Lindrooth, 2003), a desire to capture referral streams for the system's large, tertiary care facilities, or to improve the breadth and quality of services offered. System

membership could also be motivated by empire building tendencies on the part of system executives who may care more about increasing the size of the systems they manage than the capital expenditures of their systems' hospitals. If one of these alternative factors motivates a hospital to join a system, it is possible that the hospital may not see any increase in capital expenditures as a result of having joined a system. On the other hand, many of these non-capital motivations, like expanding clinical programs, may be associated with additional capital spending. Moreover, if system membership improves hospitals' access to capital, even hospitals that are motivated to join systems for reasons besides access to capital should enjoy a lower cost of capital making more of the available investment opportunities profitable.

Understanding the effects of system membership on capital expenditure is important

Hospital managers should have a complete understanding of the capital expenditure effects of system membership because traditional sources of capital are becoming scarcer and more hospitals are considering organizational changes as a way to gain access to investment capital. Theory and prior research suggest a number of reasons that hospitals may be struggling to access capital and hence to make necessary capital expenditures. First, not-for-profit status can be a barrier to capital access for many hospitals. In 2011 58% of community hospitals in the United States were organized as not-for-profit (NFP) firms (American Hospital Association,). As a result these hospitals are unable to obtain capital by issuing equity and must rely on debt, retained earnings or charitable donations as sources of capital. Issuing debt obligates a hospital to make fixed payments to bondholders to avoid default and bankruptcy, which reduces a hospitals' flexibility. Moreover, holding too much debt can limit a hospital's ability to issue additional debt in the future by reducing the hospital's bond rating and increasing the interest rate lenders require. There is some evidence that debt has become a less-attractive financing

option for hospitals over time as for-profit hospitals have increased their use of equity financing while reducing their reliance on debt financing (Wheeler, Smith, Rivenson, & Reiter, 2000)

Retained earnings resulting from returns on financial investments are another important source of capital that has recently become less reliable. Not-for-profit hospitals often hold large stocks of cash and investment securities, both as a way to store retained earnings and as a way to obtain favorable bond ratings (Gentry, 2002);(Rivenson, Wheeler, Smith, & Reiter, 2000). On average, 21% of a NFP hospital's assets are held as cash or investments and as a result equity market returns are highly correlated with hospital capital expenditures (K. L. Reiter & Song, 2011). Recent volatility and poor performance in the equity markets could limit access to capital for many hospitals. Moreover, there is evidence that NFP hospitals are particularly vulnerable to weak credit market conditions and that the credit crisis of the late 2000s may have severely restricted hospitals' access to capital (K. L. Reiter, Smith, & Wheeler, 2008). While charitable donations are a source of capital for NFP hospitals, they are unreliable and are relatively small (Smith, Wheeler, Rivenson, & Reiter, 2000).

Not surprisingly, the hospital industry press has reported that some hospitals are struggling to fund capital investments.[11] These reports claim hospitals are holding cash, concentrating on improving balance sheets, and have been shut out of capital markets (Evans, 2009) and that small hospitals find capital more costly now than they did before the credit crisis of 2008 (Evans, 2010). There are even reports that, in their search for capital, NFP hospitals are more willing to discuss and entertain the idea of a sale or other transaction than they were in the past (V. Galloro, 2010). Given recent challenging credit conditions, the importance of capital

[11] Reports from the industry press are one of the only sources of information on capital expenditures among hospitals since there is little research relating to this topic. In the past the American Hospital Association (AHA) conducted a survey of capital expenditures by hospitals, but a recent version of this survey is not available.

expenditures to hospitals and the increasing number of hospitals being directed to consider joining a system to improve capital access, a study on the relationship between capital spending and system membership is warranted.

Previous literature

Capital investment among hospitals is a thinly studied topic. There are, however, several papers that look at system membership and its effect on access to capital directly by measuring either the cost of debt (Sloan et al., 1987) or investment cash flow sensitivity (Calem and Rizzo, 1995). Two other papers examine the determinants of capital investment but also include controls for system membership. Most of this research concludes that system membership has little effect on a hospital's ability to make capital expenditures. Unfortunately, some of these papers predate important changes in hospital markets. Others are limited in their ability to draw conclusions about the effect of system membership on capital investment because they use cross sectional data that contain little variation in system affiliation.

Calem and Rizzo (1995) draw conclusions about hospitals' ability to access capital by looking at whether the amount of capital investment a hospital makes is correlated to changes in the hospital's stock of cash and short term investments. Their study contributes to a body of finance literature that suggests capital markets are imperfect and as a result, there are some firms for which internally-generated funds are less costly than external funds obtained through debt or equity issuance. Calem and Rizzo theorize that membership in a hospital system may improve access to capital markets and therefore capital investment among system-affiliated hospitals should not be related to those hospitals' cash flows. On the other hand, if independent hospitals have reduced access to capital markets, they will choose to finance more of their capital

investments using internally generate funds and so there should be a stronger relationship between cash flow and investment for these hospitals. Calem and Rizzo find that among members of large hospital systems, investment and cash flow are not significantly related while a statistically significant relationship between investment and cash flow does exist for members of small systems and for hospitals unaffiliated with any system. Unlike results in the other studies, these conclusions are consistent with the common wisdom that system membership can improve access to capital and increase capital expenditures. However, they are lacking in a few respects. First, their cash and cash flow data appear to be reported for individual facilities. It is possible, and indeed likely, that hospital systems manage cash centrally and that for system hospitals, the authors' measures of cash may not reflect the true liquidity available to the managers of individual facilities. If funds are managed centrally to insure higher returns on liquid investments, rather than to give system managers discretion in distributing cash to facilities, this centralized management would reduce investment cash flow sensitivity for system hospitals without affecting those facilities' access to capital. It is also possible that systems selectively acquire hospitals likely to have good access to capital. The authors' sample did not include any hospitals that joined or left systems and would have difficulty identifying this sort of selection issue.

It is important to note that this study looks at investment cash flow sensitivity rather than capital investment. As a result, Calem and Rizzo could be picking up a managerial rather than a financial difference in system and independent hospitals. If system membership limits the ability of facility-level managers to initiate capital projects, perhaps the reduced sensitivity of cash flow to investments has more to do with fiscal discipline imposed by system membership than with improving access to capital.

As part of a larger study of the cost of capital to hospitals, Sloan, Valvona and Hassan examine the cost of debt for both independent and system-affiliated NFP hospitals (1987). Using data from 1972-1983, they are unable to find large differences between the cost of debt for the two types of hospital. However, as the authors point out, during their study period many hospitals received reimbursement for interest expenses from commercial and government payers. This decreased hospitals' incentive to take steps to reduce their costs of borrowing. Moreover, this period ends before the introduction of Medicare's prospective payment system, which increased the risk of default among hospitals. These changes had dramatic effects on hospital management, strategy and investment. If system affiliated hospitals have better access to capital markets than independent hospitals do today, the factors which caused this differential access could have arisen after the 1972-1983 study period.

In addition, two studies of the determinants of capital investment among hospitals use system membership as a control variable. The first, by Kim and McCue (2008) uses Medicare Cost Report and American Hospital Association (AHA) data to examine the importance of market, operational and financial factors in determining the amount of capital investment hospitals make. They determine system membership has an insignificant but positive effect on rural hospitals while it has an insignificant though negative effect on capital investment by urban hospitals. The authors used system membership only as a control variable, and they use a fixed-effects "within" estimator that transforms variables to deviations from their time-series means. As a result, the authors are only able to identify the effects of system membership using hospitals that converted from independent to system-affiliated. The number of hospitals changing their affiliation status is unlikely to be large given their four year timeframe. Moreover, they exclude

hospitals that have undergone ownership conversions during the study period which is likely to further limit the number of hospitals changing their system affiliation status.

Reiter (2004) also examines the determinants of capital investment by hospitals, though she takes a slightly different approach. Using data from the Investor Tools database, she divides hospitals into high and low investors (those in either the top 30% or bottom 30% of capital investment). She uses cross-sectional data from 1999 that includes hospitals that have previously issued municipal debt. Reiter finds that there is not a significant difference in system membership between high and low investment hospitals when making univariate comparisons. Similarly, results from multivariate logistic regression suggest system membership is a positive but insignificant predictor of being a high-investment hospital. If hospitals join systems only when they are unable to access capital and the proportion of capital-constrained independent hospitals is relatively small, a cross sectional study would be unlikely to identify these differences.

In contrast to claims made by industry observers, results from previous research on the relationship between system membership and capital expenditure have been mixed. This could be because previous studies have relied only on cross section data or relatively short panels of data. It could also be because some studies were recent while others used data from periods before prospective payment for capital was implemented. Our understanding of the relationship between system membership and capital investment could be improved greatly by a study that uses recent data on hospitals changing from independent to system-affiliated status.

