What level of diversification should Dutch hospitals have in a liberalized healthcare sector to maximize the performance of the specialty in the hospital?
Name: Harry Nieuwlaar
ANR: 236156
Supervisor: dr.A.A.C.J. van Oijen
Words: 12,351
Faculty: Faculty of Economics and Business
Department: Organization & Strategy
Educational program: MSc Strategic Management
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Abstract

This paper studied the effects of diversification in the Dutch hospital sector on the performance of the specialty within the hospital. Several theories support the idea that diversification improves firm performance. Theoretically, corporate diversification has curvilinear relation with performance which means that related diversified firms outperform single business firms and unrelated diversified firms. Several theories suggest that these benefits come fort out of synergy effects. Transaction cost theory suggests that diversification decreases performance because of the high bureaucracy cost.

Within-industry diversification implies that firms operate in multiple market niches but within one industry. Theoretically, within-industry diversification should have a positive effect on performance. This means that the higher the number of specialties within a hospital, the higher the performance of these specialties should be.

Two hypotheses are formulated and tested. The first hypothesis proposes that a higher level corporate diversification improves the performance of a specialty. The second hypothesis proposes that within-industry diversification has a positive effect on specialty performance.

In this study, quality is an indicator for performance of the specialty. For this, the results of an study published by Elsevier are used as a performance measure. Of the eleven most common specialties an indication of quality is available. For the rest of the specialties only a top ten is published. Hence, they are not taken into account in this study. Corporate diversification is measured with the Narrow Spectrum Diversification (NSD) measure developed by Wood (1971) and it indicates the level of related diversification of hospitals. The level of unrelated diversification (BSD) is left out of the analysis because there is no variation between hospitals on this aspect. Within-industry diversification is measured by the number of specialties that are part of a hospital. As control variables are used the number of beds, geographical region, hospital type, hospital liquidity, and hospital solvability are used.

A regression analysis is performed with a cluster function to correct for the fact that the same hospital is in the sample with multiple specialties. This generates more robust standard errors and improves the results.
The results of this study do not support the hypotheses. First, the coefficient for corporate diversification is not statistically significant different from zero, which means that no relationship between corporate diversification and specialty performance is found. However, the coefficient for within-industry diversification is significantly different from zero. This shows that a lower level of within-industry diversification leads to better performing specialties. The optimal number of specialties is five. Hospitals with more than five specialties have less performing specialties. This could be due to the fact that specialties that operate in the same hospital do not cooperate with each other and only hamper each other instead of benefiting from each other’s presence. Synergies are not exploited.

A limitation of this study is the fact that cooperation is not taken into account. Also, the study is not generalizable to other countries because the Dutch healthcare system is different from other healthcare systems. Furthermore, no weighted measure of diversification is used in this study. These kind of measures give a better proxy of diversification than the NSD measure. Finally, Cooperation between specialties is not taken into account in this study which could be done in future research.

Future research could also focus on the financial performance of specialties or hospitals in relation to diversification. The results of this study can be used by hospitals to improve the performance of their specialties but also by the Dutch government to change and improve the policy for the Dutch hospital market. Of course this can only be done if also the effects of diversification on the financial performance is known.
**Preface**

In this report you will find the results of a study about the relation between diversification and performance in the Dutch hospital sector. The goal of the research is to give Dutch hospitals information by which they can improve the performance of each of the specialties within the hospital.

This study is conducted in line with the faculty of Business and Economics at Tilburg University in Tilburg, The Netherlands. The title of this study is: “Corporate Strategy in Dutch Hospitals”.

I would like to thank Dr Aswin van Oijen for supervising me while writing this thesis.

Tilburg, January 20, 2011

H. Nieuwlaar
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1. Introduction

This chapter forms the introduction to this research. The chapter will give a clear idea about the problem studied. First, the problem indication is given and second, the problem statement and research questions are outlined. Section four describes the feasibility of the thesis and section five provides the structure of the thesis.

1.1 Problem indication

Dutch hospitals are faced with liberalization in the sector. The Dutch government is liberalizing the sector so that the cost of healthcare decreases and that quality of the given care improves. One aspect in this whole liberalization program, is the fact that patients have to choose a hospital for their treatment by themselves. Originally this decision was made by the family doctors and often you were directed to one of the nearest hospitals in the region. A second aspect in this liberalization program is that hospitals have to negotiate with insurance companies about the compensation per treatment that they want to receive.

Hospitals are facing some problems with this liberalization program. First, it is uncertain how the future patients are going to decide to which hospital they want to go to get a treatment. So how many patients are coming to your hospital and for which treatments is a question without an answer. Second, the future revenues are really uncertain. Negotiations with insurance companies will have their influence on prices. This means that the profitability of the hospitals is very uncertain for the future and that the quality of the given healthcare is under pressure. Formerly, it was not necessary for hospitals to present themselves in a good way because patients always came to the hospital. Nowadays, hospitals have to distinct themselves which can be done by managing their portfolio to optimize their performance. Diversification is an important driver of performance in companies.

Because of the liberalization in the healthcare sector, Dutch hospitals are forced to change and improve their business. They have to attract patients to their hospital, but they often do not know how people choose between hospitals. Dutch hospitals are faced with the question which strategy they should follow to improve or at least sustain their performance. This raises the question which level of diversification maximizes performance of the hospital.

Not much literature is available that studied diversification in hospitals. According to Kuenen, Geurts, van Leeuwen, and Nolst-Trenité (2010) from the Boston Consulting Group, Dutch hospitals have to make agreements about specialization in one or more specialties, so that the hospital sector can
reduce its cost by €2 billion and improve the quality. On the other hand, Blank and Wats (2009), say that diversification is necessary because of the fact that specialties have to cooperate with each other due to the fact that people have more illnesses at a time. This would increase the quality of the given care. No clear picture is known in literature about the diversification topic in hospitals. The few studies that have been conducted, give conflicting arguments.

Diversification measurement tools (Rumelt, 1974; Varadarajan and Ramanujam, 1987), indicate the level and type of diversification in a firm. Palich, Cardinal, and Miller (2000) found support for the inverted U-shape model which means that related diversification gives the highest performance. In their study, Palich et al. (2000) examined 30 years of research in the diversification-performance linkage. Li and Greenwood (2004) studied the effects of within-industry diversification on the performance of a firm. Results show that within-industry diversification only has influence on performance when the portfolio of an direct competitor is taken into account. This implies that the level of diversification is an important issue for the Dutch hospitals because it influences their performance. This research should give more clarity about the level of diversification which is optimal in the hospital sector. This study will focus on the level of diversification that Dutch hospitals should pursue to improve the performance of the specialties in the hospital.

1.2 Problem statement
The problem statement in this research is:

What level of diversification should Dutch hospitals have in a liberalized healthcare sector to maximize the performance of the specialty in the hospital?

The answer to this problem statement should give a clear view about what level of diversification is preferred in hospitals so that performance of the hospital on an overall level can be maximized. In this case, performance does not mean a measure of the financial figures of the hospitals. This is done because financial measures are no good performance indicators for (non-profit) hospital organizations or the specialty within the hospital. Performance will be measured as quality.

1.3 Research questions
- How will the hospital sector be organized in the future?

The accompanying chapter will give an outline of the liberalization program which is followed and various aspects which will change within the sector.
• Does diversification improve hospital performance?
This chapter will outline theories in diversification. The focus will be on the relation with performance and the different measurement tools that exist.

• What methods can be used to measure the linkage between diversification and performance in healthcare?
Plenty of measures are available to operationalize diversification. This chapter will describe these methods and analyze which tool is best to use in this research. Performance is also a variable which can be determined with many measurement methods. Attention will be given to these methods and afterwards a choice for a particular method will be made. Also, additional methodological issues will be addressed in the accompanying chapter.

• What diversification level optimizes hospital performance?
The accompanying chapter focuses on the analysis of the level of diversification which maximizes the performance of a hospital. This question will be answered with help of the retrieved data.

• What conclusions can be drawn on the linkage between diversification and performance in healthcare?
The last chapter will conclude and summarize the findings of this study. Recommendations and limitations will also be provided.

1.4 Structure of the thesis
Chapter two will outline how the Dutch hospital sector will be organized in the future. This is done to give a clear view about the structure of the sector. Chapter three deals with diversification in hospitals. First relevant literature will be handled and after that it will be applied to hospitals. Also hypotheses are developed for testing. Chapter four describes the methodology used in the research. The research setting is explained and variables are operationalized. Also, the various methods to measure diversification are outlined in this chapter. Chapter five is concerned with analyzing the retrieved data and with explaining the results of the study. Chapter six is concludes the whole research. Recommendations and limitations are also given in this chapter.
2. Liberalizing the Dutch Healthcare Sector

This chapter gives an introduction to the Dutch healthcare sector. Attention is given to the liberalization of the sector and to the consequences for hospitals. The chapter will give an overview of the hospital market so that a clear view exists about the market.

2.1 Dutch hospital sector

Right now, 85 general hospitals are operating in the Dutch hospital market. On top of this, 8 University Medical Centres (UMC) are serving healthcare to the public (Dutch Hospital Data, 2009). The RIVM\(^1\) expects that this number of hospitals will decrease to 70 in 2014, and that hospitals differentiate more and more. Besides these 93 general and UMC hospitals, 35 categorical hospitals operate in the Dutch market. These categorical hospitals focus on one kind of illness or treatment. Here one could think of a dialysis centre for people with kidney failure or hospitals that only treat patients with cancer like the ‘Antonie van Leeuwenhoek’ hospital.

All general hospitals have a mix of medical specialties within their hospital. The specialist can be on the payroll of the hospital but can also be in a partnership with the other specialists of a particular specialty in the hospital. Paediatrician for example, are often on the payroll of the hospital, while other physicians are often arranged in a partnership. Each of these constructions comes with its advantages and disadvantages. The hospital has more control on physicians who are on the payroll than on physicians who are arranged in a partnership. On the other hand, physicians in a partnership are perhaps more motivated to deliver good work than physicians on the payroll. This is due to the fact that physicians in a partnership can earn more money when treating more patients and get more patients when serving a good quality of care.

