Explaining differences between hospitals

A multidisciplinary market model to overcome
the under- and oversocialized aspects of traditional models

Author: Joris Smid
January 2008

Master Thesis
Health Science
School of Management and Governance
Department of Science, Technology, Health and Policy Studies (STeHPS)
University of Twente, Enschede, the Netherlands
Institute for Governance Studies (IGS), Enschede, the Netherlands

Supervisors:
Prof. Dr. W. van Rossum, Enschede, the Netherlands
Ir. E. Bredenhoff, Enschede, the Netherlands

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Summary

We have conducted longitudinal quantitative research to explain the differences between profit and non profit hospitals of the state of Florida. We focus on hospitals from the state of Florida, because it has a free market environment and consists of a wide range of different hospital types. A free market environment is relevant for this research, since observations in a free market environment are least contaminated with external influences (like government interference). Different economic reason of existence between profit and non profit hospitals, conversion of non profit to profit hospitals, and changes in traditional maximization goals are reasons why we explain ownership type differences.

Previous research showed contradicting results, where 60% concluded higher performance of non profit hospitals and 10% concluded higher performance of profit hospitals (Rosenau 2009). Theoretical different views can result in different conclusions about hospitals. We identify three views: economic, cultural, and sociological. Each of these three views are criticized for having a serious theoretical shortcoming in their market assumptions. To overcome these shortcomings, Zelizer (1988) suggests the use of a multidisciplinary model: the Multiple Market Model (MMM).

The goal of this research is to demonstrate the added value of the multiple market model (MMM) while identifying, describing and explaining the differences between hospitals in the health care market (of Florida). Because of the contradicting results found in previous health care research we have formulated the research question:

Why are non profit hospitals more efficient than profit hospitals, while economic theory predicts profit hospitals to be more efficient?

The scientific relevance of this research is to make a convincing overlapping model for explaining the differences in organizational forms, which is currently lacking.

The practical relevance of better knowledge about organizational forms will help health care policy makers to understand the implication of their policy. This is important since some ownership types are stimulated by tax advantages, based on assumed differences in ownership where a particular ownership type should perform better.

A final relevant contribution of this research originates from the fact that in some countries there is a tendency to stimulate market functions in their health care market. The insights from this research may be used to visualize the consequences of different organizational forms for hospitals.

For every approach of the MMM we formulate two hypotheses. The data used to test the hypotheses is primarily collected from the inpatient dataset of the Agency for Health Care Administration (AHCA) for the years 2000 to 2004.

We test, using statistical software SPSS, efficiency difference between ownership types for the economic approach, range of service for the cultural approach, and mimicking behavior between alliances for the sociological approach. Logistic regression is performed to analyze the predictive value of explanatory variables on the dependent variables. We included only non-teaching short term acute care hospitals in our research. Average total research population is 165 (s.d. 2) hospitals for every year.

Based on the results we can conclude that Florida's short term acute care hospitals show:

- Convergence of the efficiency scores
- Convergence of the range of service to broad ranges hospitals
- Convergence within the close social context; the alliance

We suspect three cultural changes to be a reason for the convergence of efficiency scores. The conversion movement, the hallec tax benefits for non profit hospitals, and managed care. With the disappearance of external forces, that ensured difference between profit and non profit hospitals, maximization goals could become more equal. Traditional, cultural differences between profit and non profit hospitals are reflected in their different maximization goals. Profit hospitals maximize output to satisfy the financial need of the shareholders. Non profit hospitals maximize input to satisfy community health care need.

Focused hospitals are more efficien. then broad ranged hospitals. Because the number of broad ranged hospitals increased are the relative efficiency scores converting.

We did not find a definitive reason for the convergence of ranges of service, but based on the sociological approach we suspect hospitals within an alliance to mimic the range of service of their market environment and mimic the range of service within their alliance. This is based on the large percentage of alliances in the state of Florida -71%- and the fact that all hospitals participating in a alliance have a broad range of service.

To answer the research question, efficiency scores between profit and non profit hospitals were similar in the year 2004. Non profit hospitals are more likely to be focused and the more focused a hospital is, the more efficient it gets. Therefore, the mean efficiencies of non profit hospitals are more likely to be higher while hospitals of equal range and equal hospital type are equally efficient, independent of ownership type.

This research implicates that hospitals in a free market environment become broad ranged hospitals who participate in an alliance. If a health care policy aims on the diversity and specialization of hospitals then a free market environment is not the appropriate choice.

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Preface

This research concludes my master course Health Sciences on the University of Twente (The Netherlands). I have enjoyed the master course and was particular interested in the consequences of health care systems on health care in general. This research was an opportunity to look at the complexity of health care differences (in the form of hospitals) on a multi-disciplinary level. Also my interest in market function within health care markets was a stimulus in this research.

This master thesis could not be written without the help of other. I would like to thank my supervisors for their time and for their remarks. I would like to thank prof. van Rossum for his sincere interest and concrete advice. I would like to thank Eelco for every coffee break we had and our -for me- very helpful discussions. I felt great support from both supervisors especially, through their help in making working facilities possible. Thank you both.

My friends and family supported my research by giving great comments and asking sharp questions. I would like to thank Timon and Johan for everything during lunch breaks, coffee breaks, sympathy breaks, and other breaks. But, most of all, I would like to thank Anne Jan and Marc for their time invested in this thesis and in me.

Joris Smid,
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1 Introduction

1.1 Motive

Over the past decennia, health care organizations have been subjected to intensive research as well as major changes in their organizational structure. Considerable increases in health care costs let to the questioning of the organization of health care in general. This reassessment of health care systems resulted in new insights about health care markets and health care organizations. Theoretical implications were formulated about, for example, which type of ownership type would be suitable for a hospital in a certain market environment.

During the assessments of organizations in health care markets, many different organizational forms were found. From an economic perspective, profit hospital were expected to be more efficient than non profit hospitals (Clark 1980). However, only 10% of the health care research could support this hypothesis (Rosenau 2003). The nonconformity between theoretical expectation and observation makes us wonder why organizational forms in the health care market are different from each other.

1.2 Problem identification

Organizational forms can be studied from different points of view, based on their own specific fundamental assumptions. We identify three views: economic, cultural, and sociological. Each of these three views is criticized for having a serious theoretical shortcoming in their market assumptions. These shortcomings have become known as the under-, and oversocialized aspects of human behavior in economic action. To overcome these shortcomings, Zelizer (1988) suggests the use of a multidisciplinary model: the Multiple Market Mode (MMM). In this research, we will use this MMM to explore differences between the organizational forms of hospitals.

1.2.1 Significance

The behavior of hospitals to influence performance has been a subject of many health care studies, with various topics and with different results. This research will focus on differences between profit and non profit ownership type. There are three main reasons why we compare ownership types of hospitals.

First, the economic reason of existence in terms of financial needs differs between ownership types (Cutler and Horwitz 2000). This means that from an economic perspective profit and non profit hospitals are different by nature. Earlier research shows small performance differences between non profit and profit hospitals (Sloan and Vraciu 1983). However, when hospital ownership types are compared by their efficiency scores, 60% of the health care research indicates non profit hospitals to be more efficient versus only 10% for profit hospitals (Rosenau 2003).

Second, hospitals have experienced a major conversion of non profit organizations towards profit organizations (see section 3.1.2 (Gray 1997). This conversion was based on economic reasons that affect the performance of hospitals. This means that the difference between ownership types is big enough to make hospital want to convert.

Third, traditional goals seem to merge in some cases, where non profit hospitals are questioning efficiency and profit organizations are exploiting non profitable treatments to answer social needs. Some research suggests non profit hospitals to maximize profits and not only maximize social surplus value, while maximizing social surplus is considered the traditional purpose of non profit hospitals (Deneffe and Masson 2002). This suggests cultural differences between ownership types that exist but, in some cases vanished. When we compare hospitals by their market environment, we find that some hospitals copy behavior from other hospitals in their direct competition, whereas others do not (Duggan 2002).

We compare hospital ownership types, because economic theory predicts ownership type differences, because hospital ownership types were under influence of cultural changes, and because hospitals in a competitive environment influence each others behavior.

These studies illustrate that the social context or market environment of hospitals has effect on their economic behavior. This means that previous research suggests some effect of the social context or market environment on the economic behavior of hospitals. These studies, however, may be based on fundamentally different market assumptions, which lead to different results about the differences between these hospitals. Therefore, we will combine multiple approaches in this research. This allows us to give a more comprehensive explanation of the differences between organizational forms.

The scientific relevance of this research is to make a convincing overlapping model for explaining the differences in organizational forms.

The practical relevance of better knowledge about organizational forms will help health care policy makers to understand the implication of their policy. This is important since some ownership types are stimulated by tax advantages, based on assumed differences in ownership where a particular ownership type should perform better.

A final relevant contribution of this research originates from the fact that in some countries there is a tendency to stimulate market functions in their health care market. The insights from this research may be used to visualize the consequences of different organizational forms for hospitals.

1.3 Research question

We have reasoned that economic performance differs between ownership types and that a MMM should reveal a more comprehensive picture of why these differences occur. This research will look at the differences in efficiency between ownership types, in order to assess the economic performance of hospitals (see section 2.1). With these results, we will examine why differences between types of ownership occur. Summarizing, our main research question will be:

Why are non profit hospitals more efficient than profit hospitals, while economic theory predicts profit hospitals to be more efficient?

We will start with an economic approach, followed by a cultural approach and concluded by a sociological approach, to explore the three views that should give a more comprehensive answer to the research question. By exploring these three approaches of the MMM, we will demonstrate the added value of the MMM.

1.4 Research goal

The goal of this research is to demonstrate the added value of the multiple market model (MMM) while identifying, describing and explaining the differences between hospitals in the health care market (of Florida).

Our MMM exists of three different market approaches; economical, cultural, and sociological. This research will focus on the hospitals in Florida USA, for reasons that will later be explained in chapter 3. We categorize hospitals into two ownership types: profit and non profit.

1.5 Outline

The second chapter of this thesis explains the different approaches through a literature study. We will discuss the economical, the cultural, and the sociological approach. For every approach, we will formulate two hypotheses. Chapter two is concluded with a detailed explanation of the MMM.

In the third chapter, we will introduce the framework of this research. We will chronologically look at three different movements: the multiple hospital system (1960-1980), the conversion movement (1980-1990's), and the third malpractice crisis (2000's).

Chapter four is dedicated to the measurement and sources of data.

In the fifth chapter, the results and analyses for each individual hypothesis is presented. We will give a summary of the results of the first four hypotheses, which focus on calculating the predictive value of efficiency and range of service for ownership types. The second part of the results focuses on the mimicking behavior of alliances. At the end of chapter five, a conclusion about the results is presented.

Chapter six describes the overall conclusion of this thesis, based on the research question presented above. We will conclude this chapter with a discussion of the limitations of this research and give advice for future research.

2 Literature study

In this chapter, we will explore the research question stated in the introduction and explain the three different points of view for looking at this research question. For each approach, we will explain the differences between the types of ownership and formulate a concluding hypothesis.
This chapter also gives a detailed description of the multiple market model (MMM), which aims at giving a more realistic market view through the incorporation of different market approaches. The multiple market model represents an alternative to the neoclassical paradigm of markets and is therefore an useful model with a more realistic view on market behavior (Zelizer 1988).

2.1 Economical approach

When organizational forms are studied from an economical point of view, they are usually compared by efficiency. High health care costs combined with little health care improvement have let to question the efficiency of the health care system as a whole (Porter and Olmsted Teisberg 2004; Schieber and Poullier 1991). Reasons for the high health care costs are related to the increased need for health services. These health services account for 36% of the total health care expenditures of the US, where inefficient use is a reason for the yearly increase of the health care costs (Bates, Mukherjee, and Santerre 2006).

Efficiency differences between non profit and profit hospitals are the result of their different financial needs and organizational goals. Microeconomic theory suggests that profit driven hospitals will minimize costs by maximizing efficiency. The shareholders' claim on profit hospitals is a incentive for managers to focus on efficiency and to question hospital processes (Oswald, Gardiner, and Jahera 1994). This means that profit hospitals should be more efficient than non- profit hospitals.

Managerial theories, on the other hand, suggest that non profit hospitals managers do not have the motivation to be efficient. Non profit hospitals lack the pressure of shareholders, which is supposed to be the reason for non profit managers to focus on quantity or quality care (Newhouse 1970). This means that non profit hospitals, with the constraint of a zero profit policy, maximize the quantity of their services rather then the efficiency (Deneffe and Masson 2002).