Conceptual Framework and Hypotheses

The primary question this paper seeks to answer is whether or not an independent hospital's decision to join a system results in an increase in that hospital's capital expenditures. To test this hypothesis I use a difference in differences model. This model compares the changes in capital expenditure for independent hospitals that join systems (the first difference) to the changes in capital expenditure among hospitals without a system-status change (the second difference). I include hospitals without a system-status change (both independent and system-affiliated hospitals) to control for trends in capital expenditures that would have affected changing hospitals, even if they had remained independent. For instance, if capital expenditures among all hospitals increased because reimbursement became more generous over the time period studied, simply looking at changes in capital expenditure among acquired hospitals would not allow me to distinguish the effect of joining a system from the broader industry trend. This framework relies on the assumption that if acquired hospitals had not joined systems, their capital expenditure trends would have been similar to capital expenditure trends among hospitals without a system status change.

Formally, I test the following model:

$$Capex_{i,t} = \propto + \beta_1 PostSys5_{i,t} + \beta_2 PostSys6Plus_{i,t} + \beta_3 Sysperm_{i,t} + \beta_4 Indperm_{i,t} + \beta_5 Market_{i,t} + \beta_6 Organization_{i,t} + State_i + Year_t \quad (1)$$

Where *capex* is capital expenditure for hospital *i* in year *t*. Since acquired hospitals may experience a surge in capital expenditures shortly after acquisition, followed by a period of relatively low expenditure after initial capital needs are met, I allow the effect of system membership in the initial years after acquisition to be different from the effect in later years. The variables *PostSys5* and *PostSys6Plus* describe these two effects. *PostSys5* is a binary variable

equal to one for hospital-year observations in the first five years after an independent hospital joins a system, while *PostSys6* includes time periods later than five years after a hospital changes its system status. The variables *PostSys5* and *PostSys6* estimate the average change in capital expenditures associated with independent hospitals joining systems, net of capital expenditure changes occurring in hospitals without a change in system status.

If system membership does promote high levels of capital expenditure, I would expect system-affiliated hospitals to have consistently higher capital expenditures than independent hospitals. To account for this difference I include the variables *SysPerm* and *IndPerm* which describe whether a hospital was system-affiliated or independent throughout the study's time period. I also add time-varying controls for organizational and market characteristics of each hospital since systems may selectively acquire hospitals with organizational characteristics that make capital expenditure growth likely. I include state fixed effects to control for time-invariant state factors affecting capital expenditures. One such factor is variation in the existence or stringency of state-level certificate of need laws. These laws are unlikely to change much over the study period, but could be an important determinant of hospital capital expenditures. Failing to account for these kinds of state-specific differences could bias my estimates if, early in my study period, acquisitions were more common in high-spending states than in low-spending states, and as a result a large proportion of my post-change observations come from hospitals in high-spending states.

I include year fixed effects as well. These are especially important since, as Figure 1 shows, average capital expenditures among all hospitals rose throughout the study period. Most of my post-acquisition observations come in later years when capital expenditure for all hospitals

was higher. Adding year fixed-effects allows me to control for the total amount of capital spending among all hospitals in each year.

I also test a second version of this model that allows the effects of system membership to vary over each two year period after acquisition. The timing of changes in capital expenditures can suggest what aspects of system membership enabled them. For instance, large changes in capital expenditures early in the post-acquisition period suggest that the system may be funding investment directly. Modest increases in capital expenditure occurring later in the post-acquisition period could suggest that funding for these kinds of capital expenditures came from improvements in the hospital's profitability or operations. Formally I test the model:

$$Capex_{i,t} = \propto + \beta_1 PostSys01_{i,t} + \beta_2 PostSys23_{i,t} + \beta_3 PostSys45_{i,t} + \beta_4 PostSys6Plus_{i,t} + \beta_4 Sysperm_{i,t} + \beta_5 Indperm_{i,t} + \beta_6 Market_{i,t} + \beta_7 Organization_{i,t} + State_i + Year_t \quad (2)$$

PostSys01 is a binary variable equal to one for changing hospital observations in the year of acquisition or the first year after acquisition. *PostSys23* and *PostSys45* are observations in the second or third and fourth and fifth years after acquisition. As before, *PostSys6Plus* describes capital expenditure changes greater than six years after acquisition.

Effect of system membership on hospitals with the oldest facilities

One concern I have is that the effects of joining a multihospital system may vary greatly for different kinds of acquired hospitals. Hospitals join systems for a variety of reasons including the desire to improve access to capital, to improve contracting leverage and to gain management or clinical expertise. Most of these motivations are likely to result in some increase in capital expenditures, though some motivations will result in greater changes in capital expenditures than others.

To investigate this I identify a group of hospitals likely to experience the largest increase in capital expenditures: hospitals with relatively old facilities. I suspect the acquired hospitals that have the oldest facilities in the period before they join a system are the most likely to be struggling to access capital independently and are the most likely to join systems as a way to increase capital expenditures. If system membership allows hospitals to make larger capital investments I would expect to see this effect most clearly in the hospitals with the oldest facilities. I test this hypothesis using the following model:

$$Capex_{i,t} = \propto + \beta_1 OldFacility_i + \beta_2 PostSys5_{i,t} + \beta_3 Post5\text{x}OldFacility_{i,t} + \beta_4 PostSys6Plus_{i,t} + \beta_5 PostSys6Plus\text{x}OldFacility_{i,t} + \beta_6 sysperm_{i,t} + \beta_7 indperm_{i,t} + \beta_8 market_{i,t} + \beta_9 organization_{i,t} + state_i + \gamma_t \qquad (3)$$

OldFacility is a binary variable equal to one for acquired hospitals with the oldest facilities in the pre-acquisition period. The interaction terms *Post5*x*OldFacility* and *Post6Plus*x*OldFacility* are added to allow the post-acquisition change in capital expenditures to vary for hospitals with relatively old facilities and those with newer facilities. If hospitals with the oldest facilities experience the greatest gains in capital expenditures I expect the coefficient on *Post5*x*OldFacility* to be positive and statistically significant.

I estimate the parameters in each model using ordinary least squares. Heteroskedasticity robust standard errors are calculated accounting for hospital-level clustering.

Data

Sample

Study data come from two sources, the American Hospital Association (AHA) hospital database records from 1996-2009 and Medicare Cost Report (MCR) records from 1996-2009. The AHA data come from files maintained and updated yearly by the AHA. Medicare Cost Report data are collected by CMS and contain information on costs incurred by all US hospitals that accept Medicare patients. I have excluded hospitals that are federally owned from the study, as well as a few hospitals that are located in US territories outside the 50 US states. Hospitals owned by state or local governments have capital budgeting processes that are very different from non-governmental hospitals, but these were retained in the sample since it is possible that they could join multihospital systems in search of capital in the same way that NFP hospitals are said to do. I also drop hospitals not classified by the AHA as providing general acute care services and observations for hospitals that did not appear in both the AHA and MCR data. I exclude hospitals with multiple system status changes because it is possible that these classifications are incorrect and because my theory does not offer predictions about capital expenditures among hospitals that join and then leave and re-join systems. I also exclude hospitals with a change in system status if I was unable to verify that this change occurred. The derivation of my sample is described further in Table 4.1. There were several hospitals excluded because they had missing data or data values that were unrealistically large or small. I list the rules used to define unrealistic data in Table 4.2.

Hospitals are required to file partial-year cost reports in cases where ownership changes or the organization adopts a new beginning date for its fiscal year. As a result, the data contain some cost reporting periods of less than 365 days. When possible I have combined cost

reporting periods of less than 365 days. In some cases, however, this was not possible.[12] I chose to annualize the data in these short reporting periods. Some researchers choose to exclude partial year reports from their analyses. I chose to include annualized the values of flow (as opposed to stock) variables from partial year reports because excluding these reports could potential exclude capital expenditures made soon after a hospital is acquired. Annualizing data from partial year reports is a common practice. American Hospital Directory, a prominent vendor of MCR data, also annualizes partial year data. I estimated models both including and excluding partial years and I found that my treatment of partial years made little difference in my results.

Measures

Capital investment

Capital investment is measured as capital purchases per hospital bed. In past research the capital investment measure is scaled by beginning of period fixed assets. However, several acquired hospitals experienced large drops in net fixed assets in the period immediately after being acquired. It appears that some acquired hospitals wrote down the value of their assets after being acquired. Using a measure that scales capital expenditures by fixed assets would artificially inflate capital expenditures for these hospitals. Scaling capital expenditures by bed size provides a more conservative estimate of capital expenditure changes. In addition, hospitals with capital expenditures of more than $3 million per bed are excluded from the sample. I was able to verify the accuracy of the capital expenditure measure for a few hospitals that reported spending of $2 million per bed through hospital websites or publicly available information on

[12] For instance, if hospital A begins its fiscal year 1/1/2000, and is acquired 12/31/2000 by an organization with a fiscal year starting 7/1/2001 the acquired hospital would have a 180 day reporting period occurring between two 365 day periods.

hospital expenditures. For instance, the data indicate that Providence Hood-River Memorial Hospital, a 25-bed critical access hospital, spent $2.4 million per bed in capital expenditures in 2009. This seems possible since a local construction company website reports having constructed a new wing of the hospital that doubled the hospital's size, renovating the existing wing of the hospital, and installing a new physical plant.[13] However, capital spending amounts in excess of $3 million per bed were more difficult to verify. As a result I dropped observations where capital expenditure pre bed exceeded $3 million. Imposing this rule on the data only affected 15 hospitals. Table 4.2 lists all the rules imposed on the data and the number of observations affected by each.