The Dutch hospital sector is a complex market. It is characterized by a triangle between the hospital, the patient, and the health insurance company. This triangle is shown in figure 2.1.

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\(^1\) http://www.rivm.nl/vtv/object_map/o562n21157.html

\(^2\) RIVM is the abbreviation for: Rijks Instituut voor Volksgezondheid en Milieu.
This triangle makes the sector complex. The patients have to deal with the hospitals for their treatments while the insurance company has to pay the hospitals and, on the other hand, the patients pay the insurance companies. This triangle is the basis of the hospital sector but it would be even more complex when all stakeholders were included in the scheme. All kinds of stakeholders are related with the hospital sector and they can influence the diversification of a hospital. Stakeholders are for example the hospital’s management, specialists on the payroll, specialists in a partnership, patient’s associations, medical associations, and the government. A specialist could prefer multiple specialities within the hospitals so that they can cooperate and improve the quality of the healthcare. A patient’s association could pursue the combination of a hospital with a nursing home. This could improve the patient’s turnover due to the fact that a hospital can place patients to the nursing home when the patient does not need any medical treatment from a specialist and only has to recover for some time. These examples show the possible impact of stakeholders on the diversification of a hospital.

In 2005 the government introduced a plan to liberalize the healthcare sector. In particular this meant that competition was introduced in the market. People became free to choose their own health provider for every single treatment. Another important aspect is that healthcare providers had to start negotiating with insurance companies about compensations for every single treatment. The first year only 10 percent of the treatments was free for negotiations. The other 90 percent was still under the old arrangement. In 2009 only 34 percent of the market was liberalized and in 2011 the government wants to have 60 percent of the market liberalized. For the other 40 percent of the treatments, there is not enough demand and/or supply to get a market for it. Ten Cate (2003) gives some reasons for why these 40 percent of the treatments is not an option for liberalization.
Ten Cate (2003) questions the possibilities of a liberalised health sector. He argues that failure of the market occurs in some instances. The emergency treatment department is not able to compete with other hospitals because the time to get to the hospitals is decisive instead of quality and price. Furthermore, the so called special treatments which are only available in some hospitals have more characteristics of a monopoly or oligopoly market than of a market with full market competition (Ten Cate, 2003). Bijlsma and Pomp (2008) argue that the liberalised health sector only succeeds when the consumers base their hospital decision on quality and price. Keuzenkamp (2005) is optimistic about a liberalised hospital sector. He argues that it is important that on the long run hospitals should be more profit driven. It is perhaps odd to argue that hospitals have to pursue profits, but this implies more efficient and better healthcare while the prices will go down (Keuzenkamp, 2005). Collot d’Escury, Alma, et al. (2006) from the Roland Berger company also support this conclusion. Hospitals that perform well, based on quality, also have a good financial performance.

The Dutch government started a project with paying dividends to shareholders of a hospital. When this project succeeds, the market will be more liberalized because investors will buy the hospitals to make it good performing hospitals in both financial and non-financial respect.

2.2 Hospital problems

By introducing the liberalized health sector, the Dutch hospitals had to become more entrepreneurial. It has become more important to create a good image for the consumers, who are potential patients at a hospital. Furthermore, insurance companies are negotiating the prices to a lower level which makes the hospitals focus more on efficiency improvement.

Traditionally, the family doctors decided to which hospital a patient had to go to get a treatment. Nowadays, the family doctors do not make this decision anymore but the patient has to decide for himself. The role of the family doctors is changed to an advising role. They can advise which hospital would be better to choose. These days, the insurance companies start influencing the decision for a particular hospital. They advise patients to visit a particular hospital and arrange a shorter waiting time in these hospitals. Still, the patient is free to choose a hospital. However, an insurance companies recently announced to stop compensating treatments for breast cancer in some hospitals that perform bad on that treatment.³ This announcement was followed with a lot of resistance and because of that, the hospitals are contracted for 2011. Right now, the idea is that from 2012 onwards, the original plan will be executed.

³ http://www.cz.nl/wat-zijn-de-plannen-van-cz-borstkankerzorg
Right now, hospitals do not know which strategy to follow to convince Dutch citizens to visit their hospital instead of the competitor’s hospital. The hospitals are faced with lower prices and patients are free to choose where to go. This leads to uncertainty within the hospitals because they do not know what to do to convince patients to visit their hospital and how to cope with price drops. Right now, the hospitals often have a highly diversified portfolio.

2.3 Summary

The plan introduced in 2005 to liberalize the healthcare sector is heavily discussed from that year on. The percentage of treatments for which hospitals have to negotiate prices with the insurance companies is growing slowly. Probably it will never be for the full 100 percent negotiated because of some special treatments which rarely occur and because of emergency treatments in which the patient is not able to choose. Although the plan is under discussion, hospitals have to face the problems associated with this liberalized sector. Hospitals have to deal with lower prices and also with patients who choose between hospitals. This means that performance of hospitals is under pressure. In the future, the hospital market will be more and more liberalized. More intense competition will occur in the market, certainly when dividends can be paid to shareholders. Hospitals have to distinct themselves which can be done by managing their portfolio to optimize their performance. Formerly, this was not necessary for hospitals because patients always kept coming to the hospital.

The next chapter will deal with theories in diversification. It will help to understand the diversification topic and will give a solid base for determining hypotheses about the level of diversification which is optimal for hospitals.
3. Diversification in Hospitals

This chapter is concerned with diversification topics. The first section will pay attention to theories which explain diversification. In section two, the relation between diversification and performance will be outlined and in the third section, attention will be given to within-industry diversification. The last section deals with diversification in the hospital sector.

3.1 Theories of diversification

Different theories on diversification exist to explain the relationship between diversification and performance. Montgomery (1994) explained the phenomenon of diversification with the Resource-Based view (RBV), the Industrial Organization (IO) view, and the Agency Theory. Also, attention will be given to the Transaction Cost Economics theory (TCE) and the institutional theory. All these theories will be discussed in the following sections.

3.1.1 Industrial Organization

The industrial organization theory is also known as the market-power view. A traditional way of thinking by economists is that diversification occurred because it could potentially reduce the competition in the market. Hill (1983) argues that diversified firms have more market power than non-diversified firms. He also argues that this does not mean that a diversified firm has higher financial profits because of the fact that market power does not automatically lead to higher earnings.

There are three ways of getting market power in an anti-competitive way. One way is with the use of internal capital markets. This means that an unprofitable activity is financed by an activity which generates money. The second way of getting market power is with mutual forbearance, where firms meet each other in multiple markets, which leads to less competition. The third is reciprocal buying which will lead to oligopoly or even monopoly markets because of high entry barriers for entrants (Montgomery, 1994).

Montgomery (1994) argues that the market power view only looks at the fact that diversification can reduce competition and because of that it is always positive to diversify. On the other hand, the market power view does not look at other organizational consequences of diversification.

In the hospital sector this means that market power can be created with a diversified portfolio. High entry barriers are created for new start-ups and mutual forbearance will reduce competition because of the fact that hospitals meet each other in multiple disciplines / markets. The use of internal capital
markets to finance new investments will give hospitals more market power because they do not have to repay a high amount of debt including interest which means that more money is available for the main activities of the hospital.

3.1.2 Resource-Based view
The resource based view has two major assumptions which are needed to understand diversified firms. First, there is a focus on firms that are heterogeneous, and second, the theory assumes growth instead of equilibrium (Montgomery, 1994). Martin and Sayrak (2003) explain that diversification comes forth out of excess capacity in resources and capabilities. This excess capacity is transferred by firms to other industries when possible. This can lead to economies of scope. The firm will only enter markets in which they can share their existing resources and capabilities such as marketing, distribution, and staff employees.

According to Montgomery (1994), a firm with highly specific resources obtains higher profits with less diversification. The optimum level of diversification differs for each firm and depends on the degree of the specialty of the resources. Tangible resources like machines can often only be used for a limited number of products which are related to the main product. This leads to related diversification. Whether diversification leads to an increase in performance, depends on whether the resources and capabilities that are used for diversification have the characteristics that are required for competitive advantage (Van Oijen, & Van Rooij, 2005).

For hospitals, the RBV supports diversification because hospitals could share resources or staff employees over all activities. This could be the bundling of the administrative function for all activities. Also the sharing of medical examination equipment between several disciplines supports diversification in the hospitals. The hospital with resources and capabilities that are not easily imitable by other hospitals has an advantage over the other hospitals. This could be a highly efficient logistics function or special computer software which makes the hospital working more efficiently in every department.

3.1.3 Agency Theory
Martin and Sayrak (2003) argue that agency problems destroy shareholder value for diversified firms. They argue that it comes forth from the so called managerial entrenchment and leads to a decrease in shareholder value (Martin & Sayrak, 2003).

Agency theory is concerned with a conflict of interest between two parties. In a firm this means that the shareholder and the manager have different goals. The shareholder can diversify his portfolio
easily by investing in multiple firms which makes it unnecessary for the firm to diversify. The manager on the other hand is more concerned with the risk of employment. This leads to a situation in which the manager tries to reduce the risk of the firm while the shareholders do not benefit from these actions (Montgomery, 1994). Shleifer and Vishny (1989) argue that a manager also tries to lead a firm to a situation in which the demand for the manager’s skills is high. This is called the managerial entrenchment. This leads for example to investments in negative NPV projects with superfluous cash flow to increase the power of the manager (Jensen, 1986; Shin & Stulz, 1998). Amihud and Lev (1981) say that these risk avoiding strategies generate ‘agency cost’.

Sing, Nejadmalayeri, and Mathur (2007) argue that diversification in India does not lead to improved performance and that poor asset management and a poor quality of the assets is an indicator of agency conflicts between the manager and shareholder. Agency theory describes the negative effects of diversification on the value of the firm for the shareholder and the positive effects of diversification for the managers of the firm (Montgomery, 1994). According to Van Oijen and Van Rooij (2005), agency problems can be avoided with mechanisms which create a shared interest between the shareholder and the manager.