Combining those two theories, we can formulate the following hypothesis from an economical viewpoint about the differences in efficiency between hospitals:

Hypothesis 1: Profit hospitals are (relatively) more efficient than non profit hospitals.

Although efficiency is the logical choice for explaining differences in ownership from an economical point of view, its definition and measurement cause difficulties (Hollingsworth, Dawson, and Maniadakis 1999). The reason for this is threefold: First, real output is hard to define. Do only completely recovered patients count

as real output? Is created knowledge or are residents output? Second, there is a high probability of biased cost reporting by hospitals. Third, techniques for measuring efficiency are subject to high sensitivity.
Even if these problems can be overcome, measured efficiency results are still only valid for the unit of analysis. This makes it challenging to draw a conclusion about the health care system as a whole based on efficiency.

The difficulties with efficiency and health care are reflected in the contradicting results of several efficiency studies. Striking are the results of earlier health care research, where only 10% resulted in accepting hypothesis 1. From a classic economic argument, however, differences between efficiency and ownership are expected, in favor of profit hospitals. As argued before, financial needs (Cutler and Horwitz 2000) and managerial incentives are the reasons for the distinction between ownership types. An explanation for differences in efficiency can be that the measured efficiency results are influenced by hospital characteristic and environmental variables.

The size of the individual hospitals also affects efficiency. Large hospitals can have the benefit of economies of scale (Ozcan and Luke 1992), which can lead to efficiency gain. On the other hand, large hospitals can also have the burden of excess manpower, which causes inefficiency (Wang et al. 1999). One of the problems with the former results is that the research was conducted in metropolitan as well as urban areas. Therefore, the location could have had an effect on efficiency. Efficiency research of the health care system of the U.S. did find differences that were contributed to the concentration of hospitals in metropolitan statistical areas (MSA) (Bates, Mukherjee, and Santerre 2006; Baker et al. 2000).

Efficiency studies where competition was measured by a Herfindahl Hirschman index (HHI) showed a positive relation between efficiency and competition (Rosko 2001). This suggests that microeconomic theory about the efficiency of profit hospitals holds under perfect market conditions. We assume perfect market conditions more likely in a competitive market environment. Therefore we formulate the following hypothesis:

Hypothesis 2: In a competitive environment, profit hospitals are (relatively) more efficient than non profit hospitals.

We have argued that differences between ownership types are partly due to different maximization goals. Non profit hospitals are more focused on maximizing community health care. But hospitals converted, as we will discuss in more detail in section 3.1.2, and traditional goals of hospital types have changed. For example, non profit hospitals do not only maximize social surplus, but also maximize profit (Dereeper and Masson 2002). This means that the traditional view of non profit hospitals providing health care is no longer valid and that the organizational culture could possess the reason why some research contradicts the hypothesis that profit hospitals are more efficient. In the next section we will take a closer look at the cultural differences between non profit and profit hospitals.

2.2 Cultural approach

Organizational forms studied from a cultural approach can be compared through their range of service. We argue that the cultural differences between non profit and profit hospitals originate from their social purpose. To demonstrate the effect of culture, one must demonstrate that an individual or group with a specific culture shows different behavior than a group with different cultural elements (DiMaggio 1994). Mutual cultural elements in both profit and non profit organizations include, among others:

- The sanctity of the healthcare professional. To emphasize the professionalism of the health care professional.
- The furtherance of life. The perception to get better when asking for help at the health care organization.
- The rewards of excellence, giving by several quality authorities to emphasize the reputation of organizations.
- To act in the best interest of the patients. The patients do not only get better with the best help, but the organization will try all they can.

What distinguishes non profit from profit organizations is their social purpose. Historically, non profit hospitals exist to fulfill a social purpose to provide health care for the community, i.e. to answer the right to health care for all. In return, tax privileges and other privileges are available for hospitals (Newhouse 1970). Profit organizations traditionally have a different purpose. They have to answer to shareholders who finance their organizations, as was explained in section 2.1.

The consequence of different social purpose between profit and non profit hospitals results in different ways for maximizing their utilities. Non profit hospitals would prefer higher volumes by offering a broad range of services in order to answer the demand for health care in the community, i.e. outcome maximization. Profit organizations would prefer services that respond to the need of their shareholders by eliminating services that do not meet profitability, i.e. profit maximization. This means non profit hospitals will maximize their total utilities or treatments, while profit hospitals will maximize their total most profitable utilities or treatments. In other words, because of the different goals between ownership types, the range of service will be different. (Zwanziger, Melnick, and Simonson 1996). From a cultural point of view, we can now formulate the following hypothesis about the range of service differences between hospitals:

Hypothesis 3: Profit hospitals have a (relatively) smaller range of service than non profit hospitals.

Culture has additional effects on hospital structure that are not related to economical motives. These effects are related to the definition of culture. Culture consists of four types of symbols: norms, values, beliefs, and expressive symbols (Peterson 1979). Norms and values influence behavior by regulating the boundaries to act within (regulative culture). Beliefs influence behavior by defining the individual needs or drives of the actor (constitutive culture (DiMaggio 1994)). In a sense, culture can set rules to pursue own interest or by general excepted standards (DiMaggio 1997). This means culture defines individual preferences and community accepted restrictions on behavior.

Meyer and Rowan (1977) argue that through institutionalized myths and formal organizational structure, organizations gain legitimacy and stability when being isomorphic with socially accepted myths. In other words, if a hospital can comply with a myth it gains a reason for existence. These myths are institutionalized products, techniques, services, and programs.

Myths are a form of regulative culture, i.e. community accepted restrictions on behavior. For example, a myth can be principles of contract or, more specific, professional rules of practice. These regulative elements affect how the community perceives organizations and how organizations want to be seen.

Health care professionals use pressure groups, courses, and certification to emphasize their professionalism. It underlines trust and legitimacy of own judgment. Under stress of competition, hospitals can emphasize their heritage as provider of health care for the community. It underlines the reason of their existence in the community while their economic reason of existence might be under debate. Consequently, formal organizational structures are, for a part, formed independently of rational economical choices (Oliver 1991; Deephouse 1996).

However, under stress of the market environment profit hospitals feel the need to specialize, in order to gain competitive advantages like economies of scale and standardization advantages (Stinchcombe 1990). Another consequence of competition is that profit hospitals skim their patient mix and specialize (Iglehart 1985). This means that hospitals are partly driven by economic rationality, especially profit hospitals. Profit hospitals are less likely to use social purpose as an argument to explain their existence in the community. Part of the myth of a profit hospital is to make profit for their shareholders. This means that competition affects how a hospital will use their culture in their advantage; therefore, competition affects range of service. This means that hospital have to balance the legitimacy advantages of myths with the stresses of the market environment and economic rationality. Based on this discussion, we can formulate the following hypothesis:

Hypothesis 4: Profit hospitals in a competitive environment have a (relatively) smaller range of service than profit hospitals not under competition.

We have argued that the culture of an individual hospital is affected by the different social purpose and that competition affects the range of service of profit hospitals. However, the market environment is not the only environment that influences a hospital. The close social context of an alliance creates a group of hospitals that can exceed the (direct) market environment and forms a constitutive culture that is equal for all members of the alliance. In the next section we will argue that hospitals that are part of an alliance will behave similarly in terms of efficiency and range of service.

2.3 Sociological approach

Organizational forms studied from a sociological approach can be studied trough their relational link with others, in this case alliances. An (strategic) alliance is a "voluntary arrangement between organizations involving exchange, sharing, or co development of products, technologies, or services" (Gulati 1998). The reason why we look at alliances is based on the embeddedness of economic action in social context (Granovetter 1985). This embeddedness theory suggests that economic action can be placed within the relations between individuals or between organizations. In a sense, the relation between actors influences economical choices. However, social relations will also create a common constitutive culture.

Granovetter (1985) emphasizes that relations between firms are more important than personal relations when looking at economic actions of organizations. Examining alliances can lead to a more comprehensive view of the strategic behavior of firms (Gulati, Nohria, and Zaheer 2000). This means that an alliance is a social context formed by social relations between organizations that directly influence the economic behavior and culture within the social context.

In the previous two sections we have argued that, in theory, profit and non profit hospitals have different economical outcome and different cultural purpose. We have chosen efficiency and range of service to represent the differences in ownership types. Since the alliance embeds economic behavior and cultural purpose, hospitals within an alliance should be equal in economical and cultural terms.

This means that we argue that hospitals mimic behavior from other hospitals. We are interested in to what extent alliances mimic the behavior of their social context and their market environment.
Mimicking behavior is a strategic choice that occurs when information about a market is scarcely available and uncertainty is high. As a result, rational decision making is hard. Indeed, the uncertainty in the health care market is high and information about expenses or demand imperfect, thus mimicking behavior can be expected. As a result, hospitals look in their environment to find better practices or results and try to copy them. This mimicking behavior of hospitals runs through their network ties (Gulaskiewicz and Wasserman 1989). This means we suspect that mimicking behavior occurs within the market environment of alliances.
We explain three bases of mimicking behavior: frequency based, trial based, and outcome based imitation (Haunschild and Miner 1997). Although the identification of the different imitations is not part of this research, the differences between the three bases of mimicking behavior give useful examples about how alliances could be mimicking.

Outcome imitation assumes organizations mimic behavior of other organizations whose economic return is perceived to be the best. With the economical approach, we have explained economic return through efficiency scores. Since efficiency information can be seen as competitive sensitive information, it is more likely that this kind of information is more reliable for partners and shared with more ease within an alliance. Therefore, an alliance could allocate efficient processes within their social context. An example would be skimming of unprofitable treatments from profit organizations to non profit organizations, as was reported by Iglehart (1985).

Trait imitation assumes organizations mimicking characteristics of competitors within their environment. These traits can be size, status or technical processes. An example of trait imitation is copying expansion plans from competition, although this could also be an example of outcome mimicking when high outcome is expected.

Frequency imitation assumes organizations mimicking behavior that is practiced by a large amount of other organizations. Frequent behavior gains legitimacy until it reaches a taking-for-granted status. This means organizations imitate these for granted behaviors just because they are frequently practiced (Higstein 1985). This last kind of mimicking behavior resembles institutionalized myths that give organizations legitimacy.

We have argued that because of the characteristics of the health care market, hospitals tend to mimic behavior. We have suggested this mimicking behavior to be more present within an alliance, since the network ties between partners are stronger. From a sociological point of view we can formulate the following hypothesis about alliances:

Hypothesis 5: Hospitals within an alliance are relatively more affected by mimicking behavior, making the efficiency scores and range of service more alike.

We argue that resource sharing and trait skimming are of more importance in a high competition environment, because they are essential for survival. This suggests that the market environment is affected by alliances. We argue that efficiency and range of service of an alliance is affected by the dominant partner or the dominant alliances in the market environment. Because competition within and outside alliances increases just by the presence of an alliance, causing hospitals to react (Ireland, Hitt, and Vaidyanath 2002).

Hypothesis 6: In a competitive environment, alliances are relatively more affected by mimicking behavior, making the efficiency scores and range of service more alike.

We have argued that alliances mimic efficiency scores and range of service within their alliance and in a competitive environment. In the next section we will explain why the three approaches of the MMM give a more comprehensive view of market behavior of hospitals.

2.4 Conceptual model, synthesis between the approaches

The concept of the MMM is to form a middle course for the three approaches as described in sections 2.1 to 2.3. Interaction between the approaches allows for multidimensional solutions without being restricted by undermining basic market assumptions, which are called the undersocialized and oversocialized aspects of economic behavior. In this section, we will explain these two undermining market assumptions and explain the added value of the MMM.

2.4.1 *Undersocialized aspect of economic behavior*

Adam Smith (1982) argued in the "The wealth of nations" that perfect information and perfect competition is the basis for a free market environment. In this market environment, an invisible hand will lead the market to a stable optimum. The idea of the invisible hand forms the basis for classical economic theory, where economic action is a result of atomized human behavior (Granovetter 1985). This implies that social relations are not an important part of economic action. This is called the undersocialized conception of human action and is most appropriate to the economic approach.