Data come from the Medicare Cost Report, specifically worksheet A7, parts I and II. Previous literature has criticized use of cost report data to estimate capital expenditures ((Kane & Magnus, 2001)) and cost data ((Magnus & Smith, 2000)). Unfortunately, most sources of hospital financial data have limitations and a nationally representative dataset containing audited financial information at the hospital level is not available ((Medicare Payment Advisory Commission, 2004)). Moreover, data from the Medicare Cost Reports have been widely used in academic and industry publications (for example (Dranove & Lindrooth, 2003; Kim & McCue, 2008; Schuhmann, 2009)) and are used by CMS to set hospital payment rates.

Unfortunately, CMS did not require the majority of hospitals (those that were subject to 100% prospective capital payment) to report several parts of worksheet A7 for fiscal years beginning on or after October 1, 2001 and ending on or before April 30, 2005. Many hospitals failed to report any capital purchase information for this period, creating a large amount of

[13] http://www.andersen-const.com/project-gallery?task=view&cid=29&id=194

missing data on capital expenditures. Table 4.3 confirms that most of the missing values of capital expenditures are in the years 2002-2004.

I would be concerned if these data were missing in a systematic way. However, I believe these observations are missing randomly. The instructions for completing worksheet A7, parts I and II of the cost report, from which the capital expenditure data comes, read "…For cost reporting periods beginning on and after October 1, 2001, hospitals receiving 100 percent Federal prospective payment for capital are no longer required to complete Parts ***III*** and ***IV*** of this Worksheet…[emphasis added]" However, after emailing CMS to inquire about the missing data, I learned that some paper copies of the instructions included a space between the roman numerals, so that those instructions read "hospitals receiving 100 percent Federal prospective payment for capital are no longer required to complete Parts ***I II*** and ***IV*** of this Worksheet…" It seems that this error resulted in the omission of a capital expenditure data for a large number of hospitals from 2002-2004.

System status

Data on system status is taken from the AHA hospital database. In keeping with previous research in this area, the *sysid* variable generated from AHA internal files is used rather than the *mhsmemb* variable determined by a hospital's response to the AHA annual survey ((Dranove & Lindrooth, 2003)). I include three categories of system membership in the sample—hospitals that are members of systems throughout the study period, hospitals that are independent throughout the study period and hospitals that are independent then join a hospital system.

The AHA definition of a hospital system includes single hospital systems. A freestanding hospital can be considered a member of a system if the hospital is closely affiliated with three or more other healthcare organization (AHA Guide, 2005). If system membership

enables greater capital expenditures I expect the greatest benefits to accrue to larger systems. Relative to very small systems, larger systems may have more savvy financial managers or may be better able to reduce transaction costs of borrowing by borrowing larger amounts. I am less confident in the ability of small, one or two hospital systems to achieve financing advantages. Therefore, I adjust my system membership variable to exclude hospitals in systems containing only one or two hospitals. These hospitals are excluded from the analysis since they are not classified as system hospitals but cannot be classified as independent hospitals either. This definition is similar to the one used by the bond rating agency Standard and Poors ((Standard and Poors, 2013)). Whether the effects of system membership differ for one to two hospital systems versus larger systems is an opportunity for future research.

I used a two-step procedure to identify independent hospitals that joined systems. First, I analyzed data from the AHA annual survey for the years 1996-2009 to identify changes in a hospital's system status. I identify cases where a hospital was not classified as the member of a hospital system, then, in the next year, the hospital was classified as a system member. This yielded a list of 519 transactions in which an independent hospital joined a system. However, in researching some of these transactions I realized that a system membership change did not occur as indicated by the AHA data. To resolve this, I checked for a record of each of the potential transactions identified in the annual lists of hospital mergers and acquisitions published by *Modern Healthcare.* I also checked for a record of the transaction in the Hospital Acquisition Reports published by Irving Levin and Associates. If neither the *Modern Healthcare* lists nor the Hospital Acquisition reports contained a record of the transaction, I looked for information about the transaction on the hospital's webpage and for online news coverage of the transaction. If none of these attempts yielded confirmation that the transaction occurred I eliminated the

hospital from the sample. I chose to eliminate the hospital for several reasons. First, some hospitals with unconfirmed transactions clearly listed a system affiliation on their webpages but did not offer information about the date on which they joined a system. In these cases it was impossible to assign a system status to each hospital year since only the current system status was known. In other cases, the hospital websites did not contain information about a system affiliation. However, some hospitals with confirmed system affiliation do not prominently display their affiliation on their websites so the lack of information about system-affiliation is not adequate justification for classifying these hospitals as independent. Table 4.4 summarizes the system status of the sample while Table 4.5 summarizes the number of confirmed acquisitions that took place in each year included in the data.

In addition to dropping hospitals that are members of one or two hospital systems, I also drop hospitals that the AHA data suggest have undergone multiple changes in system status and hospitals that become independent after having been affiliated with a system. I do this for two reasons. First, I am not confident the system status data on these hospitals are accurate, especially in the case of hospitals with multiple system status changes. Second, my hypotheses are based on the common claim that joining a system enables independent hospitals to make greater capital expenditures. There are no similar claims to guide my expectations about capital expenditures among hospitals leaving systems or hospitals with multiple system changes. My results can speak to the effects of independent hospitals joining systems, though dropping cases of multiple changes in system membership will certainly limit the generalizability of these results.

Market measures

These include market factors that could affect hospital investment. From the Area Resource File (ARF) I include the median income for the county in which a hospital is located and the percent of county residents under 65 without health insurance. These measures were not available for each year and so missing years were assigned the value for the closest neighboring non-missing year. Several other variables were imputed as well. More information on the variables and hospitals affected is available in Table 4.6.

Variables capturing the urban or rural nature of a hospital's market area as well as the competition within the hospital's market were included as well. Hospital markets were divided into three categories using combinations of the Urban-Rural Continuum Codes from the U.S. Department of Agriculture's Economic Research Service. The categories are:

- Markets within metropolitan areas
- Non-metropolitan markets with a population of over 20,000 or non-metropolitan markets with a population of over 2,500 that are also adjacent to a metropolitan area
- Non-metropolitan markets with populations smaller than 20,000 that are not adjacent to a metropolitan area or non-metropolitan markets with a population smaller than 2,500 that are adjacent to a metropolitan area.

The level of competition within a market is measured using the Hirfindahl-Hirschman Index (HHI). This measure is calculated at the hospital level.

Organizational measures

These include the number of beds in the hospital, the hospital's critical access status, and its ownership status (not-for-profit, investor owned or government owned). In addition, I include

a measure of the age of a facility's assets to create the *OldFacility* variable -used in model 3 to test whether the effects of system membership are greater for hospitals with older facilities. The average age of a hospital's assets is frequently measured using the age of plant ratio, defined as accumulated depreciation divided by depreciation expense. For changing hospitals I calculate the hospital's average age of plant over the pre-change period. I use this continuous measure to create the binary *OldFacility* variable used in model 3. A changing hospital's value of *OldFacility* is determined based on whether or not a hospitals age of plant is above or below the median age of plant for independent hospitals with a BBB rating from Standard and Poors in 2011. This measure is preferred to the continuous age of plant measure since the effect of changes in plant age on capital expenditure probably is not constant, but it is not clear how large a change in the age of plant measure is required to signify a substantive change in a hospital's past ability to access capital. Using information from a bond rating agency allows me to identify a value of plant age which is likely to be associated lower bond ratings and barriers to accessing capital.

Descriptive statistics

Table 4.7 lists descriptive statistics for changing hospitals (before and after acquisition) as well as permanent independent and system-affiliated hospitals. These means suggest that changing hospitals may experience a significant increase in capital expenditures after joining hospital systems. However, they should be interpreted with caution because capital expenditures for all hospitals, including hospitals that were permanent system members or permanently independent, rose throughout the study period. Since most post-change observations come in later years of the period while most pre-change observations come in earlier years the rise could

simply reflect the increase in capital expenditures that occurred for all hospitals from 1996-2009. Surprisingly, acquired hospitals have higher mean capital expenditures in the pre-change period than permanent independent hospitals ($56,024 vs. $50,847). This suggests that independent hospitals joining systems may not always be doing so after a period of under-investment and financial decline.

There is little variation in market variables across the four hospital types, except that permanent independent hospitals are more likely to be in the small, non-metro areas than any of the other hospital types. The age distribution of acquired hospitals appears to change slightly between the pre and post-acquisition periods. In the pre-acquisition period, 37% of changing hospitals fall into the oldest age category compared to 24% of permanent independent hospitals and 22% of permanent system hospitals. In the post-acquisition period only 18% of changing hospitals fall into the oldest age category. Average age of plant seems to improve after a changing hospital is acquired, since 75% of changing hospitals fall into the newest age category, compared to only 50% of changing hospitals in the pre-period. This is consistent with the idea that system membership enables hospitals to increase their capital expenditures. Part of this increase could come from adding additional beds. The average number of beds among changing hospitals increases from 166 in the pre-acquisition period to 199 in the post-acquisition period.