Dutch hospitals do not have shareholders or other stakeholders that try to control the level of diversification in the hospitals. Because of this, the agency theory suggests that a hospital is highly diversified to meet the managers’ needs. The executive board of the hospital decides whether a hospital invests in new activities or divests activities. The stakeholders of the hospital only check whether a minimal degree of quality healthcare is served and keeps an eye on the financial position of the hospital. Only when the hospital is heading towards a possible bankruptcy, the government intervenes in the operations and will try to move the hospital to a better financial structure. In the case of the quality parameters, the government is able to shut down some facilities of the hospital which do not meet the required standard. This means that when the financial requirements and the quality standards are met, the management of the hospital is free to diversify so that the management can satisfy its own needs.

3.1.4 Transaction Cost Economics

According to Williamson (1975), there are several factors that lead to high transaction cost which in turn lead to failure of markets. In this situation, coordination should be within the firm instead of across several markets. Delios, Xu, and Beamish (2008) argue that firms can diversify in countries with a low institutional environment to reduce high transaction cost.
Internal capital markets are assumed to be more efficient than external capital markets. This means that a firm should use its raised money to invest in the best investment project. The allocation of money in internal capital markets is presumably much more efficient than in external capital markets.

As also proposed in the RBV section, a firm could use its excess resources in new markets so that economies of scope can be created. Van Oijen and Van Rooij (2005) argue that economies of scope can only be created in the case of related diversification. According to Hill and Hoskisson (1987), firms that are related diversified, have to choose to benefit from the internal capital market or to fully exploit the potential of economies of scope. When benefitting from the internal capital market, diversification can also be unrelated because these benefits do not depend on relatedness.

Jones and Hill (1988) are concerned with the cost of bureaucracy which are caused by a choice for a particular corporate strategy. Different corporate strategies have different bureaucratic cost. Bureaucratic cost arise from managing a particular strategy. Also the benefits concerned with internalizing transactions differs for different corporate strategies. This means that the optimal choice for a corporate strategy depends on the benefits and the bureaucratic cost arising with the different strategies. Related diversified firms tend to have higher bureaucratic cost than unrelated diversified firms (Jones & Hill, 1988).

In connection with the hospital sector, the transaction cost economics argues that a hospital should exploit the potential of economies of scope. This could mean diversifying in activities with which they can share for example the test equipment so that the capacity utilization is maximized. The benefits which arise from the use of internal capital markets are improving the financial position of a hospital because when investing in new assets, it is not necessary to take on external financing which is more expensive because of the transaction cost. In hospitals this principle works even better than in profit pursuing organizations because, until now hospitals do not have equity holders who want dividend payments. It is not even allowed for public hospitals to pay dividends. A negative side of TCE is the fact that bureaucratic cost are involved with different corporate strategies. Bureaucracy is already an issue in Dutch hospitals because of legislation which means that adding related diversified businesses could add even more bureaucratic costs.

### 3.1.5 Institutional Theory
Institutional theory is, according to Xu and Shenkar (2002) a perspective which is not focused on efficiency. The firm’s structure and behaviour are determined by the institutional environment. An
organization can only gain legitimacy from a source when it is based on some adopted practices (Xu, & Shenkar; 2002).

Singh, Tucker, and House (1986) argue that new companies experience no support from the institutional environment, and because of that no legitimacy is created. Lins and Servaes (1999) found that the effectiveness of diversification depends on the institutional environment of the country. This is comparable with the result of Fried, Bruton, and Hisrich (1998), who state that the level of involvement influences the performance of a firm. A higher level of involvement of the institutional environment leads to a better performance. This is not an ongoing process, so a firm with already a high level of involvement is not able to improve performance with an even higher level of involvement (Fried, Bruton, and Hisrich, 1998).

Institutional theory implies that hospitals diversify because of the fact that relevant institutions want the hospitals to do that. When this occurs it is not even relevant if this diversification strategy is performance improving or not. When for example, a group of patients or healthcare insurance companies wish the hospital to diversify in unrelated businesses while it is not performance improving for the hospital, it will be done because the institutions want the hospital to do so. Institutional theory is not arguing that diversification improves or destroys value. In the hospital sector, patients might want to have all specialties in one single hospital so that they can go to one hospital all the time.
3.1.6 Summary

The theories on diversification as described earlier, show some different outcomes on the performance of diversified firms. Table 3.1 shows the summarized findings of these theories.

<table>
<thead>
<tr>
<th>Theory:</th>
<th>Increase in hospital performance</th>
<th>No increase / No Decrease in hospital performance</th>
<th>Decrease in hospital performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resource Based View</td>
<td>Sharing medical equipment, and overhead</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agency theory</td>
<td></td>
<td>Hospital management wants to fulfil own needs</td>
<td></td>
</tr>
<tr>
<td>Industrial Organization</td>
<td>Patients can visit a hospital for every treatment.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transaction Cost Economics</td>
<td>Hospitals have to pursue economies of scope. For example sharing of medical equipment.</td>
<td>Bureaucracy cost involved with different corporate strategies can reduce benefits.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Use of internal capital markets decrease transaction cost of external funding.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Institutional Theory</td>
<td></td>
<td>Hospitals follow strategy to accommodate the wishes of the institutions</td>
<td></td>
</tr>
</tbody>
</table>

*Table 3.1 – Summary theories*

As described in this part of the chapter, theories to explain diversification have different arguments whether diversification improves performance or not, although the main idea is that diversification improves performance. The transaction cost theory and the resource based view argue that a firm should use its excess resources to create economies of scope. In the RBV, a firm only creates value with diversification when resources are shared that are hard to imitate and only when the firm expands to a related market. Transaction cost economics argues that a firm must choose between
the benefits of economies of scope or the benefits of the internal capital market. When choosing for
economies of scope, related diversification increases the performance, and when choosing for
internal capital markets, no performance differences occur between related or unrelated diversified
firms.

The industrial organization view argues that diversification leads to less competition but does not
automatically lead to a better performance. Agency theory describes the fact that managers and
shareholders have different interests and that managerial entrenchment due to diversification
decisions will lead to a worse performance of the firm, although these agency problems are relatively
easy to avoid. The institutional view is concerned with the fact that hospitals follow a strategy to
accommodate the wishes of the institutions related to the hospital even when this is not
performance improving.

The next section will discuss the relation between diversification and performance with the help of
some empirical studies which base their conclusions on statistically tested hypotheses.

3.2 Diversification and performance

Now knowledge has been gained about the major theories on diversification, it is time to review the
results of papers which studied the relation between performance and diversification. The relation
between diversification and performance is one of the most researched relations in strategy. Porter
(1985:p3) states that ‘Interrelationships among business units are the principal means by which a
diversified firm creates value, and thus provide the underpinnings for corporate strategy.’ Section
one will describe some classic studies in the diversification performance linkage and section two will
summarize the findings of more recent studies in the diversification performance linkage.

3.2.1 Analysis

Rumelt (1982) found a relation between diversification and profitability. Rumelt measured
diversification with the measure he developed in 1974. This is also called the ‘Rumelt’s Measure’.
This measure will be explained in chapter four. Rumelt’s results are similar to the findings of
Christensen and Montgomery (1981), who found that related constrained firms are more profitable
while unrelated firms have lower market shares and are less profitable. They used Rumelt’s measure
outcomes suggest that the performance of conglomerates is more volatile during the economic cycle
and that the performance significantly improved over the non-conglomerate firms.
Palepu (1985) studied the diversification performance linkage with the entropy measure for diversification from Jacquemin and Berry (1979). Palepu’s (1985) findings are rather similar to Rumelt’s findings and indicate that related diversifiers outperform unrelated diversifiers. The entropy measure for diversification will be explained in chapter four. Montgomery (1985) found that highly diversified firms have weak positions in the market. Montgomery (1985) did not make a difference between related and unrelated firms. Montgomery also found that the market power of these highly diversified firms is low. These finding are contradictory with the industrial organization view.

Markides and Willamson (1994) argue that not the relatedness at the market-level is important. It is the relatedness between the strategic assets of several divisions of a firm that helps to create competitive advantage. Firms that manage to continuously exploit strategic assets, will maximize their returns on the long run.

3.2.2 Reviewing the diversification performance studies

The studies mentioned above show several outcomes in the relation between performance and diversification. A more clear picture of this relation is provided by Palich, Cardinal, and Miller (2000) who reviewed historical literature that studied the linkage between diversification and performance. Based on the historical studies, Palich et al. (2000) developed three possible linkages between performance and diversification. The linear model, the inverted-U model, and the intermediate model (figure 3.1).

![Figure 3.1](image-url)

*Figure 3.1 – The linear model (A), the inverted-U model (B), and the intermediate model (C) – Palich et al. (2000: p.157)*

The linear model suggests that performance increases when the level of diversification increases. The model suggest that an unrelated diversified firm outperforms the related diversified firm and the single business firm is outperformed by the related diversified firm (Palich et al., 2000).
The inverted-U model suggests that the related diversified firm outperforms the unrelated diversified firms and the single business firm. This is so because related businesses can share a pool of common resources. Firms could use internal capital markets to finance new projects. Markides (1992) suggests that at some point the cost of diversification exceeds the benefits of it. Coordination and control cost get too large when the level of diversification becomes too high.

The intermediate model suggests that performance is best in related and in unrelated diversified firms. Related diversified firms are not able to fully exploit the benefits of relatedness. They only get short term economies of scope and they face high cost concerning the exploitation of relatedness. The unrelated firms can benefit from financial synergies. A firm faces less risk because of internal financing options and the debt capacity will increase (Palich et al, 2000).

These three models are tested in the study of Palich et al. (2000). They made a distinction between different performance measures in the analysis. The distinction is made between accounting based measures and market based measures. Based on accounting measures, the inverted-U model is supported, which means that related diversified firms perform best. Looking at the market based measures, there is no concrete evidence due to data limitations, but it seems that also in this case the inverted-U model is supported.