The reality of the health care system is different, caused by uncertainty and imperfect information (Arrow 1963). Under this uncertainty, organizations find a way to make their organization successful. For example, by maintaining relations between suppliers of medical products and hospitals to create a bond of trust that decreases uncertainty about the delivery of materials. This has a direct effect on the reputation of both parties and the economic outcome of the hospital (Saxton 1997). The discussed economic efficiency comparison between ownership types (section 2.1) leaves relations and cultural differences underexposed.

2.4.2 *Oversocialized aspect of economic behavior*

The fundamental basis of the cultural and sociological approaches lies in the oversocialized conception of man (Wrong 1961). This conception implies human behavior to be oversensitive to regulative culture. Systems, new norms, and values are created just to be compliant with the general accepted opinions of the community, even without questioning these opinions (Granovetter 1985). This is in contrast to real life. Individualism is part of human behavior and rational based economical choices are made by individuals and therefore by organizations. This means that disobedience to regulative culture does happen.

Granovetter (1985) suggests that disobedience can be explained through the social context of the actors. Acting on social exception rules without acceptation is called the oversocialized aspect of economic behavior, because social excepted values are the rules of which all behavior is subordinate.

2.4.3 *Synthesis between the three approaches*

Both over- and undersocialized conceptions view human behavior as subordinate to the opinion of the community or to the invisible hand of the market. In reality, social context allows for disobedience of general accepted rules. This means that hospitals will not always show the expected patterns based on theories that have undermining market assumptions.

In reality, there is interaction between economic and non-economic factors, but this interaction is hard to show (Zelizer 1988). An example would be the mimicking behavior of hospitals based on the success of a hospital. This economic behavior can be observed in the market environment by all other hospitals provoking interaction between all hospitals. This suggests every "special category of social relation" (Zelizer 1988) to interact with economic behavior as a result. Fortunately, the three approaches all have clear variables that can be measured, making every approach a power tool for exploring efficiency differences between hospital ownership types. When we are able to explain unexpected results from one of the approaches by using the results from the other two, we will have shown the added value of the MMM (see Figure 1).

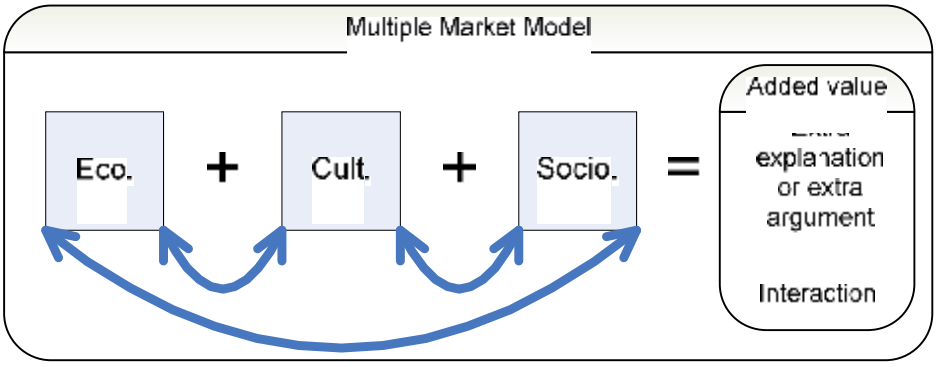

Figure 1: Multiple Market Model

3 Introduction to the background of this research

We perform our research with hospital data from the state of Florida, U.S. We have chosen for the state of Florida since it has a free health care market environment. Observations in a free market environment are least contaminated with external influences (like government interference), which means that the influence of the invisible hand can be observed in the Florida market environment. Florida is also an interesting location for this research, since it has many different hospital types therefore, making comparison between hospital types possible.

In this section we give an overview of three periods in the history of health care in Florida, the multiple hospitals system, the conversion movement, and the third malpractice crisis. But first we show some demographic characteristics in Table 1 and introduce some main demographic characteristics.

Selection of Data:	Florida (2004)	U.S.
Socio-Demographics		
Population	18,000,000	260,000,000
Residents Below 100% Poverty	12.8%	13.3%
Unemployment Rate	3.8%	5.1%
Median Income	$42,433	$46,242
Health expenditure	$4,698 per capita (2001)	$4,341 per capita (2001)
Percentage personal income	16.2%	14.2%
Health Status and Access to Care		
Total Hospital Beds (Per 100.000)	323.5	280.0
Adults who rate their health status as "excellent" or "very good"	58.9%	54.3%
Chronic Diseases		
Obese (BMI>30)	22.8%	24.4%
Heart failure death rate (age-adjusted; per 100.000)	6.8	19.4

Table 1: Characteristics of Florida; Sources: (State Center for Health Statistics 2008); (Office of Planning Evaluation & Data Analysis 2007); (U.S. Census Bureau 2007)

Florida, one of the southern states, had a population of 16 billion in the year 2000 and around 18 billion in the year 2004. Of those residents 16.8% are aged above 65 years. The ageing population causes extra stress on the health care system.

In total, around 2,700,000 resident of the state Florida underwent a medical procedure in the year 2004. Personal health care spending was $76.9 billion in Florida in the year 2001. The Organization for Economic Co-operation and Development (OECD) has calculated that the United States has the most expensive health care system with health care spending accounting for 15.3% of the gross domestic product (GDP) and the highest spending per capita of $6,100 in 2004 (OECD 2006). The GDP of Florida is with $650 billion almost as high as the Netherlands, although the Netherlands spend 8.9% of their GDP on health care in 2003.

One of the problematic chronic diseases in Florida is obesity. Obesity has reached epidemic proportions in the U.S, where an estimate of 27% of the population is obese. Economic costs are estimated around $100 billion and 40 million workdays lost annually. Besides the health risk involved with obesity, patients suffer from emotional burden due to prejudice or discrimination on the job market (Wellman and Friedberg 2002). The stress of both obesity and the ageing population can be seen in the overcrowding of emergency rooms (ER). These ER have traditional safety net functions that undergo capacity problems due to excess health care demand, especially in urban areas.

The World Health Organization (WHO) argues that the U.S. can be split into three separate parts: the rich, the average, and the poor. Only the rich -top 10%- receive top health care and the poor -5-10%- receive health care comparable to the health care of sub-Sahara Africa (The economist 2000)

In comparison to other U.S. states the state of Florida is placed 40th on health system performance (Commonwealth Fund 2007) and the U.S. is placed 37th in comparison to the rest of the world, just above Slovenia, in the WHO world's health system ranking. Nevertheless the state of Florida is a rising "New South" state with a high GDP and personal incomes surpassing most other U.S. states.

3.1.1 *The multiple hospital systems (1965-1980)*

During 1965-1980 two dramatic structural and behavioral changes occurred (Sloan and Vraciu 1983).

The first dramatic change had an effect on proprietary hospitals and corporate multiple hospital systems. The small proprietary hospitals owned by a handful of doctors decreased in number. A proposed reason for this decrease is the increase in innovations in medicine and technology, which increased the minimum efficient size of a hospital making small hospitals no longer profitable. Multiple hospital systems (both investor owned, and non profit) emerged as a result of financial benefits (Bays 1983). Especially in Florida could this effect be seen resulting in 9.2% multiple hospitals systems with more than three hospitals (Crozier 1982).

The second dramatic change had an effect on traditional business ethics. Changes in the environment, such as medical innovations, created demand for new financial needs and expertise. The hospital industry moved towards competition thinking (Sloan and Vraciu 1983).

In a time of growing market function and efficiency thinking concerns about uncompensated care were answered by government regulation. Two regulations were issued. MedicAid was decided by the US government in 1970 to provice health care to the elderly (above 65). MediCare was decided by the Florida state (in cooperation with the U.S. government) in 1970 to provide health care to indigent people.

3.1.2 *The conversion movement (1980-1990's)*

During the period 1980-1990 Florida was one of the four states with the largest number of public hospital conversion towards profit organizations (Needleman, Chollet, and Lamphere 1997). Most hospital conversions occurred among government hospitals. Most of these conversions were described as a result of the unwillingness of the community to provide tax support. Before the 1980-1990 period non profit hospitals were given tax advantages over profit hospitals, a large part of these tax advantages disappeared. This meant that some non profit hospitals were no longer economic feasible. A given reason for the high conversion percentage in Florida was the lack of a process to monitor community benefits or to oversee efficiency changes within the health care sector. As a result researchers questioned the remaining safety net for the indigent.

Consequence of the non-interest of the state of Florida in the conversion surge was that uncompensated care in previous public hospitals decreased (Needleman, Lamphere, and Chollet 1999). Although it is not clear if the safety net for the poor was shredded, it did have an effect on the capacity to serve the community needs for uncompensated care. The capacity of the safety net was affected since the traditional purpose of the public hospitals was to provide community health care needs. With the conversion of public hospitals towards profit hospitals capacity to provide public health care was lost.

The rising health care costs, the reluctance to provide tax benefits for public hospitals, the conversion of these hospitals to profit hospitals, and the changed business ethics towards competition thinking all gave the impression that providing for the poor was not part of any mission statement. As J. Goldsmith, enthusiast of free markets, stated at the 1985 Cornell University Medical College conference "I don't see the marketplace doing anything for the poor" (Iglehart 1985).

Halfway the 1990s managed care affected the U.S. health care market by its growing number of enrollees. Managed care exists in many forms, but is in general a payment system based on the number of enrollees instead of the number and quality of treatments. This has transformed the hospitals into cost centers (Shortell, Gillies, and Devers 1995).
Former legislation restricted managed care but when this legislation changed into encouraging preferred provider organizations (PPO) growth of enrollees escalated. This escalation changed the HMO market (a form of managed care). Permitting participation of HMO in Medicare under the Balanced Budget Act of 1997 has made the growth of health plans complete, although requirements that limit its growth have not totally disappeared (Glied 2000).
A second reason for the popularity of managed care is the way it responded to the health care market characteristics as reported by Arrow (1963). Managed care divides health consumers according to risks by making some packages more appealing for certain patient groups. This reduces the traditional problem of information asymmetry. Managed care can restrict, by contract, costly technologies, or stimulate supply-side cost sharing. As a result health care providers have fewer incentives to create more ranges of service. This reduces the problem of moral hazard.

Managed care has focused competition between health care providers based on the maximum added value, in other word cost reducing. This might reduce the problem of formal, and informal barriers to competition (Glied 2000).

The transformation of hospitals toward cost centers –caused by managed care- fueled the debate about the quality and accessibility of health care. Other consequence of managed is lead to hospitals narrowing their range of service to services with lower expenses. The high costs services were placed outside the hospital to specialized facilities which were presumed to be more cost effective. The empty beds within hospitals were not replaced, or removed, which increased the excess inpatient bed capacity up to 50% in some hospitals.

A positive situation occurred from 1993 to 2000 when the percentage of NHE of the GDP remained stable. This stability was in line with the changing nature of Medicare Health Maintenance Organization (HMO) benefit package, the decline in premium, and extra benefits since 1994 (Lamphere et al. 1997).

3.1.3 *The third malpractice crisis (2000's)*

During the period after the year 2000 the stable percentages of National Health Expenditure (NHE) spend on Gross Domestic Product (GDP) ended. The end of the stable expenses is in line with the third malpractice crisis and insurance market instability, especially this third crisis is important, since it affects the period of this research.

The resulting market instability is related to an increase of malpractice insurance premiums, which caused temporary shutdown of facilities, early retirement of physicians, and reluctance to perform high-risk procedures (Thorpe 2004). Florida state is one of the 20 states in full-blown crisis, exceeding base rate premiums with 50% (Dranove, Gron, and Sfekas 2006). The malpractice crisis has no negative impact on the range of service in rural areas (Brooks et al. 2004).

3.1.4 *Summary of the background of this research*

The state of Florida has and had many different problems facing the health care system. Costs were the reason to question the organization of health care institutions and are still a subject of concern. The malpractice crisis is seen as a direct problem for the capacity of the health care system.

4 Measurement and source of data

In this chapter we will explain how we have measured the dependent and independent variables and how we have collected the necessary data. We will start by presenting the data sources. We will then explain how we have measured the independent variables of which some are used in more than one approach within the MMM. Finally, we will discuss how we have measured the dependent variables. We will draw a conclusion about the measurement of efficiency used in the economical and sociological approach.
Full time equivalent (FTE) is excluded from the measurement of human resources, because of their high correlation with the number of beds within a hospital and because of data constraints on human resource collection. This leaves two input and two output variables for the efficiency measurement.