Capital expenditure timing and trends

The critical assumption required by my empirical strategy is that if changing hospitals had remained independent, their capital expenditures would have changed in the same way as capital expenditures among un-changing hospitals. It is impossible to test this assumption directly since there is no way to observe what would have happened to the acquired hospitals if

they had not joined systems. I can, however, compare capital expenditure trends among control hospitals (permanent system and independent hospitals) to pre-change trends in changing hospitals. This comparison is shown in the top panel of Figure 2. In the period between 1996 and 2001 capital expenditure trends among all three hospital types are similar. They diverge more in the latter part of the sample, but as the lower panel suggests this may be largely because the number of pre-change observations in the last half of the sample is relatively small and so averages in these years are less stable.

It is surprising to see that in many years, "pre-change" hospitals had higher capital expenditures than either system or independent hospitals, especially since a larger proportion of pre-change hospital observations are in the oldest age category than independent or system-affiliated hospital observations. However, these differences disappear in multivariate regressions that control for market and organizational characteristics.

A second concern about the difference in differences study design is that acquired hospitals could delay capital expenditures because they planned to join systems. Figure 3 shows average capital expenditures for changing hospitals in each year, relative to the year the hospital was acquired. The graph does show a small dip in capital expenditures in the year before acquisition. However, the upward trend in capital expenditures in the post-acquisition period seems too sustained to be driven entirely by that dip. The graph clearly shows the cyclical nature of capital expenditures, which seem to be relatively constant in the 12 years before acquisition but trending upward and exhibiting larger year-to-year variation in the 12 years after acquisition.

Results

Results for the 3 models described earlier are reported in Table 4.8. They suggest that system membership is associated with a substantial increase in capital expenditure that occurs early in the period after acquisition and then diminishes over time. Estimates from the first specification suggest acquired hospitals enjoyed an increase in capital expenditures of $9,459 per bed per year for the first five years after system membership began. This estimate is marginally statistically significant (p-value = 0.08). However, it is an 18.6% increase relative to mean capital spending of $50,847 per bed annually for permanent independent hospitals. This increase in capital expenditure does not appear to continue after the first five years of system membership. In all three specifications the change in capital expenditures after six years is statistically insignificant and in most cases it is negative. However, the estimates for capital expenditure changes six or more years after acquisition may not reflect the true long-term impact of system membership on capital expenditure. Only 133 of the acquired hospitals in the sample joined systems early enough to be observed six or more years after acquisition and so the estimate of long-term effects of system membership are made using a relatively small number of observations. Moreover, these hospitals may experience a period of low capital expenditures following above average expenditures in the first five years after system membership begins simply because capital expenditure is cyclical.

The second specification suggests that a large increase in capital expenditure ($12,110 per bed) occurs within the first year a hospital joins a system. The increase is practically large but only marginally statistically significant. The fact that capital expenditures increase soon after acquisition suggests systems supply acquired hospitals with capital directly, rather than working to gradually improve an acquired hospital's profitability until the hospital is able to attract

financing on its own merit or to fund capital expenditures with newly generated internal capital. None of the other post acquisition periods are associated with a statistically significant change in capital expenditures, but this is not surprising given the data limitations. The number of observations used to estimate the effect in each two-year period is relatively small since these estimates are based on a fraction of the total number of observations. These estimates are also more affected by variation in hospital and system-specific decisions about when exactly to make changes in capital expenditures. Both factors are likely responsible for the large standard errors associated with the estimates for each post-acquisition two year block of time.

The last model allows the effect of system membership to differ based on the age of a hospital's assets. My hypothesis was that older hospitals are more likely to pursue system membership as a way to increase their capital expenditures. The results do not lend support for this hypothesis. In fact, the estimated increase in capital expenditures is actually larger for hospitals with newer assets than for hospitals with older assets. In the first five years after system membership begins, acquired hospitals with newer assets enjoy a $12,383 per year increase in annual capital expenditures per bed while the estimated increase in capital expenditures for older hospitals is $6,405 lower. There is not sufficient evidence to say with statistical confidence that the there is a difference between the effect for old and new hospitals (the p-value on the interaction term is 0.56). However, the marginal effect of system membership for a new hospital is significant at the 0.05 level while the p-value for the marginal effect of system membership for an old hospital is 0.50, suggesting that the increase in capital expenditures associated with system membership is not driven primarily by large increases for older hospitals.

Discussion

This study finds that, on average, independent hospitals that join systems do experience increases in capital expenditures. This is consistent with the idea that system membership can improve access to capital for acquired hospitals. However, these results present additional questions. The increase in capital expenditures associated with system membership suggests that independent hospitals may be subject to financial market frictions that increase the returns required by debt markets and banks. Little is known about what these frictions are and how system membership helps to overcome them. It is possible that systems may play a "venture capital" role for independent hospitals by providing expertise and monitoring of investments that debt markets or banks cannot. These functions may reduce the risk involved in capital investments and as a result the cost of capital as well. Even not-for-profit systems without access to equity markets could play this role so long as the system had adequate internal capital to fund investments in acquired facilities. However, it is also possible that increases are driven by the creation of new investment opportunities that system membership creates rather than by changes in access to capital. These investments could include new service lines enabled by system-provided clinical expertise. A third possibility is that increases in capital expenditure do not occur because system membership overcomes financial market imperfections that plague independent hospitals. Rather, the increase in capital expenditures among acquired hospitals occurs because of expenses required to integrate the acquired hospital into the systems. These could include costs related to moving an acquired hospital from its existing software systems to the software used by the rest of the acquiring system. Another cost of integration could be changes in signage required after the acquisition. These costs of integration are potentially very great, but the benefits they provide to the acquired hospital's community would be minimal.

Further research is needed to distinguish between these possibilities and to determine the financial and operational mechanisms responsible for capital expenditure increases.

On average, acquired hospitals experience an increase in capital expenditures. However, the results suggest that capital expenditure increases are largest for hospitals with relatively new assets though these hospitals presumably have a smaller need for basic maintenance than older hospitals. This is an interesting finding that deserves additional research. What is it about older hospitals that leads systems to make smaller investments in them? Perhaps systems that acquire older hospitals improve operations in these hospitals before making capital investments. Alternatively, older and newer hospitals may be differentiated by their investment opportunities. Older hospitals may be more likely to be located in areas with low growth and more indigent care and as a result they may have fewer profitable investment opportunities available. Older hospitals could also have fewer investment opportunities if they are competing with financially stable hospitals able to respond quickly to new investment opportunities and seize first-mover advantage. If older hospitals do have fewer profitable investment opportunities then their inability to attract capital may be a sign that (at least for these hospitals) capital markets are operating efficiently, rather than a sign that these hospitals are subject to capital market imperfections.

It is important to acknowledge that this study found differences in capital expenditure changes between older and newer hospitals that are economically large but not statistically significant. This could result from the high variance of capital expenditures and the fact that estimating the difference in the effects on old and new hospitals required splitting an already small sample of acquired hospitals. Repeating this analysis using a larger sample of acquired hospitals would be telling. Unfortunately limited available data makes identifying acquired

hospitals a challenge and it is likely that the data include most of the independent hospitals that joined systems between 1996 and 2009.

Conclusion

Hospital managers and board members weighing the costs and benefits of joining a multihospital system should be encouraged that on average multihospital system membership is associated with an increase in capital expenditures. They should also understand that system membership provides greater capital expenditure benefits to some hospitals than others. However, a better understanding of why these increases occur and the kinds of hospitals are likely to enjoy the greatest increases would provide much needed guidance to hospital administrators. Future research should also examine what kinds of purchases hospitals are making after they join systems to determine whether the observed increases in capital expenditures will lead to a benefit to the community, or simply the reflect cost of integrating an acquired hospital into a larger system.

Tables

Table 4.1: Sample derivation

	Changes in system status		All hospitals	
	Hospitals	Hospital years	Hospitals	Hospital years
US General acute care hospitals*	576	7,555	5,095	63,132
Couldn't be matched to MCR	519	6,899	4,616	58,887
Had multiple system status changes	519	6,899	3,834	49,017
Dropping unconfirmed acquisitions	219	2,906	3,534	45,024
After deleting missing/unrealistic data	203	2,188	3,438	34,838

**Excludes military and federal hospitals as well as hospitals with multiple system status changes*

Table 4.2- Rules to define erroneous data and their effect on the sample

	Rule	Hospitals affected (changing)	Observations lost (changing hospitals)	Hospitals affected (all)	Observations lost (all hospitals)
Total sample					
Outcome variable					
Capital expenditures	non-missing and > 0	189	398	2851	6423
Capital expenditures per bed	< $3 million per bed	0	0	15	18
Operating vairables					
Depreciation expense	> 0 and non-missing	10	13	235	426
Accumulated depreciation	> 0 and non-missing	6	7	129	135
Net fixed assets	>=0 and non-missing	1	1	12	15
Operating expense	> 0 and non-missing	0	0	8	13
Operating expense per bed	Within 4x IQR*	5	7	67	194
Financial variables					
Return on assets (net income/total assets)	<p75+x4IQR >p25-4IQR** and non-missing	42	60	637	1162
Total assets	> 0	10	22	153	591
LT Liabilities/Total assets	<p75+x4IQR*	1	1	90	208
Cash	not equal to zero and non-missing	11	13	183	409
Investments > 0	> or equal to zero and non-missing	8	14	64	108
Days cash on hand (inv+cash)/opex	<p75+4IQR*	2	4	103	306
------	Hospital must be observed before and after acquisition	16	178	16	178
Final Sample		203	2,188	3,438	34,838