For hospitals this implies that a related diversified portfolio maximizes the performance of a hospital. Hospitals which also diversify in unrelated industries will see a decrease in performance. Whether an investment is related or unrelated can be derived from SIC codes or based on measures of relatedness. Diversifying in unrelated business will distract the focus from the main activities to the often less performing unrelated business. The next section will introduce the emerging research of within-industry diversification and will relate this to performance.

### 3.3 Within-industry diversification

Within-industry diversification is an emerging aspect in the diversification literature. This section will deal with within-industry diversification and will relate it to the hospital sector.

#### 3.3.1 Within-industry diversification and performance

Li and Greenwood (2004) studied within-industry diversification in relation with performance. According to Li and Greenwood (2004), within-industry diversification means that firms operate in multiple market niches within one industry. Stern and Henderson (2004) explain within-industry diversification as a firm that is present in more than one product line. Li and Greenwood (2004) explain in their study whether intra-industry diversification causes performance differences. They
used the entropy measure for measuring diversification, and Return on Assets (ROA) is used for measuring performance.

The results of their study shows that within-industry diversification does not have a significant impact on firm performance. however, when competitors are taken into account, a firm has the ability to increase performance from within-industry diversification. This means that a firm should meet its most important rivals in these segments (Li and Greenwood, 2004). Stern and Henderson (2004) also concluded that the effects of within industry diversification depend on an organization’s competitors. Tanriverdi and Lee (2008) also studied the relationship between within-industry diversification and performance in the software industry. Their results show that a firm has to pursue two strategies at the same time to gain growth in market share and sales. This means for the software industry that a firm has to increase platform relatedness and product-market relatedness (Tanriverdi and Lee, 2008).

3.3.2 Within-industry diversification in hospitals
In the hospital sector, within-industry diversification means that a hospital has to diversify in multiple specialties, which are also available at hospitals which are direct competitors in the region. Only then is it possible to increase the performance. It is important to keep in mind that the studies mentioned before only used financial measures for performance and that this kind of measures is not a very good predictor for the hospital sector.

If hospitals diversify in specialties which are also offered by the direct competitor, the patient is able to choose between a hospital and that of the direct competitor which means that the market share could increase and the direct competitor might lose market share. Another effect of this is that patients might choose for your hospital in other situations because of the fact that you already treated the patient on another specialty in good way. The idea of mutual forbearance is that competition becomes less intense when hospitals diversify in specialties that is also offered by a direct competitor.

3.4 Diversification in hospitals
Blank and Wats (2009) ask themselves the question whether Dutch hospitals should specialize in a few services or diversify into a broad assortment of services. They propose that, from the quality point of view, a diversity in services would be good because then they can offer good treatments to patients with multiple diseases at a time. They expect that small and specialized hospitals would not survive in the future. However, little research is done in the hospital sector in relation to
diversification. This section will outline studies which are conducted in this area and summarize the findings.

Snail and Robinson (1998) studied the effects of diversification in the American hospital sector. They argue that related diversification improves performance on the short-term. Related diversification outperformed unrelated diversification on the short-term. On the long run, no differences were found between unrelated and related diversification. Financial performance measures were used in this study. According to Eastaugh (1992), highly diversified hospitals see a very fast decrease in profits. He studied the Miles and Snow (1978) framework which resulted in the conclusion that hospitals cannot just diversify into every market, but that a good diversification strategy would increase profits. Collot d'Escury et al. (2006) from the Roland Berger Consultants, found that small hospitals perform better than large hospitals. This comparison is based on the revenue of the hospitals. Hospitals with less than €75 million turnover had a better medical performance, but also a better financial performance than larger hospitals. Unfortunately, this does not give any indication of the effects of diversification, because a hospital with a small turnover can be highly diversified but also have a single business.

The main idea derived from these studies is that related diversified hospitals perform better than unrelated and single business firms and that highly (unrelated) diversified firms perform less than related diversified firms.

3.5 Hypotheses
The main idea derived from the theories of diversification suggests that a hospital should be related diversified to increase its performance. Within-industry diversification studies argue that hospitals have to keep in mind the portfolio of the competitor when diversifying. As explained earlier, the critical review of Palich, Cardinal, and Miller (2000) showed that research overall shows that related diversification outperforms single business firms and unrelated diversified firms. Their results are based on accounting measures, while market based measures did not provide an answer for the relation between performance and diversification. These results are rather similar to the result of Snail and Robinson (1998). The study of Snail and Robinson made a difference between performance on the long and short run, which is not done in the review of Palich et al. The results that on the short term related diversification outperforms unrelated diversification is similar to the findings of Palich et al. (2000).
When looking at the diversification type for hospitals, the different theories suggest that related diversification outperforms the single business and the unrelated diversified businesses. When searching for the related Standard Industry Classification (SIC), we see that a hospital can add nursing home facilities or dental care, or a chiropodist function as related services. The NACE industry classification list suggests the same findings as the SIC (Appendix I). The results of the studies mentioned earlier suggest that related diversified hospitals perform better than single business firms. More interesting in this case is what the effects of diversification are on the performance of the specialty within the hospital. Logically, the performance of the hospital is (partly) depending on the performance of the specialties within the hospital, which suggests that a related diversified hospital should have better performing specialties because all parts of the hospital are able to cooperate with each other. The benefits can come forth from economies of scale and scope or from the use of internal capital markets which reduces transaction cost. Medical equipment and cost of overhead can be shared with other business.

According to these theories we can hypothesize that the performance of the specialty within the hospitals improves, when the level of related diversification of the hospital increases. This hypothesis originates from the review of Palich et al. (2000) who argue that related diversified firms outperform single business, and also from the RBV which argues that relatedness between the resources and capabilities leads to economies of scope and performance improvements.

Hypothesis 1: The performance of a specialty is positively influenced by the level of related diversification of the hospital it is part of.

Li and Greenwood (2004) argue that, when a competitor is taken into account, within-industry diversification increases firm performance. This implies that hospitals have to diversify in product lines where they meet competing hospitals. When this happens, the mutual forbearance principle argues that competition will be reduced to a minimum. This should increase the financial performance of the hospital. There are some risks concerning the performance the healthcare. The quality of the healthcare could be reduced because less competition in the market is not an incentive for the hospitals to improve the healthcare within the hospital. On the other hand, in hospitals, within-industry diversification is important because when not offering a specific product line, patients will leave to other hospitals and might not come back when having another illness. Offering multiple specialties offers a patient the chance of choosing a hospital in all occasions. This should improve the financial performance of the specialties.
Within-industry diversification is, in the case of a hospital, diversification at the level of the specialty. This assumes that hospitals diversify in a related market niche so that they can benefit from economies of scope and that competition will be reduced when they meet competitors in multiple specialties. Specialties are also able to cooperate with each other to improve the quality of the given care and to work more efficiently.

The within-industry diversification literature suggests that hospitals should have multiple specialities in which they meet their competitors. For this, it is hypothesised is that Dutch hospitals should have multiple specialties.

Hypothesis 2: The performance of a specialty is higher when it is part of a hospital that is diversified in multiple specialities than when it is part of a hospital that is not diversified in multiple specialities.

This hypothesis suggests that the specialities strengthen each other. The hospital is able to treat people with multiple diseases within the hospital. Within industry diversification is proposed to be performance improving for the specialties.

3.6 Summary

Diversification in relation to performance has been studied a lot for many years. Theories in diversification suggest that related diversification improves performance of the firm. Evidence is found for the inverted-U model which implies that related diversified firms maximize performance compared with single businesses or unrelated diversified firms. In the last few years, more attention is given to within-industry diversification, which implies that a firm should diversify across market niches while taking the competitors into account.

The research question that was dealt with in this chapter is: Does diversification improve hospital performance? This question is answered with the theories that are outlined in this chapter. Diversification can improve hospital performance. However, it depends on the level and kind of diversification.

Hypothesized is that the more related diversified a hospitals have better performing specialties. The second hypothesis is concerned with within-industry diversification and proposes that hospitals have to diversify in multiple specialties. It is possible to test and see whether the data support the developed hypotheses. Chapter four and five will deal with the research methodology and with the results of the study.
4. Research Methodology

This chapter gives an outline of the way the study is conducted. The research setting is described in section one. Section two explains the analysis of the model and section three and four explain the measurement of the variables performance and diversification.

4.1 Research setting

The purpose of the study is descriptive. The study is undertaken to describe and conclude on the relation between diversification and hospital performance. The goal is to analyze the optimal level and kind of diversification to enable Dutch hospitals to improve their performance and the specialty within the hospital.

The study setting is a field study with a non-contrived setting where minimal research interference occurs. Primary data is used for measuring diversification and within-industry diversification. Secondary data will be used for measuring performance. There will be a minimal degree of researcher interference and no manipulation will be done in this study. The study will be cross-sectional which means that data will refer to one point in time. The specialty within the hospital will be the unit of analysis in this study. Data will be gathered from Dutch hospitals.

4.2 Analysis model

A regression analysis will be used to analyse the model. The independent variable diversification will be hypothesised against the dependent variable performance. Also the independent variable within-industry diversification is hypothesised against the dependent variable. Figure 4.1 shows a graphic overview of the framework. The variables will be measured at an interval/ratio scale which makes regression analysis a good tool to test the hypotheses. A lag in time will be used to measure the variables. This lag will be one year. In this study, the performance measure is based on the year 2008 and the diversification measures on the year 2007.

![Figure 4.1 - Theoretical framework](image-url)

An F-test will be conducted to test the significance of the whole model. On the independent variables, a t-test will be conducted to indicate the significance of the variable. To indicate the completeness of the model, the $R^2$ will be used. The data will be processed with the statistical program called ‘Stata’.
4.3 Dependent variable
Specialty performance can be measured with several methods. There are accounting / finance based measures such as Return on Assets (ROA), and Return on Equity (ROE). Also market based measures are available when measuring performance. Tobin’s Q or Price-to-Earnings ratio (P/E ratio) are some examples of market based measures.