4.1 Source of data

The data used to test the hypotheses was primarily collected from the inpatient dataset of the Agency for Health Care Administration (AHCA)(see disclaimer in the appendix), the American Hospital Directory (AHD) website (2007) and the AHCA (2007) public Florida health compare website. The U.S. Census Bureau website and the Department of justice website were also used to collect data.
We assume the collected data to be valid, as hospitals are compelled by law to provide data to the AHCA and to the Florida health compare database. The AHD website claims to use only reliable sources.

Table 2 gives an overview of the used variables, their names, and their sources.

Variable names	Sources	Years
Ownership: Profit: Proprietary hospitals (Corporation, Partnership or Other) Non Profit: Governmental Hospital (District, City, County, State or Other) Voluntary Nonprofit. (Church or Other)	- American Hospital Directory website (American Hospital Directory 2007) - Agency for Health Care Administration (Agency for health care administration (AHCA) 2007)	Recent, 2007
Alliances:	- Individual websites of Hospitals, and ASC	Recent, 2007
Metropolitan Statistical Areas: MSA	U.S. Census Bureau (U.S. Office of Management and Budget (OMB) 2007)	2000- 2004
Size: Number of beds	- AHCA	2000-2004
Competition: HHI	Department of Justice (Justice 2007) Cover Story (Rhoades 1993)	2000-2004
Efficiency: Input: X1: General/surgical beds X2: Special care beds Output: Y1: Number of patients Y2: Length of Stay (LOS)	- American Hospital Directory website (American Hospital Directory 2007) - AHCA - Florida Department of Health (Florida Department of Health 2007) -AHCA	 Recent, 2007 Recent, 2007 Recent, 2007 2000-2004 2000-2004
Service Mix: Range of Services (17 ICD-9-CM Chapters)	- AHCA	2000-2004

Table 2: Variables and Sources of Data

4.2 Measurement of independent variables

In this section, we will explain the measurement of the independent variables.

4.2.1 Ownership type:

Ownership types were collected from the AHCA Florida health compare site and from the AHD website. A hospital has one ownership label that does not change over the years, because only recent (or until inactive state) information could be collected. We presume ownership types did not change significantly in the period 2000 to 2007. This assumption is reasonable, since most ownership conversions have stopped after the year 2000, which is before the studied period of this research (Robinson 2004).

4.2.2 Alliances

Alliances were collected by visiting the individual websites of health providers and organizations.

We assume hospital websites to give information about their type of alliance and who are the participants. If no alliance is mentioned, no alliance is presumed. Most recent alliance data was collected. This means we will compare the explanatory variables and dependent variables for the year 2004.

We identify five combinations or types of alliances:

- Uniform alliances consisting of only profit hospitals or only non profit hospitals (two types).
- Combined alliances dominated by profit hospitals or dominated by non profit hospitals (two types).
- Combined alliances with no dominating ownership type.

4.2.3 *Metropolitan statistical area*

Metropolitan statistical areas (MSA) were collected from the U.S. census bureau and are defined by the Office of Management and Budget (OMB). The MSA definitions of 2004 were used as a reference, which are based on the 2000 MSA standard. The MSA concept has been successful as a statistical representation of the social and economical linkages between urban cores and outlying integrated areas (Federal Register 2000).

For statistical reasons, use of a logistic regression, MSA is also dichotomized. Cut-off points are areas with more than 200 hospitals, where large MSA's are labeled 1. The MSA that are labeled as large are: Miami-Fort Lauderdale-Pompano Beach, Sarasota-Bradenton-Venice, and Tampa-St. Peterburg-Clearwater.

4.2.4 *Competition*

We use the Herfindahl-Hirschman index (HHI) to measure the level of concentration in a market as a measurement for competition. The HHI has been used in most hospital market studies as a proxy of monopoly power and competition (Dalmau-Matarrodona and Puig-Junoy 1998). The HHI is defined by squaring the market share of each firm and then summing the squares, as presented in the following Figure 2.

$$HHI = \sum_{i=1}^{n} S_{ij}^2$$

Figure 2: HHI

Where S_{ij} represents the market share of firm i in MSA j with a total of n firms in the market.

We have measured market share as a percentage of share of total available beds of the organization within their MSA, or state wide total. Discharges can also be used as a measurement of market share, but because of the heterogeneous treatments causing variable bias, beds were chosen (Gresenz, Rogowski, and Escarce 2004).

This HHI gives weight to large firms with a high contribution to the outcome in terms of production units, in this case the total number of patients. Economic argument to this weight is that with large firms controlling large portion of the outcome, competition in the market will be weak (Rhoades 1993). The HHI reaches a maximum of 10,000 (One firm with 100% of outcome makes $100^2 = 10{,}000$), and a theoretical minimum of zero. For example, 100 firms with equal market share will have a HHI = 100. This means a lower HHI represents higher competition. The U.S. Department of Justice and the Federal Trade Commission uses the HHI to detect unlawful mergers, and states:

- HHI equal or between 1.000, and 1.800 to be moderately concentrated (in our study no *competition*).
- HHI above 1.800 point highly concentrated (in our study *competition*).

- HHI below 1.000 points not concentrated (in our study *no competition*).

We have dichotomized competition, because we will use a logistic regression to measure the predictive effect of competition on efficiency.

4.2.5 *Size*

The total size of a hospital was measured by the total number beds of the organization. Previous research reports the efficient number of beds for hospitals is between 200-300 (Wang et al. 1999). We have divided organizations in three categories: less than 200 beds, equal to or between 200 and 300 beds, and more than 300 beds. To perform logistic regression, we have dichotomized the three categories into: equal to or less than 300 becs, and more than 300 beds.

4.3 Measurement of dependent variables

In this section we will examine the measurement of the dependent variables. Brackets behind the header of the subsections indicate the approach for which the variable is used.

4.3.1 *Efficiency (Economical and Sociological approach)*

Efficiency is defined as relative technical efficiency. Technical efficiency is producing the maximum amount of output with a minimal amount of input. An organization is technically efficient when it operates on its production frontier (Hollingsworth, Dawson, and Maniadakis 1999).

The second type of efficiency is allocation efficiency. An organization is regarded allocation efficient when it minimizes costs with a certain price of input, revenue or output. Technical and allocation efficiency combined are called overall efficiency. Technical efficiency is a robust way to compare grouped hospital efficiencies (Hollingsworth and Street 2006).

4.3.2 *Data Envelopment Analysis*

We use data envelopment analysis (DEA) to measure technical efficiency, since this is a robust way to measure general hospital group efficiencies (Holland and Offer 2001; Ozcan and Luke 1992; Hollingsworth and Street 2006).

DEA uses decision making units (DMU) that can have multiple inputs and multiple outputs. In our research, those DMU's are represented by the hospitals. DEA measures relative production frontiers using weighted inputs and outputs. The weight of the resources is defined by the DEA model (Wasserman 2005).

$$\max h_0(u,v) = \sum u_r y_{ro} / \sum v_j x_{io}$$
$$\textit{subject to}$$
$$\sum u_r y_{ro} / \sum v_j x_{io} \le 1 \textit{ for } j=1,\ldots,n,$$
$$u_r, v_i \ge 0 \textit{ for all } i \textit{ and } r.$$

Figure 3: DEA model by Cooper, Seiford, and Zhu (2004)

DEA software calculates the maximum of a DMU$_j$ as the sum of weighted output $u_r y_{ro}$ divided by the sum of weighted input $v_i x_{io}$ (see figure 3). This calculation if performed under the following restrictions: Efficiency can not be larger than 1, and the weigh. of a resource is presumed larger than 0 (Cooper, Seiford, and Zhu

2004). For further reading we suggest Coelli (1998) for an introduction on DEA, and Wassenaar (2005) for a thorough explanation of DEA and DEA software.

After choosing the DMUs, we have to define input and output variables. Since we exclude teaching hospitals, we can define output variables as the length of stay of all patients (an undesirable output) and the total amount of patients treated of every DMU. Input variables represent the hospital resources; workforce and materials (beds).

Data on human resources could not be collected for the years 2000-2004, so we have calculated the correlation between actual resources (see Figure 4). Because human resources show a high correlation (large then 0.5) with material resources, we can exclude human resources from the technical efficiency analysis. This makes the individual technical efficiency less accurate, but this has no major effect on this research, since we are interested in comparing grouped hospitals. We are interested in the relative difference between groups –ownership types- instead of claiming efficiency of an individual hospital over other hospitals. Besides, we use two other approaches -cultural and sociological- to make our statement about the differences between ownership types more accurate.

Summarizing the chosen input and output variables, we state:

Input:

- X1: General/surgical beds
- X2: Special care beds

Output:

- Y1: Number of patients
- Y2: Length of Stay (LOS)

Pearson Correlation	General/ surgical beds	Special/ long term beds	FTE Staffing	FTE Others
General/ surgical beds	1	.409(**)	.557(**)	.548(**)
Special/ long term beds	.409(**)	1	.652(**)	.653(**)
FTE Staffing	.557(**)	.652(**)	1	.812(**)
FTE Others	.548(**)	.653(**)	.812(**)	1

Figure 4: Summary of correlation between input variables; ** Correlation is significant at the 0.01 level (2-tailed).

DEAfrontier ™ software was used to calculate DEA in Excel. This application's main advantages are the calculation of slack, environment variables and undesirable models (we will discuss these terms further on). A disadvantage of the software version we have used, is the maximum of 200 DMUs. For further reading on this program, we suggest Zhu (2003).

An assumption of the DEA method is that decreasing input and increasing output will lead to more efficiency. In this research, LOS does not necessary result in a positive efficiency when it increases. This is called an undesirable variable. Therefore, we have used an undesirable DEA model where we can indicate such undesirable variables and still calculate the cost frontier.

The DEA software lets us chose between output or input models. The distinction between both models is defined by what the organization intends to maximize. The output model is chosen because we argue that the hospitals goal is to help as much patients as possible. This means we suspect hospitals to maximize their output with a given input.
Secondly, the DEA software let us chose between constan. or variable return to scale (VRS). The distinction between both options relies on the question whether organizations of different size can be explained without biased effects. VRS is chosen because we argue that hospitals can be best compared with hospitals of the same size in terms of input and output variables.
Therefore, we have chosen an output envelopment model with a variable return of scale (VRS).

Before explaining the calculation and use of efficiency score in this research, we have to discuss the disadvantage of the chosen DEA model. The DEA analysis, in general, is sensitive to outliers, because of the extreme way it uses the frontier method. There are easy and efficient methods for compensating for outliers, but with these methods super efficiency must be calculated (Banker and Chang 2006). We did not find a way to calculated super efficiencies with the chosen undesirable output VRS DEA model. Therefore, outliers are not compensated for.

After choosing the DEA model, efficiency scores can be calculated. For every year, one single average efficiency score for the total hospital sample was calculated. The efficiencies were calculated by DEA frontier software, which is an add-in of Microsoft Excel.

Environment disturbance on efficiency differences can be calculated with a two-stage method (Coelli, Rao, and Battese 1998). The first stage is calculating efficiency score; the second stage uses a logistic regression model to predict the effect on the explanatory variables.

The first step involves the calculated efficiency score (??). These efficiency scores are dichotomized. Technically efficient are those hospitals with efficiency score of one. All other hospitals are regarded inefficient (Cooper, Seiford, and Zhu 2004; Ozgen and Ozcan 2002). Thus, the first step gives a score of 1 to technically efficient hospitals, while all other hospitals are given a score of 0. The second step uses logistic regression to predict the effect of the explanatory variables on efficiency (Ozcan 1998).

A disadvantage of this method is that it gives contaminated results when variables are highly correlated, which is partly the case. Another disadvantage is that it partly ignores slack. Advantages, on the other hand, include its simplicity and the wide variety of research for which it can be used.

As mentioned before, the ability of the DEA software to calculate slack is a big advantage. Slack is the amount of resources that should be decreased or increased in order to perform on the optimum cost frontier.

We have chosen a DEA model that fits the data, is able to calculate technical efficiencies and can report which resources should be altered to become technically efficient.

4.3.3 *Range of service (Economical and Sociological approach)*

The dependent variable range of services is defined through the 17 chapters of the International Classification of Diseases, Ninth Revision, Clinical Modification (CD-9CM). The ICD-9-CM consists –for one– of a classification system for surgical, diagnostic, and therapeutic procedures.