*This denotes a rule stating that all observations must be less than than 75th percentile plus 4 times the interquartile range

**This denotes a rule stating that all observations must be either 1) less than the 75th percentile plus 4 times the interquartile range or 2) greater than the 25th percentile less 4 times the interquartile range

Table 4.3: Missing capital expenditure data by year

Year	Frequency	Percent
1996	4	0.05
1997	6	0.08
1998	6	0.08
1999	8	0.1
2000	9	0.11
2001	17	0.21
2002	2,272	28.6
2003	3,360	42.3
2004	1,500	18.88
2005	192	2.42
2006	155	1.95
2007	147	1.85
2008	138	1.74
2009	130	1.64
Total	7,944	100

Table 4.4: Sample by system-affiliation

System membership	Hospitals	Hospital Years
Permanent system	1,589	15,458
Permanent independent	1,646	17,192
Independent hospital joining system (hospital year ***before*** change)	203	938
Independent hospital joining system (hospital year ***after*** change)	203	1,250
Total	3,438	34,838

Table 4.5: System-status changes by year

Year	Frequency	Percent
1997	17	8.37
1998	39	19.21
1999	22	10.84
2000	16	7.88
2001	26	12.81
2002	7	3.45
2003	6	2.96
2004	11	5.42
2005	10	4.93
2006	12	5.91
2007	13	6.4
2008	11	5.42
2009	13	6.4
Total	203	100

Table 4.6: Imputation and other changes to explanatory variables

Variable	Change Description	Hospitals affected (changing)	Observations changed (changing hospitals)	Hospitals affected (all)	Observations changed (all hospitals)
Hospital beds	Impute missing values from next year	8	13	149	241
Median income (in $10)	Impute missing values from closest neighboring year	219	1,439	4,215	27,190
Percent of county younger than 65 wihtout insurance	Impute missing values from closest neighboring year	219	2,307	4,258	43,308
Accumulated depr	Observations for which accum. depr is zero were imputed as the previous year's AD + the current year's depreciation expense	53	138	853	2,903
Age of plant	Impute as average of previous and next year if age is missing or depreciation expense is zero. (Up to 3 consecutive missing years imputed)	178	449	2,913	7,208
Long-Term Liabilities	Assume negative values of LTD should be positive	23	61	424	1,933
Cash	Assume negative values of cash should be positive	93	395	1,509	6,221
Plant age (Accumulated depr) / (depreciation expense)	define categories and base these on bond rating - categories: ageAA= age <9 ageA = 9<age<10.3 ageBBB = 10.3<age<11 agejunk = age>11 (including cases where depr = 0)	0	0	0	0

Table 4.7- Descriptive statistics by system type

	Pre-Change (n=938)	Post-Change (n=1250)	Permanent Independent (n=15,458)	Permanent System Members (n=17,192)
Capital expenditures				
Capex per bed*	56,024	67,647	50,847	55,440
	(63,411)	(154,372)	(96,643)	(122,528)
Operating factors				
Hospital beds	166	199	135	197
	(127)	(170)	(146)	(191)
Critical access	0.04	0.10	0.21	0.10
	(0.18)	(0.30)	(0.41)	(0.30)
Age category (AA)	0.50	0.75	0.65	0.70
	(0.50)	(0.43)	(0.48)	(0.46)
Age category (A)	0.07	0.05	0.07	0.06
	(0.26)	(0.22)	(0.26)	(0.24)
Age category (BBB)	0.05	0.02	0.03	0.03
	(0.22)	(0.15)	(0.18)	(0.17)
Age category (junk)	0.37	0.18	0.24	0.22
	(0.48)	(0.38)	(0.43)	(0.41)
Investor owned	0.05	0.21	0.04	0.26
	(0.21)	(0.40)	(0.18)	(0.44)
Government owned	0.16	0.07	0.41	0.11
	(0.37)	(0.25)	(0.49)	(0.31)
Not for profit	0.79	0.72	0.55	0.63
	(0.41)	(0.45)	(0.50)	(0.48)

Standard deviations in parentheses

**Note: Inflation adjusted using PPI for General Medical/Surgical Hospitals*

Table 4.8: Changes in capital expenditures associated with system status changes

	1	2	3
After change- yrs 0-1		12,110	
		(7,284)	
		0.10	
After change- yrs 2-3		-1,322	
		(5,295)	
		0.80	
After change- yrs 4-5		19,264	
		(16,243)	
		0.24	
After change- yrs 0-5	9,459		12,383
	(5,443)		(6,173)
	0.08		0.05
After change- yrs 6+	-5,018	-4,987	5,935
	(5,992)	(5,990)	(11,024)
	0.40	0.41	0.59
Old facility			2,903
			(4,642)
			0.53
Old facility*After change 0-5			-6,405
			(10,922)
			0.56
Old facility*After change 6+			-20,007
			(12,724)
			0.11
System	-133	-130	998
	(2,474)	(2,473)	(2,715)
	0.96	0.96	0.71
Independent	1,318	1,319	2,421
	(2,427)	(2,427)	(2,700)
	0.59	0.54	0.37
Constant	2,902	2,799	2,224
	(26,781)	(26,511)	(26,717)
	0.11	0.11	0.93
Year fixed effects	yes	yes	yes
State fixed effects	yes	yes	yes
Other controls	yes	yes	yes

Note: Cells show the estimated coefficient, the se (in parentheses) & the p-value. Estimates are from model 1.