In this research a finance based measurement tool would not be appropriate to use because hospitals are non-profit organizations where the focus is more on quality of the given healthcare than on financial performance. Of course hospitals have to make small profits in order to have some reserves for a bad year or for extraordinary expenditures. It is therefore better to use a performance indicator which is based on quality of the given healthcare or a performance measure on change in market shares. The next section will describe the possible options for measuring performance while in section 4.3.2 a choice will be made between the possible measurements.

4.3.1 Performance indicators
There are three institutions which rank hospitals based on multiple quality factors. The first is the ‘Algemeen Dagblad’ (AD), which is a daily newspaper in the Netherlands. The second is ‘Elsevier’, which is a Dutch magazine, and the third is the consultancy firm ‘Roland Berger’. Only Elsevier studied the performance of specialties within the hospital. Therefore this is the best indicator for performance in this research. In the following, the Elsevier study will be explained.

Elsevier interviewed 5000 people who are working in the hospital sector. From these 5000 people, about 2900 were specialists. The other were family doctors, nurses, and managers. This resulted in two kind of rankings. One ranking is for the best hospital in the Netherlands and the other ranking is for each hospital per specialty.

The overall hospital ranking is based on seven indicators. These are the medical functioning, quality of the specialists, extra facilities like intensive care, quality as college of education, quality of the nursing, service to the patient, and the cooperation with the family doctors. With the results of this research all hospitals are ranked in one list. This ranking is shown in Appendix III.

The specialty performance is based on the 5000 interviews. The interviewed persons are asked which hospitals stand out in a particular specialty. They could compliment four known hospitals in their region based on perceived quality. This led to a national performance list of 11 specialties.
multiple other specialties only a top 10 could be published because they are less frequently visited by patients.\footnote{http://www.elsevier.nl/web/10194481/Artikel/De-beste-specialisten-in-de-buurt.htm}

The study of Elsevier creates the possibility to analyze the effects of diversification on the performance of each single specialty. The only limitation in this case is that only for the eleven most frequently occurring specialties, the results are available. For the other specialties, only a top ten is published.

### 4.4 Independent variable - Diversification

Diversification is one of the independent variables in this research. A plethora of measurement tools is available to measure diversification. Two major streams in diversification literature measured diversification. The ‘Industrial Organization’ literature found no significant relation between diversification and performance while the strategic management literature does find a significant relationship. According to Palepu (1985) this difference is due to the fact that the strategic management studies use categorical measures of diversification which make a difference between related and unrelated diversification while IO use simple product count. The method which is used, influences the outcomes of the study which stresses the importance of the choice for a good measurement tool. No superior method exists, so first, the different measurement methods will be explained and afterwards a suitable method for measuring diversification in hospitals will be given.

#### 4.4.1 Diversification measurement tools

A wide range of diversification measurement tools exist. These methods can be divided into groups. We distinguish the categorical or strategic methods and the continuous method. Also RBV inspired measures exist.

One commonly known method in the categorical group is called Rumelt’s measure. The measurement developed by Rumelt (1974) uses the dispersal of the revenues of different businesses to determine diversification. The different businesses are often classified as the different business units within a firm. The classification depends on the specialization ratio and the relatedness ratio. The specialization ratio is the fraction of the revenues that is accounted for by the largest business. The relatedness ratio measures the fraction of the revenues which can be attributed to the largest group of businesses. Appendix IV shows the model of Rumelt (1974) in more detail.
The continuous measurements can be distinguished in simple product count and weighted product count. Wood (1971) developed two measures of simple product count: The Broad Spectrum Diversity (BSD) and the Narrow Spectrum Diversity (NSD). BSD is diversification into a business with different first two industry codes and indicates the un-relatedness of a firm. NSD is diversification into business which have different four digit industry codes but with identical first two digit, and it indicates the level of related diversification (Wood, 1971). An often used simple product count measurement tool is that of Varadarajan and Ramanujam (1987). It builds on the measures of Wood (1971) and identifies the level of relatedness or un-relatedness, based on Mean Narrow Spectrum Diversity (MNSD) and BSD. MNSD is calculated as the number of different four digit codes divided by the number of different two digit codes. A shortcoming of these two simple product measures is that they do not take into account the degree of importance of each business for the firm. Appendix V shows the model of Varadarajan and Ramanujam (1987).

The weighted product count measure overcomes the shortcomings of the simple product count methods. One of the weighted product count measures was developed by Jacquemin and Berry (1979) and later on extended by Palepu (1985). This measure is called the ‘entropy measure’ of diversification. It uses the number of product segments, the sales distribution between these segments, and the degree of relatedness between the segments (Palepu, 1985). Often industry classification methods are used to indicate the degree of relatedness. More information about the entropy measure is placed in appendix VI.

The last group of measurement tools is the group with RBV inspired measures. These methods focus on the sharing of strategic assets and competencies between business units (Markides and Williamson, 1994). Farjoun (1994) uses, for his measure of relatedness, human resource profiles which are quantifiable.

4.4.2 Diversification in hospitals

For measuring diversification in hospitals with one of the above described methods, some additional data are needed. The product count methods need industry codes like SIC or NACE. The SIC and NACE codes for hospitals are shown in Appendix I and II. This means that the entropy measure and the method of Varadarajan and Ramanujam (1987) can indicate the diversification of a hospital. Due to limitations in the availability of the data, it is not possible to use the entropy measure. This is so because the sales distributions are not available for every business in a hospital. One could think of using some production figures such as number of patients or employees per specialty, but this is also not available in every case.
Rumelt’s measure uses revenues of each business unit to determine diversification. Again, these data are not reported for every business in the hospital which makes it impossible to use this measure. Montgomery (1982) found that the categorical measure of Rumelt (1974) is highly correlated with the product count measure of Varadarajan and Ramanujam (1987).

The RBV inspired measure looks for the sharing of strategic assets and competencies. To use this, knowledge is needed about the relatedness between each specialty. This knowledge is only known by insiders, so this measure is not really suitable for measuring diversification in hospitals.

In this research it seems best to use the method of Varadarajan and Ramanujam (1987). Rumelt’s measure and the entropy measure are not usable in this study due to data limitations. Because of the fact that Dutch hospitals have no variation in BSD, the method of Varadarajan and Ramanujam (1987) is not adding value with regard to the simple product count method of Wood (1971). Wood’s (1971) simple product count method will be used in this case with NSD as indicator for diversification.

Annual reports of all hospitals are used to measure NSD. The NSD measure is based on annual reports of 2007. SIC is the Standard Industrial Classification method which is used often. When comparing SIC with other classification methods like NACE and NAIS, similar results are found. Some other more unknown classification methods in The Netherlands are SBI (Standaard Bedrijfs Indeling) and BIK (Bedrijfsindeling Kamers van Koophandel). SBI is used by the Dutch government and is based on SIC and NACE which also makes that is rather similar to their system. BIK codes are used by the Dutch chamber of commerce and offers a rather limited list of industry codes which is not suitable for measuring diversification. Also the chamber of commerce changes over to the SBI system which means that BIK will disappear in the future. Because of the fact that SIC, NACE, NAIS, and BIK are all rather similar to each other, this study will use SIC because it is the standard method used in research.

**4.5 Independent variable – Within-industry diversification**

For within-industry diversification, the entropy measure is used in existing literature. In the previous section we have seen that this method is not usable due to data limitations. Within-industry diversification in hospitals, is seen at the level of the specialty. This means that a hospital with a high number of specialties, has a high degree of within-industry diversification.
Within-industry diversification will be measured by counting the number of specialties within each hospital. In the Netherlands, 30 official certified medical specialties exist. These are contemplative$^5$, supporting$^6$, and cutting$^7$ specialties.$^8$ For each hospital, it will be identified how many of these 30 specialties they offered in 2007.

### 4.6 Control variables

As control variable, hospital size will be used. With a measure of hospital size in the analysis, the effects of size on diversification and performance will be controlled for in the diversification performance relationship. Hospital size can be measured in terms of turnover, profits, number of beds, or as the number of employees. In this research the number of beds, and turnover, will be indicators for hospital size.

Also, a control variable for hospital type will be taken in the model. This variable will indicate whether the hospital is academic, general, or categorical (See section 2.1). Dummy variables will be used for each type of hospital with the UMC hospitals as base. Two other variables will indicate the solvability and liquidity of the hospitals. Solvability will be measured as equity divided by the total assets. Liquidity is a measure of current assets divided by current liabilities.

Dummy variables will be created to control for the effects of location of the hospitals on the performance. For each province a dummy variable is created. This will give an indication of the urbanization level of the hospitals. The province Zuid-Holland is used as the base in the regression analysis.

### 4.7 Sample

The sample consists of 96 hospitals located in the Netherlands. Of every hospital, 11 specialties are in the sample. In total we find 1036 observations. Table 4.1 shows all variables which are used in this study. In addition, it shows the source of the data and the measurement.

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$^5$ In Dutch: Beschouwende specialismen  
$^6$ In Dutch: Ondersteunende specialismen  
$^7$ In Dutch: Snijdende specialismen  
$^8$ [http://orde.artsennet.nl/orde/Wetenschappelijke-verenigingen.htm](http://orde.artsennet.nl/orde/Wetenschappelijke-verenigingen.htm)
As an indicator of performance, the Elsevier study of 2008 is used. This study reports performance measures of 11 specialties within a sample of 96 Dutch hospitals. Of the remaining specialties only a top 10 is reported and because of this, these are excluded from the study. Palich et al. (2000) found a curvilinear relation between performance and diversification in their study. Because of this, the diversification measure NSD is raised to a square.

As an indicator for within-industry diversification data are used from the RIVM which offered data about the specialties which were offered by each individual hospital in 2007. The RIVM also offered data about the geographical region of the hospitals and also the number of beds which were available in each hospital in 2007. On top of this, the RIVM indicates the type of each hospital which is used in the dummy variables. Annual reports are used for retrieving financial data like liquidity, solvability, and turnover.