We measure these chapters by measuring the maximum number of different groups in a hospital over a year. This means a hospital that uses two chapters, one of which is used only once a year will be given a range of service of 2.
Depending on the number of ICD-9-CM chapters, the range of service a hospital offers will be higher. Because the range of services is not normally distributed, we group this variable into three categories. These categories are based on a histogram of all hospitals for a year. We noticed a peak on both ends of the total number of chapters used. Therefore, we classified the chapters into:

- Small ranged hospitals have less than 6 chapters
- Moderate ranged hospitals have between 6 and 15 chapters
- Large ranged hospitals have 16 or 17 different chapters

Besides being grouped into three categories, the range of service is also dichotomized to be used in logistic regression. We have grouped small against large, with a cut off point at 5 different chapters with large labeled 1. And we have grouped large against small, with a cut-off point at 15 different chapters, with large labeled 1. With those two groups we can compare the effect of the mediator group on very small range and very large range hospitals, as well as the effect on both ends of range of service.

4.4 Statistical approach

We will use the statistical software SPSS to support our results and conclusions. Exceptional methods will be described separately for each approach.
We will use data envelopment analysis (DEA) software to calculate the dependent variable: efficiency. Efficiency scores are calculated for the total population for every year of this research period. This means we have run five efficiency score calculations.
We will use AHCA inpatient data to calculate the range of service of a hospital. Section 2.2 discusses why we have chosen for range of service to be the dependent variable.
After describing the results of the first four hypotheses, a post hoc logistic regression will be performed to evaluate the predictive power of the explanatory variables.
As mentioned before, we will use individual hospital websites to collect alliance information. The alliance information gathered is recent information, but will be compared with efficiency information and range of service information of the year 2004.
In the chapter conclusion and discussion, the added value of our approach will be described.

4.5 Research population

The research population is based on inpatient - and organizational information of all hospitals of the state of Florida that were active for one, a few, or all years during the period 2000-2004.

Excluded are:

- Teaching hospitals. Teaching hospitals were excluded from the efficiency study, since their resources are also used for education and therefore cannot be compared with non-teaching organizations.
- Freestanding ambulant surgical centers (ASC). ASC hospitals were excluded since too little information could be collected.

This means that four types of hospitals are part of this research population: Critical access hospitals, long term hospitals, psychiatric hospitals and short term acute care hospitals. Because of the two exceptions mentioned above, rehabilitation hospitals are excluded from this research population. Hospital based ASC's are only included if they shared the same AHCA ID number. This results in a research population of, on average, 165 (s.d. 2) hospitals.

5 Results and analysis

In this chapter we will present the results and analysis of the hypotheses formulated in chapter 2. First, we will give a description of the research data. We will specify the different hospital types, show the MSA's in a competitive environment, give a description of the alliances and specify the variables that are used to measure the efficiency score. In the introduction to the data, we will show that efficiency scores differences are significant between hospital types and unrelated to casemix differences. Therefore, we focus our analysis to short term acute care hospitals.

Subsequently, we will analyze the hypotheses one by one. After the first two hypotheses we give a small conclusion and calculate the predictive value. We conclude this chapter with a summary of the results and analysis.

5.1 Introduction to the data

The total number of profit and non profit hospitals show little variation over the years. The difference in the total amount of hospitals has a maximum 3 hospitals within a year.

We analyze efficiency differences between hospital types and case mix variables, since the nature of the illness influences the length of stay and the efficiency score. Long term hospitals will not have the same amount of patient discharges as short term hospitals, because long term patients obviously have a longer stay at the hospital than short term patients. Therefore, efficiency scores will be different.

The results of comparing efficiency with hospital types show large efficiency differences that are only related to the different types. To further support this statement we have tested correlation between two casemix variables and efficiency.

We have used percentages of patient's labeled emergency and patient length of stay (LOS) longer than 2 days as the two case mix variables. We performed regression for the four hospital types for the years 2000 and 2004. LOS longer than two days had a small effect on efficiency for critical access hospitals with a confidence interval of ± 0.12 for both years. A scatter plot analysis of critical access hospitals proved this difference to be 0.03 efficiency points.

All other hospital types showed no linear relation between the case mix variables and efficiency. This is surprising, as one would expect hospitals with a high percentage of emergency patients to be less efficient, as emergencies are harder to plan. Analyzing scatter plots of all combinations showed more variance in efficiency for hospitals with around 60% of LOS longer than 2 days (see appendix for scatter plot in Figure 5). Since the differences between efficiencies are not related to casemix differences and since efficiencies are very different between hospitals types, we have chosen the hospital type with the largest number hospitals to analyze the hypotheses: short term acute care hospitals.

Years	2000		2001		2002		2003		2004	
	P	NP	P	NP	P	NP	P	NP	P	NP
Count	90	74	90	73	88	75	90	76	91	76
Total:	164		163		163		166		167	
Facility types:										
Critical access	4	7	4	7	4	7	4	7	4	7
Long-term	5	0	5	0	5	0	7	1	8	1
Psychiatric	8	4	8	4	7	4	7	4	7	5
Short term acute care	73	63	73	62	72	64	72	64	72	63

Table 3: Descriptive statistics research population

5.1.1 *Description of the population and MSA with competition*

Table 4 shows the description of the location and number of hospitals located in a market environment under competition for the year 2004. Short term acute care hospitals are counted and shown between brackets. The hypotheses based on a competitive environment are tested with information from the three specified MSA's.

Competition in the year 2004		Hospital Count		Concentration number (HHI)	
				Mean	(s.d.)
(count for Short term acute care hospitals)		Profit	Non profit	(low HHI means competition)	
No competition	MSA's not specified	40 (36)	41 (33)	4671	(2822)
Competition	Miami-Fort Lauderdale-Pompano Beach	23 (16)	16 (15)	204	(0)
	Sarasota-Bradenton-Venice	12 (8)	10 (7)	654	(0)
	Tampa-St. Petersburg-Clearwater	16 (12)	9 (8)	448	(0)
	Total in a competitive environment	51 (36)	35 (30)	354	(199)

Table 4: Division of competition, 2004

5.1.2 *Description of the population and alliances*

Table 5 shows the description of the hospital alliances. Most hospitals (71%) form an alliance with other hospitals. Because of the large percentage of alliances, independent hospitals have a small effect on the mean efficiency. This means that the behavioral differences between ownership types can be contributed to the large percentage of alliances within the state of Florida.

Of the short term acute care hospitals, 72% (97) have formed an alliance and 28% (38) have not. Five (5) alliances combine more than one hospital type (28%) and 17 (72%) are all short term acute care hospital alliances.

All alliances have short term acute care hospitals, some combine short term acute care hospitals with other hospitals types, and all but one alliance have outpatient facilities.

	Type of Alliance (short term acute care)	Number of Alliances	Total hospitals with n type
No Alliance	None (independent hospitals)	0	38(28%)
Alliances	Profit dominance and sole profit alliance	9	44(33%)
	Profit dominance and mixed alliance	3	15(11%)
	No dominance and mixed alliance	2	5(4%)
	Non profit dominance and mixed alliance	0	0
	Non profit dominance and sole non profit alliance	14	33(25%)
	Total	28	97(72%)
Total			135(100%)

Table 5: Descriptive statistics alliances of short term acute care hospitals, 2004

5.1.3 *Description of the population and efficiency variables*

Table 6 shows the descriptive statistics of the input and output variables used for the data envelopment analysis (DEA) measurement. The input and output variables show large variations, which can be contributed to the different sizes of the hospitals. During the period 2001-2003, some hospitals had an extreme patient uptake that can be seen in the enormous differences between total numbers of patients. Length of stay (LOS) is measured in days and treatments that take less time than a day are measured as 1 day. Consequently, hospitals with a high percentage of admissions of less than one day are awarded with a higher output variable, resulting in a potential higher efficiency score.

Average per hospital Years	2000	2001	2002	2003	2004
Profit	Mean	Mean	Mean	Mean	Mean
Input variable:					
Genera / surgical beds	181	180	184	181	179
Special/ long term beds	32	32	33	32	32
Output variable:					
Number of patients	11425	12481	13086	12419	11676
Total LOS	38305	41829	44159	43174	43203
# patients/ total LOS	0.298	0.298	0.296	0.288	0.27
Years	2000	2001	2002	2003	2004
Non Profit	Mean	Mean	Mean	Mean	Mean
Input variable:					
Genera / surgical beds	180	181	180	177	177
Special/ long term beds	41	41	40	40	40
Output variable:					
Number of patients	14919	17353	17313	16699	15676
Total LOS	44970	53213	53064	53310	53140
# patients/ total LOS	0.332	0.326	0.326	0.313	0.295

Table 6: Descriptive statistics input, and output variables

5.2 Result and analysis of the hypotheses

In the previous section, we have given a description of the data and made a decision about the focus of our research. We will now use this data to test the hypotheses formulated in chapter 2. Because the differences between hospital types are only related to the different hospital types and short term acute care hospitals are by far the most present hospital type in our research data, we will focus on these hospitals specifically.

We will analyze the hypotheses one by one. We will give a short conclusion after the first four hypotheses, because the first four hypotheses focus on ownership differences and the last two focusses on alliances.

5.2.1 Analyzing hypotheses one and two

The first two hypotheses were formed from the perspective of economic theory. Based on economic theory we have formulated the following hypothesis in section 2.1:

Hypothesis 1: Profit hospitals are (relatively) more efficient than non profit hospitals.

Based on economic theories, profit hospitals should be more efficient. Table 7 shows the results of the efficiency analyses for the ownership types. Because efficiency scores did not show normal distribution, we used the Wilcoxon rank test to test this hypothesis (Ozcan, Wogen, and Mau 1998). Because we use the Wilcoxon rank test, we analyze the null hypothesis if the distribution of efficiency scores between profit and non profit hospitals is equal.

The Wilcoxon results show that the distribution between profit and non profit hospitals for the years 2001 and 2004 are equal ($p > 0.08$). The insignificant difference for the year 2001 can be ascribed to the large deviation of efficiency scores (see appendix figure 7 for histogram). This means that the differences in efficiency means between profit and non profit hospitals is not significant, making profit hospitals as efficient as non profit hospitals.

For the years 2000, 2002, and 2003 distribution of the efficiency scores for the ownership types are not significantly different ($p < 0.06$). This points out that the differences in efficiency mean between profit and non profit hospitals is significant, where profit hospitals are less efficient than non profit hospitals.

These results reject hypothesis 1, but confirm most health care research about efficiency. We have shown that non profit hospitals are more or equally efficient compared to profit hospitals during the period 2000-2004. This suggests that profit maximization of profit hospitals is not measured by their efficiency. Another possibility is that shareholders are content with the profit they receive and does not need a higher efficiency score. This result also suggests that the maximization goal of non profit hospitals leads to a higher efficiency (e.g. productivity).

Years	2000		2001		2002		2003		2004	
Efficiency	Mean	(s.d.)	Mean	(s.d.)	Mean	(s.d.)	Mean	(s.d.)	Mean	(s.d.)
Profit	.933	(.052)	.948	(.037)	.946	(.037)	.959	(.032)	.991	(.009)
Non Profit	.956	(.041)	.958	(.038)	.960	(.036)	.971	(.030)	.992	(.014)
Wilcoxon test of difference of efficiency										
Z-test	-2.32		-1.92		-1.85		-1.99		-1.72	
Sign.	.02		.23		.064		.047		.085	
Difference in means	.023		.010		.014		.012		.001	

Table 7: Efficiency differences between ownership types

As we have argued in section 2.1, we suspect the economic theory about the efficiency of profit hospitals to be confirmed when the market environment resembles a free market. Based on this assumption we have formulated hypothesis two:

Hypothesis 2: In a competitive environment, profit hospitals are (relatively) more efficient than non profit hospitals.

Based on the results shown in Table 8, we can reject hypothesis 2. The results show that under competition, distribution of the efficiency scores of ownership types differs for the year 2000. For 2001 to 2004, the distribution of the efficiency scores is not significantly different with a confidence level of $\alpha = 0.05$. We have shown that profit hospitals under competition are not more efficient than non profit hospitals. This implicates that, even under competition non profit hospitals have equal or higher efficiency scores.