Figures

Figure 4.1- Capital expenditures for all hospitals

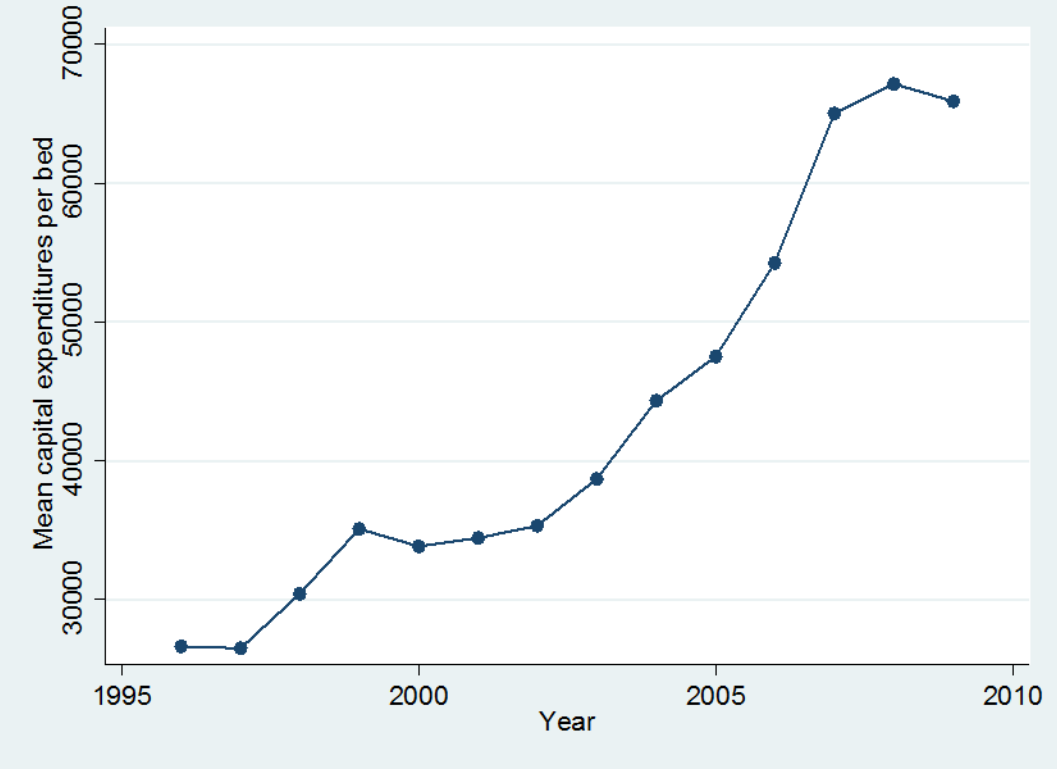


Figure 4.2- Capital expenditures per bed per year

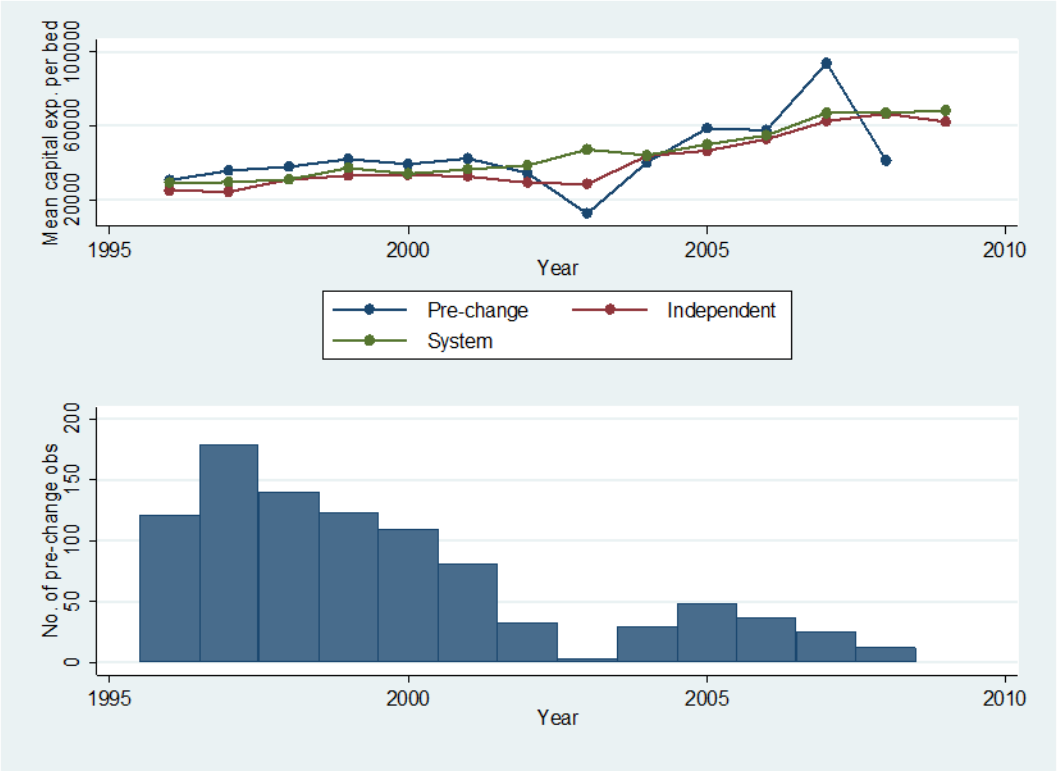
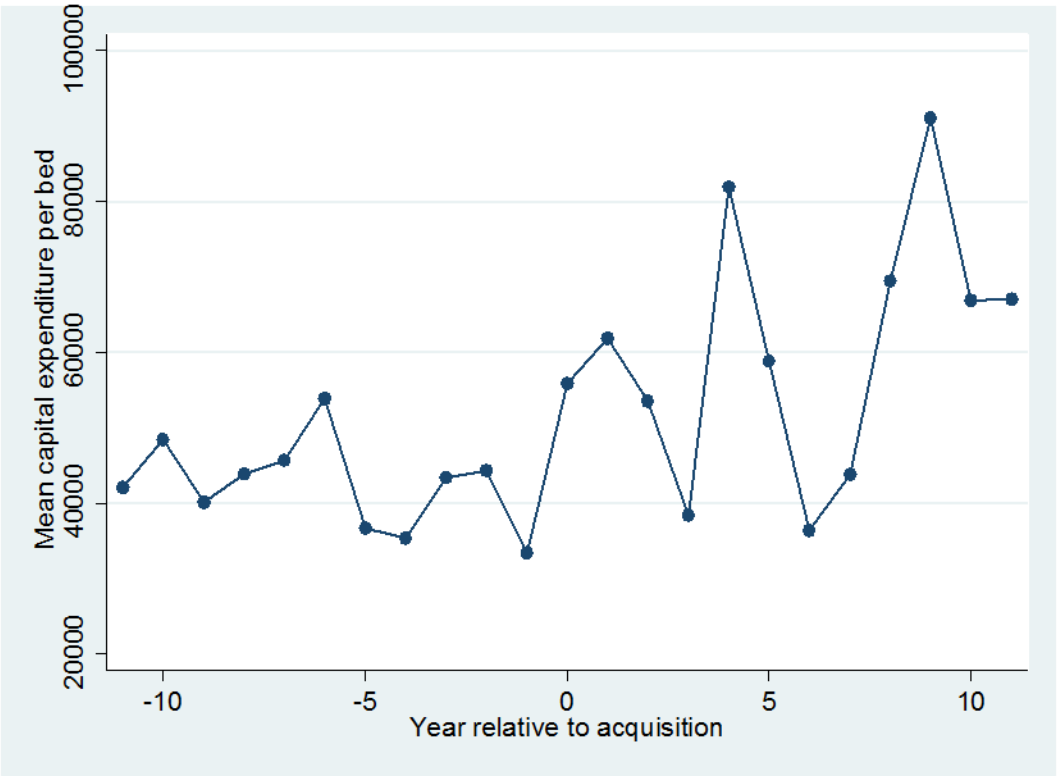


Figure 4.3- Mean capital expenditures by year (relative to acquisition year)



References

American Hospital Association.Fast facts on US hospitals Retrieved, 2013, Retrieved from http://www.aha.org/research/rc/stat-studies/fast-facts.shtml

Ault, K., Childs, B., Wainright, C., & Young, M. (2011). Relevant factors to consider prior to an investor-owned acquisition of a nonprofit healthcare entity. *Journal of Healthcare Management, 56*(4), 269-80; discussion 280-1.

Bazzoli, G. J., Shortell, S. M., Dubbs, N., Chan, C., & Kralovec, P. (1999). A taxonomy of health networks and systems: Bringing order out of chaos. *Health Services Research, 33*(6), 1683-1717.

Bazzoli, G. J. (2003). *The US hospital industry: Two decades of organizational change? statement to the FTC/DOJ hearings on healthcare competition law and policy*

Burns, L. R., & Pauly, M. V. (2002). Integrated delivery networks: A detour on the road to integrated health care? *Health Affairs, 21*(4), 128-43.

Byrd, C., & McCue, M. (2003). Can your hospital remain independent? *Healthcare Financial Management, 57*(9), 40-44.

Cali, B., & Quinn, C. (2013, May 2013). A new tool for system building. *Healthcare Financial Management, ,* 72.

Carey, K. (2003). Hospital cost efficiency and system membership. *Inquiry : A Journal of Medical Care Organization, Provision and Financing, 40*(1), 25-38.

Carlson, J., & Galloro, V. (2009). M&A: An upside to a down market. *Modern Healthcare, 39*(3), 22-31.

Creswell, J. (2013, 1/24/2013). Judge orders HCA to pay $162 million to foundation. *New York Times* Retrieved from http://www.nytimes.com/2013/01/25/business/hca-must-pay-kansas-city-foundation-162-million.html?_r=1&

Cuellar, A. E., & Gertler, P. J. (2003). Trends in hospital consolidation: The formation of local systems. *Health Affairs, 22*(6), 77-87.

DMC hospitals continue to receive capital infusion, but questions linger | detroit free press | freep.com Retrieved, 2013, Retrieved from http://www.freep.com/article/20130526/BUSINESS06/305260031/DMC-Detroit-Medical-Center-Vanguard

Dranove, D., Durkac, A., & Shanley, M. (1996). Perspective: Are multihospital systems more efficient? *Health Affairs, 15*(1), 100-104.

Dranove, D., & Lindrooth, R. (2003). Hospital consolidation and costs: Another look at the evidence. *Journal of Health Economics, 22*(6), 983-997.

Dubbs, N. L., Bazzoli, G. J., Shortell, S. M., & Kralovec, P. D. (2004). Reexamining organizational configurations: An update, validation, and expansion of the taxonomy of health networks and systems. *Health Services Research, 39*(1), 207-220.

Evans, M. (2009, February 16, 2009). On the hot seat. *Modern Healthcare, 39*, 6.

Evans, M. (2010, 07/26; 2013/5). The few, ... the stand-alone hospital. some solo hospitals.*40*, 6.

Galloro, V. (2010, Capital crisis.*40*, 6.

Galloro, V., & Tieman, J. (2002). Hitting the brakes. *Modern Healthcare, 32*(2), 22.

Gentry, W. M. (2002). Debt, investment and endowment accumulation: The case of not-for-profit hospitals. *Journal of Health Economics, 21*(5), 845-872.

Janiga, N., & Muller, M. (2013). 7 common reasons for hospital transactions | news & analysis Retrieved, 2013, Retrieved from http://www.beckershospitalreview.com/news-analysis/7-common-reasons-for-hospital-transactions.html

Kane, N. M., & Magnus, S. A. (2001). The medicare cost report and the limits of hospital accountability: Improving financial accounting data. *Journal of Health Politics, Policy and Law, 26*(1), 81-105.

Kaufman Hall and Associates, Inc. (2010). *A guide to financing strategies for hospitals with special consideration for smaller hospitals.* American Hospital Association.

Kim, T. H., & McCue, M. J. (2008). Association of market, operational, and financial factors with nonprofit hospitals' capital investment. *Inquiry, 45*(2), 215-231.

Levitt, S. (1994). Quality of care and investment in property, plant, and equipment in hospitals. *Health Services Research, 28*(6), 713-727.

Madison, K. (2004). Multihospital system membership and patient treatments, expenditures, and outcomes. *Health Services Research, 39*(4p1), 749-770.

Magnus, S. A., & Smith, D. G. (2000). Better medicare cost report data are needed to help hospitals benchmark costs and performance. *Health Care Management Review, 25*(4), 65-76.

Medicare Payment Advisory Commission. (2004). *Report to the congress: Sources of financial data on Medicare providers.* (Report to the Congress No. 2013).