### 4.8 Summary

This chapter identified the ways in which the hypothesis can be analyzed. The research question stated which methods could be used to measure the diversification performance linkage. A regression analysis will be conducted to measure the linkage between diversification and performance. The dependent variable is performance. Corporate diversification and within-industry diversification are the independent variables in the model.
Multiple ways to measure performance are available. In the hospital sector financial measures are not a good indicator for performance because the focus should be more on quality. Performance of specialties is only available from the Elsevier study and these data are the best to use in this study as an indicator for performance.

For diversification, multiple methods exist which indicate the level and kind of diversification. There are product count measures, categorical measures, and RBV inspired measures. In this situation, NSD is used as a measure of diversification. Within-industry diversification, will be measured by counting the number of specialties within the hospital. The number of beds in a hospital will indicate the size of the hospital and is included as control variable. Turnover, solvability, liquidity, location, and hospital type are other variables which will be used to control the effects of diversification on performance.

The next chapter will execute the data analysis in the way it is stated in this chapter. After that the results of the study are discussed.
5. Results

This section deals with the results of this study. First some descriptive statistics are outlined to get feeling for the data. In the second part a correlation matrix is discussed and the third part deals with the regression analysis. This part will also deal with the hypothesis testing.

5.1 Descriptive statistics

A total of 1036 performance measurements are used in this study. A total of 96 hospitals are included in the sample. Table 5.1 shows descriptive statistics of every variable in the sample.

<table>
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<th>Variable</th>
<th>Obs</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
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<td>8.5%</td>
<td>28.6%</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Geo. Flevoland</td>
<td>1036</td>
<td>2.1%</td>
<td>14.4%</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Geo. Drenthe</td>
<td>1036</td>
<td>5.3%</td>
<td>22.4%</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Geo. Groningen</td>
<td>1036</td>
<td>5.3%</td>
<td>22.4%</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Geo. Friesland</td>
<td>1036</td>
<td>5.3%</td>
<td>22.4%</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 5.1 – Descriptive statistics

The performance measure shows a minimum of 2 and a maximum of 78, which can be put down to the ‘Havenziekenhuis’ and the ‘Sint Maartenskliniek’, respectively. The performance measure has an average of 25.
NSD shows a minimum of 4 and a maximum of 15. The average is 9. Within industry diversification has a minimum of 1 and a maximum of 34. The mean is 25 which means that hospitals have on average 25 specialties available in the hospital.

The hospitals in the sample have an average turnover of €183 million, 546 beds, a current ratio of 0.76, and 11.9% equity over total assets. These four measures are as used control variables in the analysis. The solvability measure displays a minimum of -0.01 which denotes that one or a few hospitals in the sample have a negative amount of equity on the balance sheet. Last, dummy variables for hospital type and for geographical region are included the model as control variables.

A check on the normality of the variables gives negative results. The Shapiro-Wilk test for normal data gives a significant p-value which means that the data are not similar to a normal distribution (See table 5.2).

| Variable                      | Obs | W     | V     | z    | Prob>|z|
|-------------------------------|-----|-------|-------|------|------|
| Specialty Performance        | 1036| 0.949 | 33.081| 8.577| 0.000|
| Diversification NSD          | 1036| 0.949 | 33.129| 8.681| 0.000|
| Within-Industry Diversification | 1036| 0.919 | 52.529| 9.824| 0.000|
| Hosp. Solvability            | 1036| 0.868 | 85.659| 11.037| 0.000|
| Hosp. Liquidity              | 1036| 0.370 | 410.362| 14.922| 0.000|
| Hosp. Turnover               | 1036| 0.698 | 196.408| 13.095| 0.000|
| Hosp. Beds                   | 1036| 0.914 | 55.774| 9.973| 0.000|
| Type UMC                     | 1036| 0.980 | 13.335| 6.424| 0.000|
| Type Categorical             | 1036| 0.502 | 324.529| 14.340| 0.000|
| Type General                 | 1036| 0.983 | 11.343| 6.023| 0.000|
| Geo. Limburg                 | 1036| 0.972 | 18.364| 7.218| 0.000|
| Geo. Noord-Brabant           | 1036| 0.984 | 10.222| 5.765| 0.000|
| Geo. Zeeland                 | 1036| 0.943 | 37.250| 8.972| 0.000|
| Geo. Zuid-Holland            | 1036| 0.995 | 2.983 | 2.710| 0.003|
| Geo. Noord-Holland           | 1036| 0.988 | 8.091 | 5.185| 0.000|
| Geo. Overijssel              | 1036| 0.982 | 11.615| 6.082| 0.000|
| Geo. Utrecht                 | 1036| 0.976 | 15.512| 6.799| 0.000|
| Geo. Gelderland              | 1036| 0.980 | 13.163| 6.392| 0.000|
| Geo. Flevoland               | 1036| 0.916 | 54.799| 9.929| 0.000|
| Geo. Drenthe                 | 1036| 0.966 | 22.278| 7.597| 0.000|
| Geo. Groningen               | 1036| 0.966 | 22.278| 7.597| 0.000|
| Geo. Friesland               | 1036| 0.966 | 22.278| 7.597| 0.000|

Table 5.2 – Shapiro Wilkinson test for normal data
Because of the negative results for normality of the data, additional tests are performed. A test on Skewness and kurtosis give the same results which means that the data are not normally distributed. To improve the normality of the data, all variables are transformed to a logarithm, square root, and to the power of two. Next, the same tests (Shapiro-Wilk, Skewness & Kurtosis) are performed to test the normality of the data. The results are presented in Appendix VIII. The general view derived from these tests is that the transformed variables do not improve the normality of the data. Section 5.3 deals with the regression analysis. Based on the previous findings, additional regressions are performed with the transformed variables.

5.2 Correlation matrix

A correlation matrix is presented in appendix VII and displays the correlation coefficients of all variables in the model. High correlation is an indication for multicollinearity. The results show that within-industry diversification has a relatively high positive correlation with NSD (0.36). Furthermore, we see that the control variables turnover (0.53), and hospital beds (0.58) are highly correlated with within industry diversification. This suggests that hospitals with a high level of specialties have a higher turnover and also more beds. Turnover and hospital beds are positively correlated (0.73) which is very high. An additional check on the Variation Inflation Factor (VIF) resulted in a value of 11.05 which indicates a very high level of multicollinearity. As a possible solutions, it is tested to raise turnover to the second power, which resulted in a lower VIF value of 6.58. This value is still too high and because of this turnover is excluded from the regression analysis.

Another striking point in the correlation matrix is that both NSD and within industry diversification are negatively correlated with performance which indicates that performance is negatively influenced by the level of diversification. In section 5.3, a regression analysis is conducted in which the hypotheses are tested.
5.3 Regression analysis

Table 5.3 shows the results of a regression analysis which is conducted in STATA. The OLS regression is adjusted for 96 hospital clusters which means that standard errors are adjusted for within-cluster correlation and because of this more robust.

![Regression Results Table]

The R² of the model is 0.054 which means that only 5.4 percent of the variation in performance is explained by the model. This is a rather low percentage but in this particular case not a problem because the goal of this study is not to predict the performance of hospitals but to find a relation between diversification in hospitals and their performance.
The F-statistic shows a value of 10.66 with a p-value of 0, which means that the model is suitable and further analysis is useful. Hypothesis one suggested that the performance of a specialty is improved by a higher level of related diversification in the hospitals. This hypothesis is not supported because the independent variable NSD is not significantly related to performance.

The second hypothesis argued that a higher level of within-industry diversification would increase the specialty performance. This hypothesis is also not supported by the model. The test statistic is significantly related to performance but the effect of the coefficient is negative. This means that a higher level of within-industry diversification has a negative impact on the performance of a specialty. This implies that specialties that are part of a hospital which offers a small number of specialties tend to offer a better quality of healthcare than specialties that are part of a hospital which offers a large number of specialties.

Other results indicate that liquidity is significantly related to specialty performance. A better liquidity of a hospital indicates less performing specialties within that hospital. Hospital type is also an important factor for the performance of the specialty. University medical centres are the base in the regression analysis. Specialties within a categorical hospital tend to perform much better than specialties in UMC or general hospital. Specialties in a general hospital do not perform statistically significant better than specialties in an UMC. This is also supporting the results found for within-industry diversification because categorical hospitals have on average fewer specialties within their hospital.

The effects of location on performance are ambiguous. On average hospitals in less urbanized provinces seem to perform better but only Flevoland is significantly performing better than Zuid-Holland while the rest of the provinces is not or only marginally significantly different.

The results of the regression analyses with the transformed variables are shown in Appendix IX. The results do not show large differences with the original analysis. NSD is not statistically significant related to performance in all regressions. Within-industry diversification is significant related to specialty performance but only in the model with logarithm’s, it is not significant related to specialty performance. The results on geographical regions remain the same. Hospital type also gives the same results.
5.4 Optimal level Within-Industry Diversification

In the case of within-industry diversification it is possible to determine the optimal level of specialties that operate in the same hospital to maximize performance of these specialties. With the corporate diversification measure (NSD) this is not possible because it is not significantly different from zero.

Figure 5.1 shows a fractional prediction of performance in relation with within-industry diversification. It is based on the average performance for each number of specialties.

As shown in the graph, the optimal level of within-industry diversification is five. This means that specialties that are part of a hospital with five specialties within the hospital have on average a better performance than specialties that are part of a larger or smaller diversified hospital.

Also shown in the graph is the fact that performance decreases with an increasing level of within-industry diversification. Hospitals with fewer than five specialties have also less performing specialties within their hospital but those specialties still perform better than highly diversified hospitals.
5.5 Summary

This chapter was concerned with the findings of the study. A test on multicollinearity resulted in the exclusion of liquidity from further analysis. An OLS regression is conducted with performance as a dependent variable. The sample consisted of 1036 observations on specialty performance and in total 96 hospitals were included in the sample. The regression produced an $R^2$ of 5.4 percent and a significant F-statistic.