Years	2000		2001		2002		2003		2004	
Efficiency	Mean	(s.d.)	Mean	(s.d.)	Mean	(s.d.)	Mean	(s.d.)	Mean	(s.d.)
Profit	.909	(.050)	.931	(.040)	.931	(.037)	.948	(.030)	.989	(.007)
Non Profit	.944	(.043)	.943	(.038)	.947	(.038)	.959	(.032)	.992	(.007)
ANOVA test of difference of efficiency										
Z-test	-2.13		-1.02		-1.66		-1.52		-1.80	
Sign.	.033		.309		.097		.128		.071	
Difference in means	.035		.012		.016		.011		.003	

Table 8: Efficiency differences between ownership types in a competitive environment defined by MSA's: Miami-Fort Lauderdale-Pompano Beach; Sarasota-Bradenton-Venice; Tampa-St. Petersburg-Clearwater

5.2.2 *Analyzing hypothesis three and four*

We were unable to show efficiency differences between ownership types to be in favor of profit hospitals, nor could the analysis give a reason why profit hospitals would be less efficient than non- profit hospitals. With hypothesis three and four, we test our suspicion that cultural differences between non profit and profit hospital reveal reasons for ownership type differences. The third hypothesis we test is:

Hypothesis 3: Profit hospitals have a (relatively) smaller range of service than non profit hospitals.

Table 9 shows the descriptive statistics of the range of service for short term acute hospitals and ownership type. Striking are the percentage small range non profit hospitals in relation to profit hospitals. Non profit hospitals tend to have a smaller range of service than profit hospitals based on a rejection limit of 5%[1], except in the year 2003. Based on the column percentage difference with a rejection limit of 5% for every year range of service "16 & 17 chapters" on ownership types did not show any significant differences. This means that on average, profit hospitals had the same percentage of high ranged short term acute care hospitals for every year.

The results show that profit hospitals in the years 2000, 2003, and 2004 had more hospitals with a range of service of "6-15 chapters". In addition, the result show that in the years 2001 and 2003 profit have equal focused (6 chapters) short term acute care hospitals, but in the years 2000, 2002, and 2004 the focus of profit hospitals is lower than those of non profit hospitals.
Overall, hypothesis 3 is rejected; profit hospitals do not have a smaller range of service than non- profit hospitals. This result suggests profit short term acute care hospitals to be not focusing on services.

It is interesting to note that all hospitals that do focus on a service do not have an outpatient facility. This suggests no skimming of services to more specialized hospitals, although skimming of certain high costs treatments can not be ruled out since we have only analyzed ICD-9-CM chapters and not the individual treatments of every chapter.

Other interesting observation, when looking at Table 9, is the high percentage broad ranged hospitals. Although, we can not give a definitive reason for this high percentage we suspect two main causes. First, shift of hospitals with 15 ICD-9-CM chapters to 16 chapters. Second, mimicking behavior of hospitals in the same market environment. With the sociological approach we can investigate if mimicking behavior or alliances affect the range of service and thereby give reason for the high percentage of broad ranged hospitals in 2004.

[1] Rejection limit and cross tab comparison were based on a textbook of Aarts (2007)

Range of service & Ownership										
Count	2000		2001		2002		2003		2004	
Column %	P	NP	P	NP	P	NP	P	NP	P	NP
<6	2	7	3	5	2	6	4	5	0	4
	2,7%	11,1%	4,1%	8,1%	2,8%	9,4%	5,6%	7,8%	,0%	6,3%
6-15	20	13	17	13	23	19	22	16	6	1
	27,4%	20,6%	23,3%	21,0%	31,9%	29,7%	30,6%	25,0%	8,3%	1,6%
	51	43	53	44	47	39	46	43	66	58
16 & 17	69,9%	68,3%	72,6%	71,0%	65,3%	60,9%	63,9%	67,2%	91,7%	92,1%

Table 9: Descriptive statistics range of service of short term acute hospitals

We suspect profit hospitals to be more affected by economic rationality than non profit hospitals are affected by social purpose when under pressure of competition (see section 2.2). Based on this assumption we have formulated hypothesis four:

Hypothesis 4: In a competitive environment, profit hospitals have a (relatively) smaller range of service than profit hospitals not under competition.

Table 10 shows the relation between competition and range of services. In 2004, all short term acute care hospitals have relatively the same high range of service. For the years 2000, 2002, and 2003, profit hospitals have a higher percentage of middle ranged hospitals. However, this higher percentage of middle ranges profit hospitals is due to the large number of hospitals that offer 15 different ICD-9-CM chapters. This means we do not accept hypothesis 4. The results suggest that, under competition, both profit and non profit hospitals offer the same range of services.

Range of service & Ownership under competition										
Count	2000		2001		2002		2003		2004	
Column %	P	NP	P	NP	P	NP	P	NP	P	NP
<6	1	1	2	1	0	0	0	0	0	0
	2,6%	3,1%	5,1%	3,1%	,0%	,0%	,0%	,0%	,0%	,0%
6-15	10	5	9	8	12	8	12	8	1	0
	25,6%	15,6%	23,1%	25,0%	33,3%	25,8%	33,3%	25,8%	2,8%	,0%
16 & 17	28	26	28	23	24	23	24	23	35	30
	71,8%	81,3%	71,8%	71,9%	66,7%	74,2%	66,7%	74,2%	97,2%	100%

Table 10: Competition and range of service

5.2.3 *Predictive value variables and convergence of efficiency scores and ranges*

The previous results show non profit hospitals to be more efficient. Within an environment under competition, non profit hospitals are also more efficient, but hospitals not located in a competitive environment do not show significant efficient differences.

We have calculated output slacks to locate the reason for inefficiencies, see Table 15 in the appendix. By calculating output slack we can identify –given the input- how much output is not produced given the expected output in relation to the DMU's on the efficient frontier (Wan et al. 2002). In other words how much the output can be increased given the input.

Consistent with the low occupancy rates found in previous research, hospitals must reduce the number of beds to become more efficient or increase the total number of patient treated. There are two problems with this advice:
First, state regulation restricts hospitals to change their number of beds without considering community health care needs. The Certificate of Need (CON) program ensures that new or expanding services fit in the health care need of a particular community. Therefore, changing the number of hospital beds will take some time and can be considered a long term decision.
Secondly, safety levels are not taken into account in this research. With uncertain demand, a hospital will have some spare beds in case of unforeseen extra patients. This means reducing the number of beds depends on the chosen safety level, which makes some proposed bed changes redundant.
The presented slacks show that hospitals must consider if they can reduce their total number of beds and balance such an effort against the expected efficiency gain.

The previous results show non profit hospitals to have a smaller range of services than profit hospitals. Within a competitive environment, both non profit and profit hospitals offer a broad range of services. The small difference for "6-15" ICD-9-CM chapters can be ascribed to the large number of profit hospitals that offer 15 different services (in terms of ICD-9-CM chapters). The difference in range of services could be the reason for the differences in efficiency scores between profit and non profit hospitals.

We have compared efficiency scores with ranges of services to see if the results show a reason for ownership type differences. Table 11 shows the mean efficiency scores and the standard deviation for 2000 and 2004. Of interest are the small differences between ownership types and range of service (see column differences). The results suggest a high correlation between efficiency scores and ranges of service. This means the more focused a hospital the higher the mean efficiency scores. Unfortunately, this does not explain ownership type differences, because differences in efficiency scores between ownership types are very small for a given range of services.

Most interesting is that efficiency scores and ranges of services converge between profit and non- profit hospitals. Differences in mean become smaller over time and standard deviations in 2004 are smaller than in 2000

Efficiency scores by range of service (Means, (s.d.))	2000			2004		
	Profit	Non profit	Difference	Profit	Non profit	Difference
<6 Chapters	.9950 (.)	.9901 (.0080)	.0049	.	.9972 (.0024)	
6-15 Chapters	.9742 (.0209)	.9847 (.0096)	.0095	.9978 (.0041)	1.0000	.0022
16 & 17 Chapters	.9356 (.0324)	.9341 (.0406)	.0015	.9910 (.0122)	.9896 (.0203)	.0014
Total means:	.933 (.052)	.956 (.042)	.023	.991 (.014)	.992 (.009)	.001

Table 11: Efficiency scores by Range of service

We use logistic regression to analyze the predictive power of ownership type, competition, and range of service on efficiency. Table 12 shows the result of the logistic regression based on dichotomized efficiency scores, where technically efficient hospitals (with an efficient score of one) were labeled one. The results show that the efficiency frontier is dominated by non profit hospitals. The results confirm that hospital efficiency scores convert, although the predictive value for ownership types on efficiency scores for the year 2004 is still significant ($p < 0.05$) the odds ratio is very low. In the year 2000, a non profit hospital had 13.5 times more chance to be technically efficient, whereas in the year 2004 a non profit hospital had only 1.2 times more chance to be more efficient than a profit hospital. This result confirms converge of efficiency scores between hospitals for technically efficient hospitals. However, it does not give a reason for this convergence.

Efficiency as dependent Cu. off efficiency score of 1,0		B	S.E.	Wald	Sig.	Odds ratio
2000	Ownership	2,604	1,066	5,972	,015	13,520
	Range	-,138	,500	,076	,783	,871
	Competition	,221	,689	,103	,748	1,247
	Constant	4,172	1,282	10,599	,001	,015
		B	S.E.	Wald	Sig.	Odds ratio
2004	Ownership	-1,432	,687	4,345	,037	,239
	Range	-,364	,562	,418	,518	,695
	Competition	-,357	,635	,315	,575	,700
	Constant	-,851	1.021	,696	,404	,427

Table 12: Predictors of efficiency; Logistic regression for the years 2000-2004, threshold of 1

5.2.4 *Suspected reason for convergence of efficiency scores*

With the introduction of managed care programs, some research suggests hospitals to focus on enrollees instead of efficiency. This means a convergence of efficiency scores could be a symptom of equal maximization goals between ownership types. Especially with the end of discriminating tax benefits for non profit hospitals, hospital goals could be more inline since an external reason for differences vanished.

Convergence of efficiencies could be a sign of mimicking behavior, where the success of non profit hospitals is adopted by profit hospitals or where resources are skimmed to alter efficiency scores in benefit for profitability. Analyses of hypotheses five and six should confirm these assumptions.

5.2.5 *Analyzing hypotheses five and six*

We have showed converging of efficiency scores between ownership types and demonstrated focused hospitals to be more efficient, regardless of their ownership type. But we did not find reasons why hospital efficiency scores are converging. In this section, we will analyze our suspicion that the convergence of hospitals is related to the mimicking behavior of hospitals within an alliance. The fifth hypothesis we test is:

Hypothesis 5: Hospitals within an alliance are (relatively) more affected by mimicking behavior, making the efficiency scores and range of services more alike.

We test this hypothesis by comparing standard deviations of the individual alliances with the standard deviation of hospitals without an alliance. We present the results by grouping alliances by their dominant ownership type. For every group of alliance type we calculate the average standard deviation of the participating alliances. For calculation, see Figure 6 in the appendix. This average standard deviation shows the similarity between hospitals within an alliance.

We identify four dominant alliance types: profit dominant, non profit dominant, and mixed alliances with either profit dominance or no dominance. There are no mixed alliances with non profit dominance. By grouping the alliances by dominant ownership types, we underline the influence of ownership types on alliances and give insight in ownership differences, which is the main research goal.

Table 13 shows that the average standard deviation for alliances is very low, less than 0,007 efficiency points. This suggests hospitals within an alliance to have relatively the same efficiency scores. Table 13 shows the mean efficiencies of short term acute care alliances. Sole profit and sole non profit alliances have different efficiency scores, where non profit dominant alliance is most efficient. Mixed alliances do not have significant different efficiency scores. This suggests that efficiency differences can be ascribed to the differences in dominant alliance types or differences between alliances.

When a profit hospital is part of a sole profit dominant alliance, efficiency scores are lower than when the same hospital acts alone or is mixed with non profit organizations. Of interest is that, in one case[1], profit hospitals gain efficiency when part of an alliance mixed with non profit hospitals. This suggests skimming of access bed capacity between non profit and profit partners, making the profit partner more efficient. Unfortunately, one case is not enough to validate this observation.

[1] Alliance name: "Lee Memorial Health System"

Remarkably, none of the alliances is focused. Unprofitable treatment skimming can not be confirmed with this result. What can be confirmed, is that most alliances share the same range of services. This suggests alliances to adapt to their partners. Based on the previously explained results, hypothesis 5 can be accepted: within an alliance hospitals show relative equal efficiency scores and equal range of service.