Melnick, G., & Keeler, E. (2007). The effects of multi-hospital systems on hospital prices. *Journal of Health Economics, 26*(2), 400-413.

Moody's Investor Service. (2012). *Moody's: Driven by M&A, upgraded non-profit healthcare debt exceeds downgraded debt in third quarter*.

News - memorial medical center - memorial medical center Retrieved, 2013, Retrieved from http://www.mmcwm.com/News/SpectrumHealth

Reiter, K. L., & Song, P. H. (2011). The role of financial market performance in hospital capital investment. *Journal of Health Care Finance, 37*(3), 38-50.

Reiter, K. L., Smith, D. G., & Wheeler, J. R. C. (2008, Fall; 2013/2). Liquidity constraints on hospital investment when credit markets are tight.*35*, 24+.

Rivenson, H., Wheeler, J., Smith, D., & Reiter, K. (2000). Cash management in health care systems. *Journal of Health Care Finance, 26*(4), 59-69.

Schuhmann, T. M. (2009, 11; 2013/6). Hospital capital spending: Shifting and slowing even before the financial meltdown.*63*, 92+.

Smith, D. G., Wheeler, J. R., Rivenson, H. L., & Reiter, K. L. (2000). Sources of project financing in health care systems. *Journal of Health Care Finance, 26*(4), 53-58.

Standard and Poor's. (2013). *U.S. not-for-profit health care system ratios: Stability in 2011 gives providers a firm foundation to face industry changes.* (No. 2013).

Wheeler, J. R., Smith, D. G., Rivenson, H. L., & Reiter, K. L. (2000). Capital structure strategy in health care systems. *Journal of Health Care Finance, 26*(4), 42-52.

Chapter 5

Conclusion

Hospital industry professionals and the trade press often claim multihospital system membership improves access to capital for independent hospitals acquired by these systems. However, neither anecdotal reports nor academic research explain how improvements in access to capital could occur. Moreover, there is little evidence available to support or refute this claim. Much of the research that does examine the relationship between system membership and access to capital uses data that predate important changes in the hospital industry, changes that drastically altered the way hospitals manage their finances. This dissertation begins to fill those gaps in the literature by proposing and testing specific theories about how system membership could affect hospitals' access to internal and external sources of capital. The dissertation also includes a study of changes in acquired hospitals' capital investment behavior since investment behavior is an outcome affected by changes in access to capital. Specifically, the three questions this dissertation addresses are:

1. Does system membership enable not-for-profit hospitals to reduce the amount of cash they hold in reserve?
2. What are the effects of system membership on hospital leverage? Does system membership allow low-leverage not-for-profit hospitals to increase their leverage? Are highly-levered not-for-profit hospitals affected and if so how?

3. Does system membership enable acquired hospitals to increase their capital expenditures? When do these changes occur relative to acquisition? Are they immediate as we would expect if hospital systems made capital available to acquired hospitals, or do they take longer to develop, as we would expect if system membership caused operational improvements which in turn improved a hospital's creditworthiness or internal capital generation gradually?

Chapter II examines the effects of system membership on the availability of internal capital. This chapter furthers our understanding of the relationship between system membership and access to capital by proposing a mechanism through which system membership may make additional internal capital available to acquired hospitals. The paper notes that relative to hospital systems, independent hospitals have high costs of a cash shortfall resulting from their limited access to external capital, their higher probability of bankruptcy and their relatively high costs of bankruptcy. In theory these factors contribute to independent NFP hospitals' high cash balances and, because system membership affects these factors, system membership should reduce NFP hospitals' optimal cash balances thus "freeing up" cash reserves to fund capital investment.

Overall, the results in Chapter II do not support the idea that system membership meaningfully increases the internal capital available for investment. In reality, the percent of acquired hospitals with large cash reserves is similar to the percent of all independent hospitals with large cash reserves. Even if system membership does offer hospitals a chance to reduce cash reserves, a relatively small portion of acquired hospitals have sizeable reserves to reduce. There are many reasons independent hospitals may choose to join multihospital systems (Ault,

Childs, Wainright, & Young, 2011) and it appears that the desire to gain access to internal capital to fund investments is not a prominent one. This is a notable difference between the NFP and investor-owned sectors since investor owned firms with high cash holdings frequently become the target of takeover attempts.

The second portion of this paper examines whether acquired hospitals that did have relatively large cash holdings experienced reductions in these reserves after joining systems. Given the fact that relatively few hospitals in the sample of acquired hospitals have unusually large cash holdings to begin with, the sample of hospitals that could be expected to reduce their cash holdings was small. A very small sample size resulted in estimates with large standard errors and no statistical significance. The results cast doubt on the hypothesis that system membership reduces acquired hospitals' cash balances by a meaningful amount. For acquired hospitals' cash balances to be equivalent to the average system-affiliated hospital's cash holdings, the actual declines in cash balances would have to be much greater than the effects estimated in this paper. However, this study only included a two-year follow-up period and it is possible large changes in cash balances take longer than two years to develop.

Chapter III examines the effects of system membership on another source of capital—debt. Like the first paper this one adds to the literature on system membership and access to capital by identifying a specific mechanism through which system membership could improve independent hospitals' access to capital. This paper uses finance theory to identify factors that may make debt issuance either unattainable or unusually expensive for independent hospitals relative to hospitals affiliated with multihospital systems. These factors include a lack of financial expertise, high proportional transactions costs of borrowing and a binding project-financing constraint. The results indicate that low-leverage acquired hospitals (which are most likely to be

encountering barriers to increasing leverage) experience statistically significant and substantively large increases in leverage after joining multihospital systems. The results do not suggest leverage changes for highly-levered acquired hospitals. However, interpreting this result is challenging. The study could have failed to find an effect because none is actually present. Alternatively, system membership could help some highly-levered hospitals reduce their leverage towards a lower optimum, while other highly-levered hospitals could have taken on additional debt as a means of funding further investment. If both these effects are present the net effect could be small.

The first two studies propose and test specific theories explaining how system membership could improve access to capital for acquired hospitals. The third study does not specify a particular mechanism through which system membership could improve access to capital. Rather, it looks at an outcome influenced by changes in hospitals' access to capital---investment behavior. If hospitals have profitable investment opportunities they are unable to fund because they lack access to capital, and if system membership improves access to capital, acquired hospitals should increase their level of capital expenditures after joining multihospital systems. This study finds evidence that capital investment increases for acquired hospitals after they join systems. Moreover, these increases occur early in the first five years after acquisition. Quick increases in capital expenditures are consistent with the idea that system membership improves access to capital directly, rather than indirectly by improving hospital operations which then improve hospitals' creditworthiness or internal capital generation. Surprisingly, the biggest increases in capital expenditures occurred for the hospitals with the newest physical plants. This could indicate that systems are most willing to fund capital expenditures for hospitals that lack access to capital because of plentiful investment opportunities rather than for other reasons.

These three papers provide complimentary insights into the effects of system membership on hospital access to capital. Alone, the finding that system membership increases capital investment does not necessarily suggest access to capital has improved. Increases in capital investment would occur, even without changes in access to capital, if system membership creates new investment opportunities for acquired hospitals that were more profitable than existing opportunities or if increases in capital expenditures reflect integration costs. Similarly, even without changes in access to capital, leverage could increase for some hospitals that join systems if these hospitals were allocated a portion of the system's overall debt holdings. The joint finding that both capital investment and leverage increase for some acquired hospitals is stronger evidence that system membership does in fact improve access to capital. However, further research is warranted to determine how many acquired hospitals experience improvements in access to capital, how these improvements occur, and what factors drive changes in leverage. For instance, Chapter III's results, which suggest system membership allows low-leverage hospitals to increase their leverage, does not offer information about how these changes in leverage came about or how much of the additional leverage was used to fund capital expenditures. Rather than enabling new capital investment, additional debt could have been issued to preserve cash holdings for investment in financial securities. Future research could distinguish between these two possibilities by examining changes in net fixed assets for the group of acquired hospitals that enjoyed increases in leverage. If hospitals increased both leverage and net fixed assets this would be strong evidence that increased debt market access was going to fund capital investment. Alternatively, if hospitals that increased leverage failed to increase fixed assets it is more likely that debt issuance was funding indirect arbitrage or that hospitals in systems were simply being reporting a system-average leverage.

Similarly, further research on the factors that caused the capital investment increases observed in Chapter IV, would be useful. Were these increases funded by changes in leverage or were they funded in other ways? More detail about the kinds of projects that made up these increases would also be interesting. The increased capital expenditures could have been caused by investments that promise a substantial benefit to the acquired hospital's community, like service line expansions or new technology to improve the quality of care. Alternatively, these investments could simply represent the costs of integrating the acquired hospital into a larger system. Future research could use AHA data on service offerings as a way to better-understand what kinds of investments made up the increases in capital expenditures.

Because each of the three dissertation papers uses a similar sample of hospitals, there is an opportunity to combine the results from each study to produce "back of the envelope" conclusions about how capital expenditure increases are funded and the outcomes associated with changes in internal and external capital. Of the 203 confirmed hospital acquisitions, 51% (104) of these hospitals fell into the sub-group of hospitals for which increases in capital expenditures were estimated to be the largest (this sub-group was hospitals with relatively new assets). It is interesting to note that only half of acquired hospitals fall into the group with the largest increases in capital expenditures. This reinforces the idea that many acquisitions may occur for reasons unrelated to access to capital.