Both hypothesis are not accepted based on the regression analysis. The NSD measure is not statistically significant different from zero. The within-industry diversification measure showed a significant negative relation between within-industry diversification and performance. The results remain the same when the analysis is performed with transformed variables. These results imply that hospitals have to specialize to let the specialty provide a high quality of healthcare. This is also shown by the fact that the optimal level of within-industry diversification is five. Hospitals with five specialties within their hospital have the best performing specialties on average. The next chapter will discuss the results which came up from this chapter and provide limitations to the research. Also recommendations for future research are indicated.
6. Discussion and conclusions

This chapter will summarize the main conclusions of the study and provide a discussion of some points. Also, recommendations for future research are given. At last, limitations of this research will be outlined.

6.1 Discussion

The main finding of this paper is that Dutch hospitals should become more specialized instead of diversified to improve their performance in quality. Within-industry diversification resulted in the finding that hospitals have to focus on a limited number of specialties to improve the quality of the given care. Specialties that are part of a hospital with a high number of specialties show a significantly lower performance than specialties that are part of a hospital with a low number of specialties. These results are in contrast with hypothesis two, which proposed a better performance for specialties which are part of a highly diversified hospital. This indicates that hospitals are not able to create better performing specialties from diversification.

This could be due to the fact that specialties within a hospital do not cooperate with each other. Theoretically, cooperation between specialties is a critical element in performance improvement. This implies that specialties which work within the same hospital, have to cooperate to improve the quality of the provided healthcare. Cooperation could lead to the exploitation of synergies which lead to better quality of the given care within the specialty. When the specialties do not cooperate, they will not be able to improve the performance. This could be the case in this study because within-industry diversification leads to a lower performance of the specialties. If specialties do not cooperate, they will hamper each other and decrease performance.

The difference between the results of hypothesis one and hypothesis two is not directly explicable. The fact that NSD is not significantly different from zero could be due to the fact that variation in corporate diversification is rather low for hospitals. Hospitals vary on some nursing facilities and some miscellaneous healthcare services such as kidney dialysis centres which they sometime have in their portfolio. The variation in within-industry diversification is higher because hospitals vary more on the number of specialties than on NSD. This difference in variation could lead to different findings between the two hypothesis. Another explanation could be that with less related businesses the cost of bureaucracy become less because the businesses are more independent.
The problem statement - What level of diversification should Dutch hospital have to improve the performance of the specialty in the hospital? – can now be answered. The optimal level of within-industry diversification is five which implies that hospitals that offer five specialties have the best performing specialties. The number of specialties should be limited to five, to improve the quality performance of the specialty. The level of corporate diversification does not seem to be of any influence on the performance of the hospital. The results of this study argue for a healthcare system in which hospitals are more specialized than they are nowadays so that the quality of the given healthcare is improved.

6.2 Recommendations

Future research could focus on financial performance in relation to diversification in the Dutch hospital sector. Here one can think of Return on Assets or other financial performance indicators that measures financial performance. The Dutch population is getting older on average which will have its effect on the cost of the total healthcare sector. A combination of qualitative good care and less expensive care is very important for the future so that healthcare stays available for everyone in the population.

The influence of cooperation between specialties is not taken into account in this research. The degree of cooperation between specialties could be a critical element in the quality of the given care. Future research could study the effects of cooperation between specialties and its effect on the performance of the specialty and also on the hospital performance.

Future research could also focus on the bureaucracy cost of the Dutch hospitals and relate this to performance. Gaining more knowledge about the cost of bureaucracy in the hospital sector, will give managers the opportunity to make better decisions related to the portfolio of the hospital.
6.3 Limitations

This section will cover the limitations of this research. A first limitation is the fact that only performance of the eleven most common specialties is used. This means that the effect of the smaller and often more specific specialties is not taken into account. It could be that adding these specialties would provide better quality of the given care or that these specialties profit from the presence of the other specialties. Also some limitations of the research methods of Elsevier can be mentioned. The way of phrasing the question can influence the answers given by the respondents. It could also be that the respondents might not be able to judge the quality of a specialty in another hospital. If this is the case, it become an index of popularity.

The third limitation is the fact that diversification is not measured with use of a weighted measurement tool such as the entropy measure. These kinds of measurement give a better proxy for the diversification level of a hospital. The results of this study are only applicable to the Dutch hospital sector. The Dutch healthcare system has unique properties which makes it hard to compare with other healthcare systems over the world. Therefore, this study is not generalizable to other countries.

A fourth limitation can be found in the fact that the view of the patient is not taken into account in this study. Only professionals who work in the sector could participate in the study. Another limitation is the fact that cooperation between specialties is not taken into account in this study. Finally, the study would have given more solid results when data over multiple years would have been available.
References


Appendices

Appendix I – SIC codes health services

80 HEALTH SERVICES

801 OFFICES AND CLINICS OF DOCTORS OF MEDICINE
   8011 OFFICES AND CLINICS OF DOCTORS OF MEDICINE

802 OFFICES AND CLINICS OF DENTISTS
   8021 OFFICES AND CLINICS OF DENTISTS

803 OFFICES AND CLINICS OF DOCTORS OF OSTEOPATHY
   8031 OFFICES AND CLINICS OF DOCTORS OF OSTEOPATHY

804 OFFICES AND CLINICS OF OTHER HEALTH PRACTITIONERS
   8041 OFFICES AND CLINICS OF CHIROPRACTORS
   8042 OFFICES AND CLINICS OF OPTOMETRISTS
   8043 OFFICES AND CLINICS OF PODIATRISTS
   8049 OFFICES AND CLINICS OF HEALTH PRACTITIONERS, NOT ELSEWHERE CLASSIFIED

805 NURSING AND PERSONAL CARE FACILITIES
   8051 SKILLED NURSING CARE FACILITIES
   8052 INTERMEDIATE CARE FACILITIES
   8059 NURSING AND PERSONAL CARE FACILITIES, NOT ELSEWHERE CLASSIFIED

806 HOSPITALS
   8062 GENERAL MEDICAL AND SURGICAL HOSPITALS
   8063 PSYCHIATRIC HOSPITALS
   8069 SPECIALTY HOSPITALS, EXCEPT PSYCHIATRIC

807 MEDICAL AND DENTAL LABORATORIES
   8071 MEDICAL LABORATORIES
   8072 DENTAL LABORATORIES

808 HOME HEALTH CARE SERVICES
   8082 HOME HEALTH CARE SERVICES

809 MISCELLANEOUS HEALTH AND ALLIED SERVICES, NOT ELSEWHERE CLASSIFIED
   8092 KIDNEY DIALYSIS CENTERS
8093 SPECIALTY OUTPATIENT FACILITIES, NOT ELSEWHERE CLASSIFIED
8099 HEALTH AND ALLIED SERVICES, NOT ELSEWHERE CLASSIFIED

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Appendix II – NACE codes Healthcare services

NACE codes:

Q - Human health and social work activities
Q86 - Human health activities
Q86.1 - Hospital activities
Q86.1.0 - Hospital activities
Q86.2 - Medical and dental practice activities
Q86.2.1 - General medical practice activities
Q86.2.2 - Specialist medical practice activities
Q86.2.3 - Dental practice activities
Q86.9 - Other human health activities
Q86.9.0 - Other human health activities
Q87 - Residential care activities
Q87.1 - Residential nursing care activities
Q87.1.0 - Residential nursing care activities
Q87.2 - Residential care activities for mental retardation, mental health and substance abuse
Q87.2.0 - Residential care activities for mental retardation, mental health and substance abuse
Q87.3 - Residential care activities for the elderly and disabled
Q87.3.0 - Residential care activities for the elderly and disabled
Q87.9 - Other residential care activities
Q87.9.0 - Other residential care activities
Q88 - Social work activities without accommodation
Q88.1 - Social work activities without accommodation for the elderly and disabled
Q88.1.0 - Social work activities without accommodation for the elderly and disabled
Q88.9 - Other social work activities without accommodation
Q88.9.1 - Child day-care activities
Q88.9.9 - Other social work activities without accommodation n.e.c.

Appendix III – Elsevier ranking hospitals 2008

BESTE ZIEKENHUIZEN BEOORDEELD

ALLE ZIEKENHUIZEN BEOORDEELD

Corporate Strategy in Dutch Hospitals

Thursday, 20 January 2011

Harry Nieuwlaar

236156

VII
Appendix IV – Rumelt’s measure

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Category</th>
<th>Ratio specification</th>
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<tbody>
<tr>
<td>SB</td>
<td>Single business</td>
<td>$R_s \geq 0.95$</td>
</tr>
<tr>
<td>DV</td>
<td>Dominant vertical</td>
<td>$R_s \geq 0.70$</td>
</tr>
<tr>
<td>DC</td>
<td>Dominant constrained</td>
<td>$0.95 &lt; R_s &lt; 0.7; \quad R_c &gt; (R_s + R_t)/2$</td>
</tr>
<tr>
<td>DLU</td>
<td>Dominant linked-unrelated</td>
<td>$0.95 &lt; R_s &lt; 0.7; \quad R_c &lt; (R_s + R_t)/2$</td>
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<tr>
<td>RC</td>
<td>Related constrained</td>
<td>$R_s &lt; 0.70; \quad R_t &gt; 0.70; \quad R_c &gt; (R_s + R_t)/2$</td>
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<tr>
<td>RL</td>
<td>Related linked</td>
<td>$R_s &lt; 0.70; \quad R_t &gt; 0.70; \quad R_c &lt; (R_s + R_t)/2$</td>
</tr>
<tr>
<td>UB</td>
<td>Unrelated business</td>
<td>$R_t &lt; 0.70$</td>
</tr>
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</table>

Source: Rumelt (1982; p360)

Source: Rumelt (1974)
Appendix V – Varadarajan and Ramanujam (1987)

<table>
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<th>Broad spectrum diversity$^a$</th>
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<th>Low</th>
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<tr>
<td>Cell C: Unrelated-</td>
<td>Cell D: Firms with</td>
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<tr>
<td>diversified firms</td>
<td>very high diversity</td>
<td></td>
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<tr>
<td>Cell A: Firms with</td>
<td>Cell B: Related-</td>
<td></td>
</tr>
<tr>
<td>very low diversity</td>
<td>diversified firms</td>
<td></td>
</tr>
</tbody>
</table>

$^a$ Broad spectrum diversity (BSD) is the number of two-digit SIC categories in which a firm concurrently operates.