	Efficiency Mean (s.d.)				Range of services in chapters		
					<6	6-15	16 & 17
Alliances (Short term acute care)	Mean efficiency	Average s.d.	Profit	Non profit	Count	Count	Count
Profit dominance and sole profit alliance	.9891 (.0064)	(.0060)	.9891 (.0064)		0	2	42
Profit dominance and mixed alliance	.9905 (.0034)	(.0028)	.9945** (.0032)	1.000* (0.0)	0	0	15
No dominance and mixed alliance	.9908 (.0081)	(.0064)	.9938 (.0076)	.9888 (.0094)	0	0	5
Non profit dominance and sole non profit alliance	.9933 (.0060)	(.0049)		.9933 (.0060)	0	0	33
Non profit dominance and mixed alliance				.	0	0	0
Total Alliance	.9908 (.0064)		.9894 (.0062)	.9931 (.0063)	0	2	95
No Alliance	.9909 (.0178)		.9957 (.0047)	.9886 (.0211)	4	5	29

Table 13: Mean efficiencies and range of service for short term acuce care hospitals;

*** = Outlier; ** = one extreme excluded with efficiency score of ,923**

We suspect hospitals to demonstrate more mimicking behavior when hospitals are in a competitive environment, since uncertainty results in mimicking behavior. Based on this assumption, we have formulated hypothesis six:

Hypothesis 6: In a competitive environment, alliances are relatively more affected by mimicking behavior, making the efficiency scores and range of service more alike.

To test this hypothesis, we have to prove that the average standard deviation of alliances under competition is lower and that ranges of service are more alike. We have already shown that all alliance have the same rang of service, which is broad.

The results in table 14 do not reveal a reason for any mimicking behavior in a competitive environment. The average standard deviations of alliances in a competitive environment are not smaller than the alliances not in a competitive environment. We can reject the hypothesis; in a competitive environment alliances are not more alike than not in a competitive environment.

Alliances	no competition		competition		Alliances under mixed competition			
					no competition		competition	
	Profit Mean (s.d.)	Non profit Mean (s.d.)	Profit Mean (s.d.)	Non profit Mean (s.d.)	Profit	Non profit	Profit	Non profit
Profit dominance, and sole profit alliance	,991 (0,002)	.	.988 (0.009)	.	992 (.005)	.	.988 (.006)	
Profit dominance, and mixed alliance			.994 (0.0)	1,000	,994 (.003)		,996 (.004)	
No dominance, and mixed alliance		,988 (0,0)			.994 (.007)	,988 (0,0)		,980 (0,0)
Non profit dominance	,997 (0,0)			,993 (,005)		,995 (,004)		,988 (.005)

Table 14: Alliances in a competitive environment defined by MSA's: Miami-Fort Lauderdale-Pompano Beach; Sarasota-Bradenton-Venice; Tampa-St. Petersburg-Clearwater

We further test the suspicion that dominant alliances in a market environment influence other hospitals within the same market environment. We compared mean efficiencies of the dominant alliance with the rest of the hospitals in the MSA. Mimicking behavior from the dominant alliance within a MSA does not occur. Although every alliance has a broad range of service, when an alliance is dominant their competitors in the market environment do not have the same efficiency scores.

The analysis of hypotheses five and six suggests that alliances mimic processes or treatments within the social context of their alliance, resulting in almost equal efficiency scores. The equal range of services for all alliances suggest that hospitals within an alliance mimicking traits of their competitors, showing in the same range of service between alliances. Differences in efficiency score can be contributed to differences between alliances.

5.2.6 *Summary of the results and analysis*

The results of this section show that during the year 2004, different combinations of alliances are the reason for efficiency differences between ownership types.

The mean differences between profit and non profit hospitals can be ascribed to the number of focused hospitals within an ownership type. The more focused a hospital, the more efficient. With a higher number of non profit focused hospitals mean efficiencies of non profit hospitals appear to be higher.

Within an alliance, efficiency scores are almost the same, which can be seen by the low standard deviation of efficiency scores. Range of services is broad for hospitals participating in an alliance, which indicates that alliances mimic competitor characteristics and characteristics visual for the patients. Because all alliances have the same broad range of service and have an outpatient facility without being noticeably focused, we conclude that mimicking behavior of hospitals within their close social context occurs. This is confirmed by the lack of effect of a dominant alliance within a market environment on the efficiency scores of other hospitals within the same market environment.
In general, converging of efficiency and range of services can be ascribed to alliances being uniform.

6 Conclusion and discussion

In this chapter we will give answers to the research question and explore the added value of the MMM. We will formulate conclusions based on the analysis of the hypotheses. We will conclude this chapter by discussing the limitations of this research and give advice for future research.

6.1 Differences between profit and non profit hospitals

In section 1.3 we formulated the research question.

Why are non profit hospitals more efficient than profit hospitals, while economic theory predicts profit hospitals to be more efficient?

6.1.1 *Convergence of efficiency scores*

We have explored efficiency differences between ownership types by looking at efficiency differences of short term acute care hospitals.

The results rejected the first two hypotheses and supported the fact that non profit hospitals are more efficient than profit hospitals. However, based on the Wilcoxon rank test in the year 2001 and 2004, efficiency differences were not significant. For the year 2001, this can ascribed to the large deviation of efficiency scores. For the year 2004, means and standard deviation between profit and non profit hospitals were almost identical. So, profit and non profit hospitals were almost identical.

Competition did not have a positive effect on the efficiency for profit hospitals. Under competition, non profit hospitals are more efficient than profit hospitals.

Interestingly, hospital efficiency scores converge during the research period. This can be seen by the difference in means and by the standard deviation in Table 7. Why this convergence occurs could not be explained by looking at efficiency differences.

We suspect three cultural changes to be a reason for the convergence of efficiency scores. The conversion movement, the halted tax benefits for non profit hospitals, and managed care. The disappearance of external forces that ensure differences between profit and non profit hospitals, allowed for their goals to become more equal. Traditionally, cultural differences between profit and non profit hospitals are reflected in their different maximization goals. Profit hospitals maximize output to satisfy the financial needs of the shareholders. Non profit hospitals maximize input to satisfy community health care needs.

6.1.2 *Convergence of ranges of service*

We have looked at the cultural differences between profit and non profit hospitals by looking at their ranges of service. We suspected the range of service between profit and non profit hospitals to be different and non profit hospitals to be more focused. The third and fourth hypotheses were rejected. We did not

find support for the idea that cultural differences contribute to efficiency differences between ownership types.

Interestingly, both profit and non profit hospitals offered a broad range of treatments. Ranges of service converged during the research period. In the year 2000, 9 hospitals offered less then 6 different treatments and 33 hospitals between 6 and 15 treatments. In the year 2004, only 4 hospitals were focused and only 7 offered between 6-15 treatments. At the end of the research period most hospitals offered more than 15 different treatments for health problems.

Non profit short term acute care hospitals without an outpatient facility are the only hospitals that are focused. This suggests that the skimming of an unwanted specialty to outpatient facilities does not occur. However, it is possible that skimming of unwanted treatments is applied in those hospitals, since we compared chapters of related treatments instead of individual treatments. Therefore we can no be sure if treatment skimming does not occur.

In general, given the range of service, both profit and non profit hospitals perform all treatments at all different market environments. If the community need for health care was served in the year 2000, then the community need for health care was still served in the year 2004, since the total LOS and total number of patients did not decrease (see table 7 in the appendix). This suggests that the social purpose of providing community need is not restricted by non profit hospitals and that the traditional maximization goal of non profit hospitals is no longer exclusive for non profit hospitals. Profit hospitals do not fill in the most profitable market niches, but all profit hospitals treat all possible health problems. This could suggest that maximization goals have converted or changed.

We have performed a post hoc logistic regression to analyze if ownership type or competition predicts efficiency differences. The results did show that the technical efficiency frontier was dominated by non profit hospitals, the decline in odd ratio for the year 2004 supported the conversion of efficiency scores.

We did find focused hospitals to be more efficient than broad ranged hospitals, although this difference was unrelated to type of ownership, as can be seen by the small column differences in table 11. Efficiency is affected by the range of service, but this does not explain ownership type differences.

Slack calculation revealed that hospitals must decrease their total number of beds in order to become technical efficient, which is consistent with low occupancy rates for Florida. This advice relies on the chosen bed safety level, which we did not include in our research. Besides, changing the number of beds is strictly regulated.

We suspect hospitals to maximize enrollees due to the increased influence of managed care programs (since the mid 1990's). The convergence of hospital goals could be the reason for the converging efficiency

scores and ranges of service. However, this does not explain why hospitals are converging. We suspect that hospitals mimic behavior and this mimic behavior results in convergence of efficiency scores and ranges of service.

6.1.3 *Convergence within close social context*

We have explored mimicking behavior by looking at the range of service and efficiency differences between alliances.

Almost every short term acute care hospital is part of an alliance, 71% to be precise. Only short term acute care hospitals have alliances with other hospital types (28%). Because of the large percentage of alliances, mean differences can be ascribed to differences between the alliances.
Standard deviation of efficiency scores within an alliance is very small (less then 0.007). This suggests that hospitals participating in the same alliance mimic processes that influence their efficiency, making their efficiency scores more alike.

Interestingly, none of the alliances includes a focused hospital, which suggests alliances imitate characteristics of their competitors. Hospitals within the same market do not share the same efficiency scores, but hospitals within an alliance do share the same efficiency scores. All alliances share the same range of treatments. This is confirmed by the lack of affect of a dominant alliance within a market environment.

We could not find indications that hospitals maximize enrollees, as previous approaches suggested.
In general, converging of efficiency and range of service can be ascribed to alliances being uniform to their close social context while mimicking characteristics of their competitors that can be observed by their patient population. This mimicking behavior is independent of ownership type.

To answer the research question, efficiency scores between profit and non profit hospitals were not different in the year 2004. Non profit hospitals are more likely to be focused and the more focused a hospital is, the more efficient it gets. Therefore, the mean efficiencies of non profit hospitals are more likely to be higher while hospitals of equal range and equal type are equally efficient, independent of ownership type.

This research implicates that, due to free market forces and reductions of tax advantages, hospitals are becoming more uniform and part of an alliance. If a health care policy aims on the diversity and specialization of hospitals then a free market environment is not the appropriate choice.

6.2 Discussion and limitations

This research provides insight in the implications of market forces on hospitals, especially, since we could compare data of several years. This research is not limited to the state of Florida and not limited to health

care systems with managed care. We have argued that the absence of discriminating external barriers (taxes) with the same market incentive (managed care) leads to uniformity within alliances and between alliances. We suspect most health care systems with no external barriers between hospital types and with a single market incentive (for example the incentive to reduce waiting lists) with a free market to behave as the hospitals in the research.

We have proven the added value of the MMM by offering additional explanations from the three combined approaches. We have combined cultural and economic reasons to explain the efficiency differences between ownership types. The question "Why convergence?" raised after the results of the first two approaches could be answered by the third approach that focused on the formal network between hospitals. A limitation of the MMM is that the political or legal perspective was not highlighted. We can only speculate that one of the effects of managed care is reflected in the uniformity of hospitals goals. A more thorough study of the political background or legal environment could visualize the restrictions on the free market.

A limitation of this research is that it is generalized by the research population bias. We have excluded hospital types other than short term acute care hospitals, we have excluded teaching hospitals, and ambulant surgical centers. This means that future research must confirm that hospitals show convergence of efficiency and range of service within a free market.

The use of the DEA method does not come without limitations. DEA is sensitive to outliers and efficiency scores are dependent on their variables. We did not take costs and human resources into account. This means that the efficiency scores are a relative indication of the material efficiency or productivity. This means the efficiency scores cannot be used to compare individual hospitals or to make statements about profitability. However, as with any technical efficiency score, the scores are useful in comparing different hospital groups (Holland and Offer 2001).

The calculated efficiency scores are relative efficient scores, which means that technical efficient hospitals are not necessarily very efficient, as long as they are more efficient than those hospitals that are not on the efficiency frontier. We were unable to compare efficiency scores between different years, because we have calculated efficiency scores for every year separately. This means that the high efficiency score only indicates a convergence of efficiency scores; it does not implicate that efficiency in the year 2004 was higher. In fact, efficiency in 2004 is probably lower than previous years since fewer hospitals were focused.

Future research might focus on general accepted efficiency measurement variables, because we have encountered different efficiency measurements in each new journal article, although the DEA method is highly preferred. Teaching hospitals can be included when residents FTE is considered an output (Wang et al. 1999). Quality of care can also be included in the DEA analysis by incorporating mortality rates.