Of the 104 hospitals in the sub-group that experienced the largest increases in capital expenditures, 11 were also in the group that Chapter II identified as increasing leverage after joining systems. This suggests that even though increases in leverage could be funding increases in capital expenditures for some hospitals, many of the hospitals with increases in capital expenditures do not appear to be funding those investments by issuing additional debt. There is

also uncertainty about how hospitals that increased their leverage used those increases. Of the 20 hospitals in the "low leverage" group that experienced increases in leverage, only 11 were also in the group found to enjoy the greatest increases in capital. The results from Chapter II also highlight the need for future research describing how increases in capital expenditures are funded. Of the 104 hospitals in the sub-group of hospitals with the largest capital expenditures, only 10 were also in the group of hospitals with the largest estimated reductions in cash. Reductions in cash holdings do not appear to be funding much of the capital expenditure made by acquired hospitals.

These are, admittedly, rough estimates. They are based on mean changes in financial outcomes for groups of hospitals, rather than changes in outcomes for individual hospitals. This method of synthesizing the results from each of the three dissertation has flaws. For instance, it is quite possible that some hospitals in the group that experienced increases in leverage, but did not have the largest increases in capital expenditures, still experienced some increases in capital expenditures after joining systems. Still, these estimates make it clear that further research is needed to identify the characteristics of system membership that cause changes in capital expenditures and the reasons for the observed increases in leverage for some hospitals.

Rigorous research on the relationship between system membership and access to capital is extremely scarce. These dissertation papers do much to advance the literature in this area by offering evidence that system membership does increase leverage and capital expenditures, at least for some groups of hospitals. However, quantitative research to answer detailed questions about how changes in capital expenditure are funded and what drives changes in leverage would require detailed, accurate data and a large sample of acquired hospitals. Unfortunately, sample sizes were relatively small for each of the three dissertation papers and identifying a large sample

of independent hospitals acquired by systems in recent years is not possible. Pursuing this question further may require qualitative research methods. Despite the fact that much of what we know about hospital finance comes from quantitative research, qualitative methods have a great deal to contribute to the field. Methods like structured interviews of health finance professionals and case studies could offer a richer understanding of the mechanisms through which system membership affects access to capital. Hospital financial data are plagued by a number of shortcomings including questions about the accuracy of Medicare Cost Report information, large numbers of missing and unrealistic data values, and the endogeneity of financial variables in general. Moreover, concepts like "the cost of capital", "the optimal level of cash holdings" or "optimal capital structure" can be difficult to define conceptually and even harder to observe in data. Qualitative methods would be less affected by these problems than traditional quantitative methods.

The idea that hospital systems may affect acquired hospitals' access to capital also raises interesting questions about whether hospital systems create and maintain internal capital markets to actively control the allocation of capital to system affiliates. Health systems are not homogeneous and vary on the degree to which control is centralized. (Bazzoli, Shortell, Dubbs, Chan, & Kralovec, 1999; Dubbs, Bazzoli, Shortell, & Kralovec, 2004) This suggests some systems may have active internal capital markets even if others do not. At least one health system appears to maintain actively managed internal capital markets (Robinson & Dratler, 2006) but virtually nothing is known about how many systems maintain these markets, whether there are features common to all markets and whether features of these markets differ for different types of systems (large vs. small, geographically diverse vs. local, not-for-profit vs. investor-owned).

If many hospital systems do actively manage internal capital allocation it begs the question, are these systems better at allocating capital than traditional lenders? If so hospital systems may play an important role in improving the efficiency of capital allocation. The finance literature does not offer a consistent answer to the question of whether or not internal capital markets improve capital allocation among investor-owned firms. Some theoretical work suggests these markets can improve investment efficiency (Gertner, Scharfstein, & Stein, 1994) while other research suggests this may not be the case (Scharfstein & Stein, 2000). Empirical evidence from investor-owned firms is difficult to find because financial statements for divisions of conglomerate companies are not publicly reported. For all its limitations, hospital data may have a unique contribution to make to the finance field since hospital data it is sometimes available at both the facility and the system level. However, before larger questions about the effects of internal capital markets on investment efficiency can be answered, basic descriptive research is required to confirm that hospital systems are maintaining internal capital markets and to describe the structure and processes of these markets. Qualitative research could make an important contribution to this effort by helping to identify and classify common characteristics of internal capital markets.

The first two papers of this dissertation identify financial market imperfections that may inhibit independent hospitals' ability to access capital markets. This adds evidence to a body of literature that suggests hospitals face capital market imperfections that affect their ability to make capital investments. (K. L. Reiter, 2004; K. L. Reiter & Song, 2011) This literature has consistently stressed that, because of these imperfections, hospitals are not always able to find financing for value-creating investment projects. Instead, some hospitals face tradeoffs between using cash holdings to fund current investment projects and retaining these holdings to insure

future debt market access. (Rivenson, Reiter, Wheeler, & Smith, 2011; Smith, Wheeler, Rivenson, & Reiter, 2000; Song & Reiter, 2010) Similarly, NFP hospitals, because they have limited access to equity, face a choice between passing up investment opportunities or increasing leverage and limiting their future access to debt capital. (Wheeler, Smith, Rivenson, & Reiter, 2000) However, the net present value tools most hospitals use to evaluate investment opportunities (K. L. Reiter, Smith, Wheeler, & Rivenson, 2000) do not take into account the limitations in future debt market access that many hospitals must accept when they choose to use cash or debt to fund investment. Hospital managers and boards can be guided by net present value analysis but ultimately they lack analytical tools that can help them decide whether an investment opportunity creates enough value to sacrifice future access to debt markets or internal capital. Devising criteria managers can use to analyze investment opportunities that take into account the loss of future access to capital costs is a formidable task that may require the use of complex theory for valuing real options. Still, such criteria have the potential to vastly improve investment decision making by hospitals and so developing these tools is a worthwhile endeavor.

Finally, the discussion of NFP hospitals' cost of capital in Chapter III raises questions about how NFP hospitals' equity holders' expected returns vary for system vs. independent hospitals, and who the equity holders for system-affiliated hospitals are. Traditionally the community in which a not-for-profit hospital is located is considered the hospital's residual claimant. But little is known about how this relationship changes as NFP hospitals join systems that may span multiple states or regions of the country. In this case who are the system's equity holders and who receives the dividends-in-kind provided by the hospital? Do these benefits flow to communities most in need of services or do system-affiliated hospitals that generate funding for community benefit spend that funding in their local communities? Additional research

examining this question could help inform independent hospital managers and boards considering joining multihospital systems.

References

Ault, K., Childs, B., Wainright, C., & Young, M. (2011). Relevant factors to consider prior to an investor-owned acquisition of a nonprofit healthcare entity. *Journal of Healthcare Management, 56*(4), 269-80; discussion 280-1.

Bazzoli, G. J., Shortell, S. M., Dubbs, N., Chan, C., & Kralovec, P. (1999). A taxonomy of health networks and systems: Bringing order out of chaos. *Health Services Research, 33*(6), 1683-1717.

Dubbs, N. L., Bazzoli, G. J., Shortell, S. M., & Kralovec, P. D. (2004). Reexamining organizational configurations: An update, validation, and expansion of the taxonomy of health networks and systems. *Health Services Research, 39*(1), 207-220.

Gertner, R. H., Scharfstein, D. S., & Stein, J. C. (1994). Internal versus external capital markets. *The Quarterly Journal of Economics, 109*(4), 1211-1230.

Reiter, K. L. (2004). *Investment, financing, and liquidity constraints in not-for-profit hospitals.* (Unpublished PhD). University of Michigan,

Reiter, K. L., & Song, P. H. (2011). The role of financial market performance in hospital capital investment. *Journal of Health Care Finance, 37*(3), 38-50.

Reiter, K. L., Smith, D. G., Wheeler, J. R. C., & Rivenson, H. L. (2000). Capital investment strategies in health care systems. *Journal of Health Care Finance, 26*(4), 31-41.

Rivenson, H., Reiter, K., Wheeler, J., & Smith, D. (2011). Cash holdings of not-for-profit hospitals. *Journal of Health Care Finance, 38*(2), 24-37.

Robinson, J., & Dratler, S. (2006). Corporate structure and capital strategy at catholic healthcare west. *Health Affairs, 25*(1), 134-147.

Scharfstein, D. S., & Stein, J. C. (2000). The dark side of internal capital markets: Divisional rent-seeking and inefficient investment. *The Journal of Finance, 55*(6), 2537-2564.

Smith, D. G., Wheeler, J. R., Rivenson, H. L., & Reiter, K. L. (2000). Sources of project financing in health care systems. *Journal of Health Care Finance, 26*(4), 53-58.

Song, P. H., & Reiter, K. L. (2010). Trends in asset structure between not-for-profit and investor-owned hospitals. *Medical Care Research and Review, 67*(6), 694-706.

Wheeler, J. R., Smith, D. G., Rivenson, H. L., & Reiter, K. L. (2000). Capital structure strategy in health care systems. *Journal of Health Care Finance, 26*(4), 42-52.