$^b$ Mean narrow spectrum diversity (MNSD) is the number of four-digit SIC categories in which a firm operates divided by the number of two-digit SIC categories in which it operates.

Source: Varadarajan and Ramanujam (1987;p383)
Appendix VI - Entropy measure of diversification

The entropy (inverse) measure of industry concentration weights each $P_i$ by the logarithm of $1/P_i$, e.g.

$$E = \sum_{i=1}^{n} P_i \ln 1/P_i$$

Source: Jacquemin and Berry (1979; p360)
Appendix VII – Correlation matrix

| Specialty Performance | Diversification N&D | Within-industry Diversification | Hospital Solvability | Hospital Liquidity | Hospital Turnover | Hospital Beds | Type UMC | Type Categorical | Type General | Geo Limburg | Geo Noord-Brabant | Geo Zeeland | Geo Duitsehoek | Geo Overijssel | Geo Utrecht | Geo Gelderland | Geo Friesland | Geo Groningen | Geo Fryslan |
|-----------------------|---------------------|-------------------------------|----------------------|-------------------|------------------|---------------|----------|----------------|--------------|------------|-----------------|------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| Specialty Performance | 1                   |                               |                      |                   |                  |               |          |                |              |            |                 |            |                |                 |                |                |                |                |                |                |
| Diversification N&D   | -0.0501             | 1                             |                      |                   |                  |               |          |                |              |            |                 |            |                |                 |                |                |                |                |                |                |
| Within-industry       | -0.124              | 0.36                          | 1                    |                   |                  |               |          |                |              |            |                 |            |                |                 |                |                |                |                |                |                |
| Diversification N&D   | -0.0462             | -0.120                        | 0.0808               | 0.1017            | 1                |               |          |                |              |            |                 |            |                |                 |                |                |                |                |                |                |
| Hospital Solvability  | -0.0268             | 0.0407                        | 0.1436               | 1                 |                  |               |          |                |              |            |                 |            |                |                 |                |                |                |                |                |                |
| Hospital Turnover     | -0.0274             | 0.2174                        | 0.5256               | 0.347             | 0.0421           | 1             |          |                |              |            |                 |            |                |                 |                |                |                |                |                |                |
| Hospital Beds         | -0.0119             | 0.1696                        | 0.581               | 0.1019            | 0.0533           | 0.7297        | 1         |                |              |            |                 |            |                |                 |                |                |                |                |                |                |
| Type UMC              | -0.0498             | 0.0901                        | 0.3555               | 0.3341            | 0.0859           | 0.8647        | 0.4566    | 1              |              |            |                 |            |                |                 |                |                |                |                |                |                |
| Type Categorical      | 0.1054              | -0.112                        | -0.2767             | 0.0741            | 0.0196           | -0.0289       | -0.0355   | -0.0134        | 1            |            |                 |            |                |                 |                |                |                |                |                |                |
| Type General          | 0.0204              | -0.0717                       | -0.3384             | -0.3423           | -0.0879          | -0.8354       | -0.4436   | -0.9878        | -0.1438      | 1          |                 |            |                |                 |                |                |                |                |                |                |
| Geo Limburg           | 0.0187              | 0.2413                        | 0.1677               | 0.0038            | -0.0255          | 0.0297        | -0.0085   | 0.0765         | -0.0115      | -0.0759   |                 |            |                |                 |                |                |                |                |                |                |
| Geo Noord-Brabant     | 0.0117              | 0.0845                        | 0.067               | -0.0586          | -0.0608          | -0.0398       | 0.1567    | -0.105          | -0.0153      | 0.1063    | -0.0899        | 1          |                |                 |                |                |                |                |                |                |
| Geo Zeeland           | 0.0037              | -0.0141                       | 0.1059              | -0.1076          | -0.0227          | -0.0999       | -0.1056   | 0.0559          | -0.0080      | 0.0559    | -0.0073        | 0.0625      | 1          |                 |                |                |                |                |                |                |
| Geo Zuid-Holland      | 0.0057              | -0.1014                       | -0.1904             | -0.0113          | 0.2033           | 0.0036        | 0.0211    | 0.0111         | 0.0276       | -0.0153   | -0.1444        | -0.1908     | -0.1004      | 1          |                |                |                |                |                |                |                |
| Geo Noord-Holland     | -0.0013             | -0.1198                       | -0.0192             | -0.067           | -0.0467          | 0.0416        | -0.0131   | 0.112          | -0.0368      | -0.1893   | -0.0997        | -0.1317     | -0.0699      | -0.2135      | 1          |                |                |                |                |                |                |                |
| Geo Overijssel        | -0.0319             | 0.0234                        | 0.1206              | -0.0955          | -0.0389          | -0.0131       | 0.09      | -0.099         | -0.0143      | 0.1003    | -0.0548        | -0.112      | -0.0590      | -0.1799      | -0.1242      | 1          |                |                |                |                |                |                |                |
| Geo Utrecht           | 0.0027              | 0.0468                        | 0.1204              | -0.0457          | 0.1391           | 0.0484        | 0.0589    | -0.0125        | -0.0563      | -0.0738   | -0.0977        | -0.0914     | -0.1569      | -0.1093      | -0.0821      | 1          |                |                |                |                |                |                |                |
| Geo Gelderland        | 0.0421              | 0.0040                        | 0.0575              | -0.018           | -0.0754          | 0.0608        | 0.0019    | 0.0425          | 0.065        | 0.0512    | -0.08           | 0.1057      | -0.0556      | -0.1607      | -0.1171      | -0.0596      | 0.0869      | 1          |                |                |                |                |                |                |
| Geo Friesland         | 0.0349              | -0.0641                       | -0.0435             | -0.1433          | -0.0254          | -0.0841       | -0.1059   | -0.0449        | -0.0005      | 0.0454    | -0.0384        | -0.0586      | -0.0267      | -0.0815      | -0.0563      | -0.0479      | -0.0417      | -0.0452      | 1          |                |                |                |                |                |                |
| Geo Drenthe           | -0.0536             | 0.1075                        | 0.1104              | 0.0611           | 0.0004           | -0.1151       | -0.2024   | -0.0721        | -0.0104      | 0.0703    | 0.0603          | -0.0816     | -0.0429      | -0.1321      | -0.0905      | -0.0774      | -0.0726      | -0.0946      | 1          |                |                |                |                |                |                |
| Geo Groningen         | 0.0119              | -0.1117                       | -0.0177             | -0.0253          | -0.0152          | 0.0628        | -0.0257   | 0.0977          | -0.0104      | -0.0951   | -0.0618        | -0.0616     | -0.0429      | -0.1311      | -0.0905      | -0.0774      | -0.0726      | -0.0946      | 0.0591      | -0.0561      | 1          |                |                |                |                |                |                |
| Geo Friesland         | -0.0217             | 0.0056                        | 0.0293              | 0.1617           | 0.0401           | -0.0389       | -0.1187   | -0.0721        | -0.0104      | 0.0703    | 0.0618          | -0.0429     | -0.1321      | -0.0905      | -0.0774      | -0.0726      | -0.0946      | 0.0591      | -0.0561      | 1          |                |                |                |                |                |                |
### Appendix VIII - Shapiro-Wilk, Skewness & Kurtosis

#### Shapiro-Wilk Test for Normal Data

<table>
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<tr>
<th>Variable</th>
<th>Normal z</th>
<th>Logarithm z</th>
<th>Square root z</th>
<th>Power (2)</th>
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<td>8.681</td>
<td>7.204</td>
<td>7.582</td>
<td>10.928</td>
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<td>Within Industry Diversification</td>
<td>9.824</td>
<td>13.564</td>
<td>11.514</td>
<td>7.088</td>
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<tr>
<td>Hosp. Solvability</td>
<td>11.037</td>
<td>5.540</td>
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<td>14.043</td>
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<td>Geo. Limburg</td>
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<td>Geo. Noord-Brabant</td>
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<td>Geo. Zeeland</td>
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<td>Geo. Noord-Holland</td>
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#### Skewness & Kurtosis Test for Normal Data

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<th>Power (2) adj chi2</th>
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<td>Hosp. Solvability</td>
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<td>Hosp. Beds</td>
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<tr>
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<td>Geo. Overijssel</td>
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<td>Geo. Utrecht</td>
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<td>Geo. Gelderland</td>
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<tr>
<td>Geo. Flevoland</td>
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<td>Geo. Drenthe</td>
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<tr>
<td>Geo. Groningen</td>
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<td>Geo. Friesland</td>
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Appendix IX – Regression results transformed variables

<table>
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<th>Variable</th>
<th>Normal</th>
<th>Logarithm</th>
<th>Square root</th>
<th>Power (z)</th>
</tr>
</thead>
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<tr>
<td>Diversification NSD</td>
<td>-0.003</td>
<td>0.850</td>
<td>-0.008</td>
<td>0.910</td>
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<td>Within-Industry Diversification</td>
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<td>-0.334</td>
<td>0.081</td>
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<tr>
<td>Hosp. Solvability</td>
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<td>0.582</td>
<td>0.004</td>
<td>0.921</td>
</tr>
<tr>
<td>Hosp. Liquidity</td>
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<td>0.016</td>
<td>-0.007</td>
<td>0.839</td>
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<tr>
<td>Hosp. Beds</td>
<td>0.003</td>
<td>0.880</td>
<td>0.103</td>
<td>0.040</td>
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<td>0.137</td>
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<td>0.231</td>
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<td>0.375</td>
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<td>Geo. Noord-Brabant</td>
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<td>0.821</td>
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<td>0.674</td>
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<td>1.376</td>
<td>0.306</td>
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<td>0.062</td>
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<tr>
<td>Geo. Flevoland</td>
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<td>0.012</td>
<td>0.181</td>
<td>0.000</td>
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<td>0.279</td>
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<tr>
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<tr>
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