Further research should focus on the implications of uniformity of hospitals in the quality of health care. Also, further research in the cost and quality of health care is needed, since managed care fueled cost competition without (suspected) regard for quality (Miller 1996).

The next logical step for the MMM is to build a model with generally accepted measurements for all approaches of the Multiple market model. With a fourth approach, a political or legal approach, the MMM should be even more capable of giving explanations for economic behavior.

7 Appendix

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Scatter plot of ownership types and LOS longer then 2 days for 2000 and 2004.

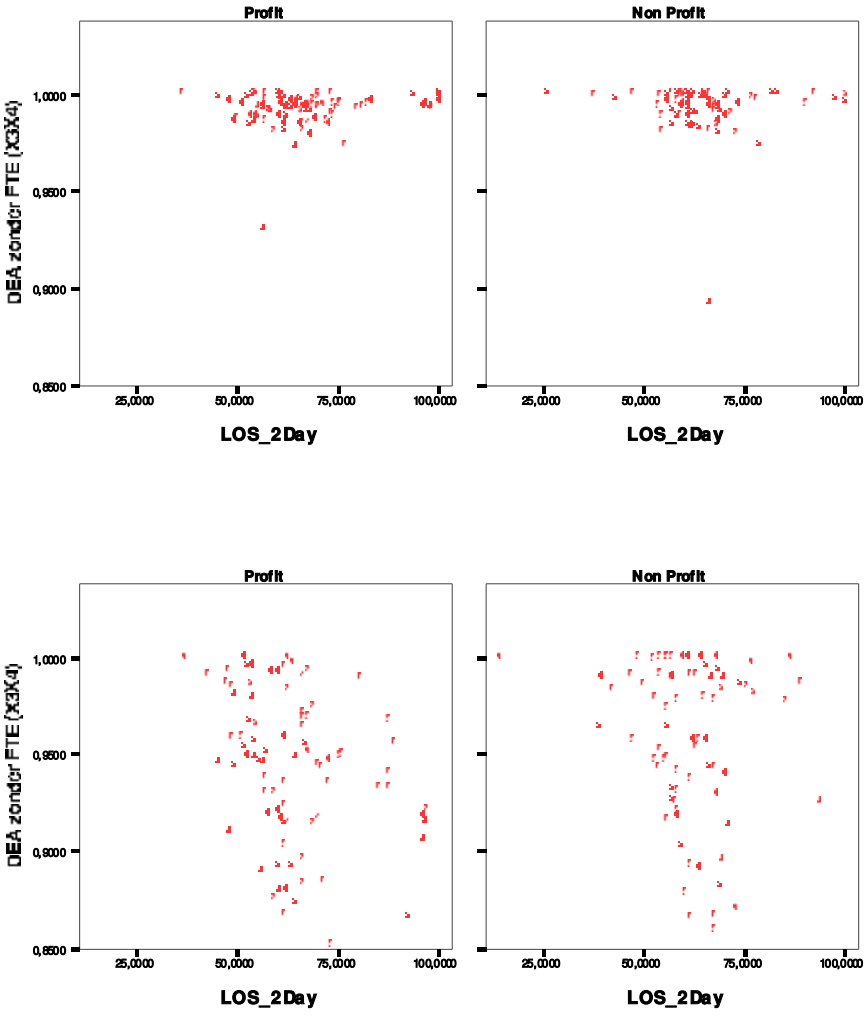


Figure 5: Scatter plot of ownership types and LOS longer then 2 days for 2000 and 2004.

Slack calculation and ownership differences

Slacc	2000		2001		2002		2003		2004	
	Profit Mean	Non Profit Mean	Profit Mean	Non Profit Mean	Profit Mean	Non Profit Mean	Profit Mean	Non Profit Mean	Profit Mean	Non Profit Mean
Genc al/ s.rg'ca beds	68.43	39.10	109.1	80.88	101.5	70.34	91.96	57.41	72.49	37.40
Special/ org term beds	19,03	18.92	13.70	23.24	11.59	13.25	22.30	19.89	6.19	10.93
Number of patients	1.20						0.73	0.94	0.45	0.00
Total LOS									2.79	38,287

Table 15: Output slack of short term acute care hospitals; no columns show significant differences (α=0,05%)

Avarage Standard Deviation calculation

$$\sum_{i=1}^{n} \frac{X_{ij} \times h_i}{Y_j}$$

$X_{ij} = s.d.\ alliance\ i\ part\ of\ alliance type\ j$

$h_i = number\ of\ hospitals\ participating in alliance\ i$

$Y_j = total\ hospitals\ grouped\ by\ an alliance type$

$i = name\ of\ an alliance, i = 1,...26$

$j = the\ four\ specified\ allaince types, j = 1,2,3,4$

Figure 6: avarage s.d. alliances

Total patient discharge and total LOS

Years	2000		2001		2002		2003		2004	
	Profit Sum	Non Profit Sum	Profit	Non Profit	Profit	Non Profit	Profit	Non Profit	Profit	Non Profit
Total number of patients	1002675	1088798	1054218	1250017	1081485	1281528	1053801	1252501	1033534	1158854
Ratio	1,09		1,19		1,18		1,19		1,12	
Total LOS	3201027	3266233	3344521	3813410	3448269	3905891	3433702	3980286	3442144	3908005

Figure 7: Total LOS and Patient discharge for short term acute care

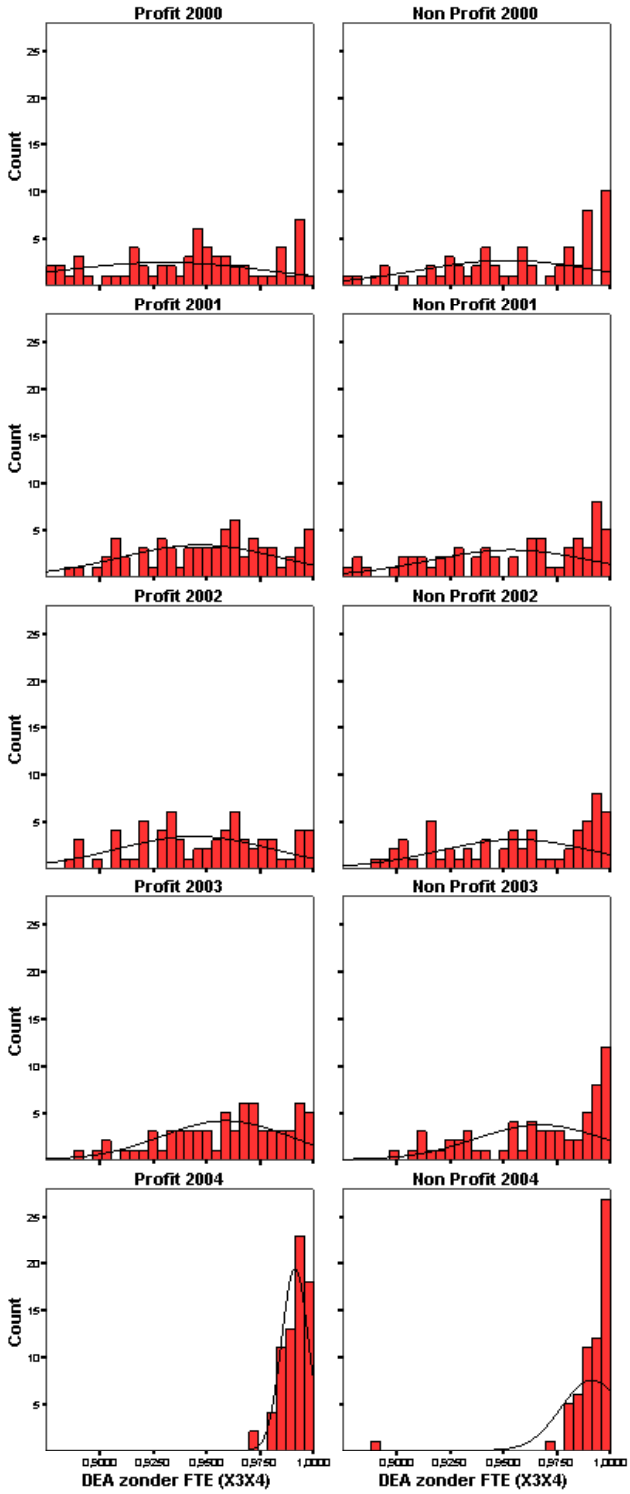
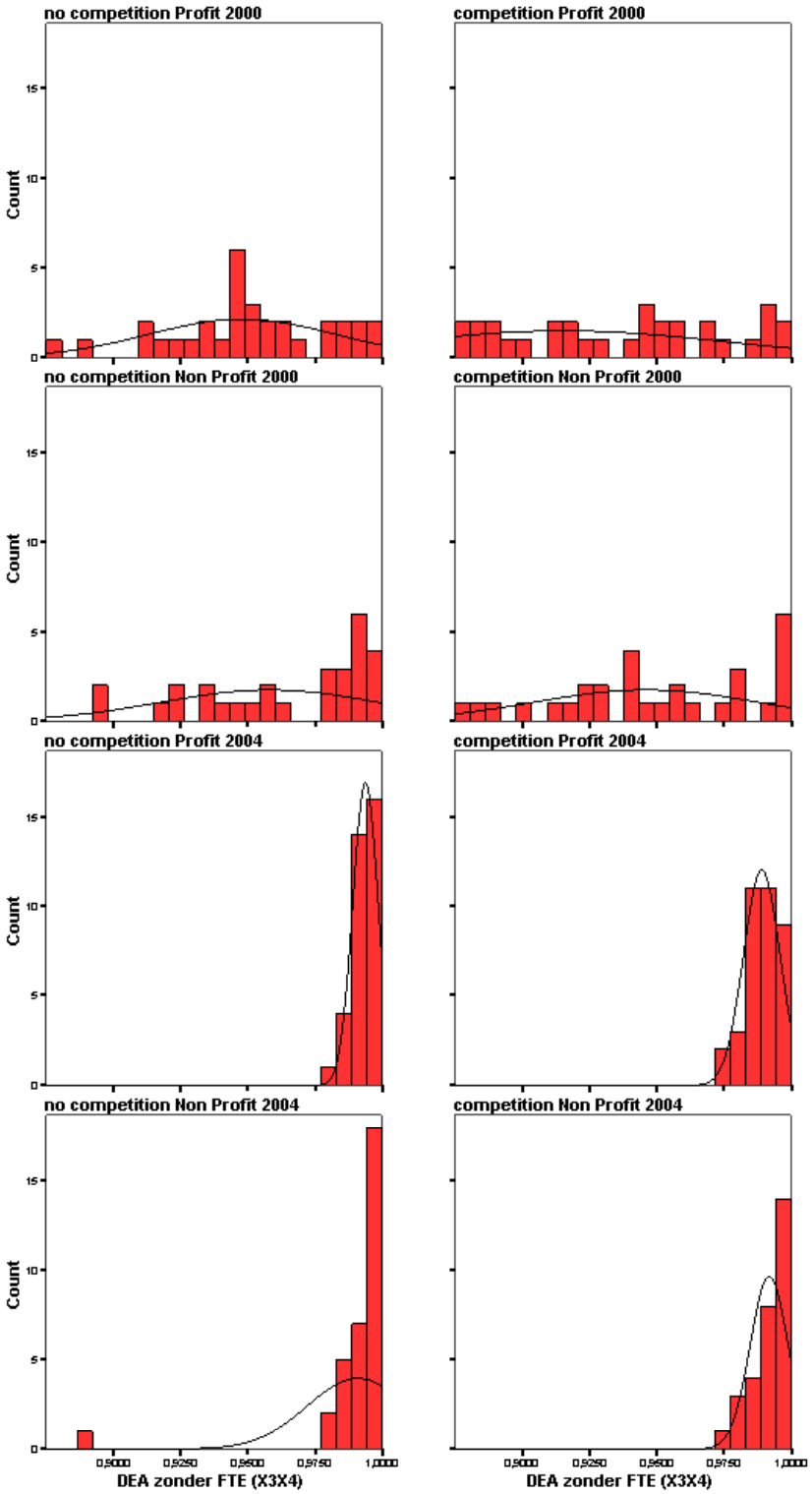


Figure 8: Histogram of Ownership type differences with competition and for 2000 and 2004



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